DELL®

Dell® PowerEdge® 6300 Systems

USER'S GUIDE

Safety Instructions

Use the following safety guidelines to help protect your computer system from potential damage and to ensure your own personal safety.

WARNING: The power supplies in this computer system produce high voltages and energy hazards, which can cause bodily harm. Only trained service technicians are authorized to remove the computer covers and access any of the components inside the computer.

WARNING

There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

WARNING: This system may have more than one power supply cable. To reduce the risk of electrical shock, a trained service technician must disconnect all power supply cables before servicing the system.

When Using Your Computer System

As you use your computer system, observe the following safety guidelines:

- Be sure your monitor and attached peripherals are electrically rated to operate with the AC power available in your location.

- To help prevent electric shock, plug the computer and peripheral power cables into properly grounded power sources. These cables are equipped with three-prong plugs to help ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable. If you must use an extension cable, use a three-wire cable with properly grounded plugs.

- To help protect your computer system from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).

- Be sure nothing rests on your computer system's cables and that the cables are not located where they can be stepped on or tripped over.

- Do not spill food or liquids on your computer.

- Do not push any objects into the openings of your computer. Doing so can cause fire or electric shock by shorting out interior components.

- Keep your computer away from radiators and heat sources. Also, do not block cooling vents. Avoid placing loose papers underneath your computer; do not place your computer in a closed-in wall unit or on a rug.
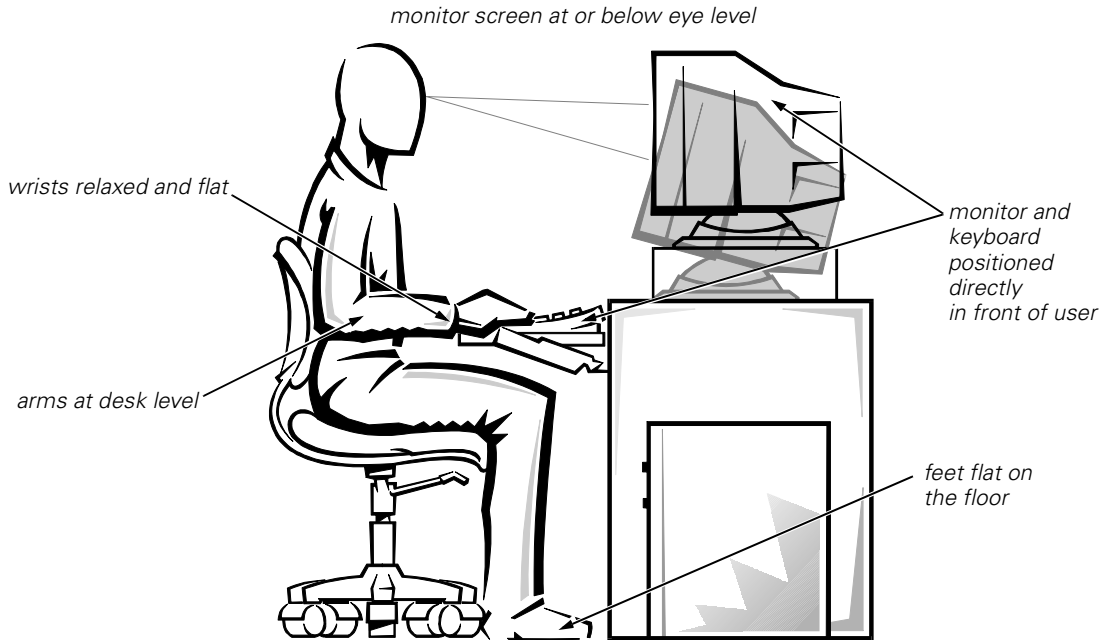
Ergonomic Computing Habits

WARNING: Improper or prolonged keyboard use may result in injury.

For comfort and efficiency, observe the following ergonomic guidelines when setting up and using your computer system:

- Position your system so that the monitor and keyboard are directly in front of you as you work. Special shelves are available (from Dell and other sources) to help you correctly position your keyboard.

- Set the monitor at a comfortable viewing distance (usually 510 to 610 millimeters [20 to 24 inches] from your eyes).

- Make sure the monitor screen is at eye level or slightly lower when you are sitting in front of the monitor.

- Adjust the tilt of the monitor, its contrast and brightness settings, and the lighting around you (such as overhead lights, desk lamps, and the curtains or blinds on nearby windows) to minimize reflections and glare on the monitor screen.

- Use a chair that provides good lower back support.

- Keep your forearms horizontal with your wrists in a neutral, comfortable position while using the keyboard or mouse.

- Always leave space to rest your hands while using the keyboard or mouse.

- Let your upper arms hang naturally at your sides.

- Sit erect, with your feet resting on the floor and your thighs level.

- When sitting, make sure the weight of your legs is on your feet and not on the front of your chair seat. Adjust your chair's height or use a footrest, if necessary, to maintain proper posture.

- Vary your work activities. Try to organize your work so that you do not have to type for extended periods of time. When you stop typing, try to do things that use both hands.

monitor screen at or below eye level

wrists relaxed and flat

monitor and keyboard positioned directly in front of user

arms at desk level

feet flat on the floor

When Working Inside Your Computer

Take note of these safety guidelines when appropriate:

CAUTION: To help avoid possible damage to the system board, wait 5 seconds after turning off the system before disconnecting a peripheral device from the computer.

- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnecting the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, make sure both connectors are correctly oriented and aligned.

Preface

About This Guide

This guide is intended for anyone who uses the Dell PowerEdge 6300 computer systems. The guide can be used by both first-time and experienced computer users who want to learn about the features and operation of the systems or who want to upgrade their systems. The chapters and appendixes are summarized as follows:

- Everyone should read Chapter 1, "Introduction," for an overview of the system features, a description of the controls and indicators on the front panel, and a general discussion of connecting external devices to the back panel of the system.

- Users who want to use the utilities, the diagnostics, or the online documentation, or install drivers for their operating system, should read Chapter 2, "Using the Dell Server Assistant CD."

- Everyone should read the first few sections of Chapter 3, "Installing and Configuring SCSI Drivers," to find out which small computer system interface (SCSI) device drivers (if any) are required for a particular system configuration. Users who need to install and configure particular SCSI device drivers should then read the appropriate section for their operating system.

- Everyone should read the first several sections of Chapter 4, "Using the System Setup Program," to become familiar with this important program. Only users who want to make configuration changes to their system or who want to use the password features need to read the rest of Chapter 4.

- Everyone should read Chapter 5, "Using the Resource Configuration Utility," whenever a Peripheral Component Interconnect (PCI) is added, removed, or repositioned in the computer, or when the settings for one of the built-in devices is changed.

- Appendix A, "Technical Specifications," and Appendix B, "I/O Ports and Connectors," are intended primarily as reference material for users interested in learning more about the details of the system.

- Appendix C, "Maintaining the System," describes preventive maintenance procedures that you should perform regularly to keep the system in top operating condition.

- Appendix D, "Regulatory Notices," is for users who are interested in which regulatory agencies have tested and approved the Dell PowerEdge 6300 systems.

- Appendix E, "Warranties and Return Policy," describes the warranties for Dell PowerEdge 6300 systems and the "Total Satisfaction" Return Policy.

- The Glossary provides definitions of terms, acronyms, and abbreviations used in this guide.

Warranty and Return Policy Information

Dell Computer Corporation ("Dell") manufactures its hardware products from parts and components that are new or equivalent to new in accordance with industry-standard practices. For information about the Dell warranty for your system, see Appendix E, "Warranties and Return Policy."

Other Documents You May Need

In addition to this *User's Guide*, the following documentation is included with your system:

- The *Installation and Troubleshooting Guide* provides instructions for installing system hardware and includes troubleshooting and diagnostic procedures for testing your computer system.

- The *HP OpenView Network Node Manager Special Edition 1.2 With Dell Open-Manage HIP 3.2 User's Guide* describes the alert messages issued by the server management software.

You may also have one or more of the following documents:

- Operating system documentation is included with the system if you ordered the operating system software from Dell. This documentation describes how to install (if necessary), configure, and use the operating system software.

- The Dell PowerEdge 6300 rack installation documentation provides detailed instructions for installing the system in a rack.

- Documentation is included with any options you purchase separately from the system. This documentation includes information that you need to configure and install these options in your Dell computer.

- Technical information files—sometimes called "readme" files—may be installed on the hard-disk drive to provide last-minute updates about technical changes to the system or advanced technical reference material intended for experienced users or technicians.

- Documentation updates are sometimes included with the system to describe changes to the system or software. Always read these updates *before* consulting any other documentation because the updates often contain information that supersedes the information in the other documents.

Notational Conventions

The following subsections list notational conventions used in this document.

Warnings, Cautions, and Notes

Throughout this guide, there may be blocks of text printed in bold type within boxes or in italic type. These blocks are warnings, cautions, and notes, and they are used as follows:

WARNING: A WARNING indicates the potential for bodily harm and tells you how to avoid the problem.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

NOTE: A NOTE indicates important information that helps you make better use of your system.

Typographical Conventions

The following list defines (where appropriate) and illustrates typographical conventions used as visual cues for specific elements of text throughout this document:

- *Keycaps*, the labeling that appears on the keys on a keyboard, are enclosed in angle brackets.

  Example: <Enter>

- *Key combinations* are series of keys to be pressed simultaneously (unless otherwise indicated) to perform a single function.

  Example: <Ctrl><Alt><Del>

- *Commands* presented in lowercase bold are for reference purposes only and are not intended to be typed at that particular point in the discussion.

  Example: "Use the **format** command to. . . ."

  In contrast, commands presented in the Courier New font are intended to be typed as part of an instruction.

  Example: "Type `format a:` to format the diskette in drive A."

- *Filenames* and *directory names* are presented in lowercase bold.

  Example: **autoexec.bat** and **c:\windows**

- *Syntax lines* consist of a command and all its possible parameters. Commands are displayed in lowercase bold; variable parameters (those for which you substitute a value) are displayed in lowercase italics; constant parameters are displayed in lowercase bold. The brackets indicate items that are optional.

  Example: **del** [*drive***:**] [*path*]*filename* [**/p**]

- *Command lines* consist of a command and may include one or more of the command's possible parameters. Command lines are presented in the Courier New font.

  Example: `del c:\myfile.doc`

- *Screen text* is text that appears on the screen of your monitor or display. It can be a system message, for example, or it can be text that you are instructed to type as part of a command (referred to as a *command line)*. Screen text is presented in the Courier New font.

  Example: The following message appears on your screen:

  `No boot device available`

  Example: "Type `md c:\dos`, and then press <Enter>."

- *Variables* are symbols for which you substitute a value. They are presented in italics.

  Example: DIMM*n* (where *n* represents the DIMM number)

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Introduction

The Dell® PowerEdge® 6300, which has an Intel® Pentium® II Xeon™ processor is a feature-rich, enterprise class server that offers the highest performance, availability, scalability, manageability, and investment protection features. The PowerEdge 6300 provides a robust, reliable, rack-optimized platform on which large corporate customers can deploy their mission critical applications.

This chapter describes the major hardware and software features of the computer system, provides information about the indicators and controls on the system's front panel, and discusses connecting external devices to the system.

System Features

The PowerEdge 6300 systems offer the following major features:

- One to four Intel Pentium II Xeon microprocessors with an internal operating frequency of 400 megahertz (MHz) and an external bus speed of 100 MHz.

  The Pentium II Xeon microprocessor includes MMX™ technology designed to handle complex multimedia and communications software. This microprocessor incorporates new instructions and data types as well as a technique called single instruction, multiple data (SIMD) that allows the microprocessor to process multiple data elements in parallel, thereby improving overall system performance.

- A secondary (L2) cache of 512 kilobytes (KB) to 2 MB of static random-access memory (SRAM) is included within the single-edge contact (SEC) cartridge that contains the microprocessor. Math coprocessor functionality is internal to the microprocessor.

- Support for symmetric multiprocessing (SMP) is available by installing up to three more Pentium II Xeon microprocessors. SMP greatly improves overall system performance by dividing microprocessor operations among the independent microprocessors. To take advantage of this feature, you must use an operating system that supports multiprocessing, such as Microsoft® Windows NT® 4.0 or Novell® NetWare® 4.11 (and later versions).

  NOTE: If you decide to upgrade your system by installing additional microprocessors, you must order microprocessor upgrade kits from Dell. Not all versions of the Pentium II Xeon microprocessor will work properly as additional microprocessors. The upgrade kit from Dell contains the correct version of the

microprocessor for use as an additional microprocessor, as well as instructions for performing the upgrade. The additional microprocessors must have the same internal operating frequency as the initial microprocessors.

- A minimum of 128 MB of system memory, upgradable to a maximum of 4 GB by installing combinations of 32-, 128-, and 256-MB buffered extended-data out (EDO) dual in-line memory modules (DIMMs) in the 16 DIMM sockets on the memory board.

- A basic input/output system (BIOS) that resides in flash memory on the Peripheral Component Interconnect (PCI) bus and can be upgraded if required.

- Up to six, hot-pluggable, 1.6-inch, small computer system interface (SCSI) hard-disk drives. Two additional 1-inch drives can be installed in the optional removable media bay. These additional drives are not hot-pluggable.

- Three redundant, hot-pluggable power supplies and power-supply paralleling board (PSPB).

NOTE: A minimum of two power supplies are needed to run the system.

- Five redundant system cooling fans.

The system board includes the following built-in features:

- Seven PCI connectors;(4) 64-bit and (3) 32-bit.

- A video graphics array (VGA)-compatible video subsystem with an ATI 3D Rage Pro super VGA (SVGA) video controller. This video subsystem contains 2 MB of synchronous graphics random-access memory (SGRAM) video memory (nonupgradeable). Maximum resolutions are 1024 x 768 with 256 colors noninterlaced. In 800 x 600 and 640 x 480 resolutions, 16.7 million colors are available for true-color graphics.

- A National Semiconductor PC87309 super input/output (I/O) controller that controls the bidirectional parallel port, two serial ports, and the diskette drive in the externally accessible front bay.

  The parallel port can be set to operate in the following modes via the Parallel Mode category in the System Setup program: output-only (AT-compatible) or bi-directional (Personal System/2 [PS/2]-compatible).

- Two Adaptec AIC-7890 Ultra2/LVD SCSI host adapters that support up to six, 1.6-inch, internal SCSI hard-disk drives via a SCSI backplane board and special SCSI hard-disk drive carriers. The SCSI backplane automatically configures SCSI identification (ID) numbers and SCSI termination on individual hard-disk drives, greatly simplifying drive installation.

NOTE: The 1.6-inch drive carriers will accommodate 1-inch drives.

A hot-pluggable 1 x 6 SCSI backplane board supports hot-pluggable SCSI hard-disk drive installation and removal when used in conjunction with the PowerEdge Expandable RAID controller.

- An Adaptec AIC-7860 Ultra/Narrow SCSI-III host adapter that supports up to three externally accessible SCSI devices in the external hard-disk drive bays (for example, CD-ROM drive, tape drive unit).

- Server management circuitry that monitors operation of the system fans as well as critical system voltages and temperatures. The server management circuitry works in conjunction with the HP OpenView Network Node Manager Special Edition (NNM Special Edition) and the Dell OpenManage™ Hardware Instrumentation Package (HIP) software package.

- System board support for the Dell OpenManage Remote Assistant when the optional Dell Remote Assistant Card version 2.0 (DRAC 2) is installed, which provides additional local and remote server management.

- A PS/2-style keyboard port and a PS/2-compatible mouse port.

Standard PowerEdge 6300 systems include a 3.5-inch diskette drive and a SCSI CD-ROM drive installed in the externally accessible bays and a SCSI hard-disk drive installed in slot 0.

The following software is included with your Dell system:

- Video drivers for displaying many popular applications in high-resolution modes. For more information on these drivers, see Chapter 2, "Using the Dell Server Assistant CD."

- SCSI device drivers that allow your operating system to communicate with devices attached to the built-in SCSI subsystem. For more information on these drivers, see Chapter 3, "Installing and Configuring SCSI Drivers."

- The System Setup program for quickly viewing and changing the system configuration information for your system. For more information on this program, see Chapter 4, "Using the System Setup Program."

- The Resource Configuration Utility (RCU), which automatically configures installed PCI expansion cards. For more information, see Chapter 5, "Using the Resource Configuration Utility."

- Enhanced security features available through the System Setup program including a user password and a supervisor password.

- Diagnostics for evaluating your system's components and devices. For information on using the system diagnostics, see Chapter 2, "Using the Dell Server Assistant CD" in this *User's Guide* or see Chapter 5, "Running the System Diagnostics," in your *Installation and Troubleshooting Guide*.

Supported Operating Systems

Dell supports the following network operating systems for use on PowerEdge 6300 systems:

- Windows NT Server 4.0

- Windows NT Server 4.0, Enterprise Edition

- NetWare 4.11

Front Panel

The following controls and indicators are behind the external drive door on the system's front panel:

- The *power button* controls the output power delivered to the system board from the power supply.

- The green *power indicator* in the center of the power button lights up when the power supply is turned on and the system is receiving direct current (DC) power.

  NOTE: The power button is recessed into the system's front panel to prevent accidentally turning off the computer and losing valuable data.

The following indicators are on the system's front panel (see Figure 1-1):

- The green *fan/temperature status indicator* blinks amber when a fan failure is detected or temperature is out of bounds.

- The green *power supply status indicator* blinks amber if a fault is detected with any of the power supplies or any system voltages.

The three indicator lights on each of the SCSI hard-disk drive carriers provide the following information (see Figure 1-2):

- The green *hard-disk drive online indicator* lights up when the hard-disk drive is receiving power.

- The green *hard-disk drive activity indicator* lights up when data is being transferred to or from the hard-disk drive.

- The amber *hard-disk drive failure indicator* blinks if a hard-disk drive failure is detected.
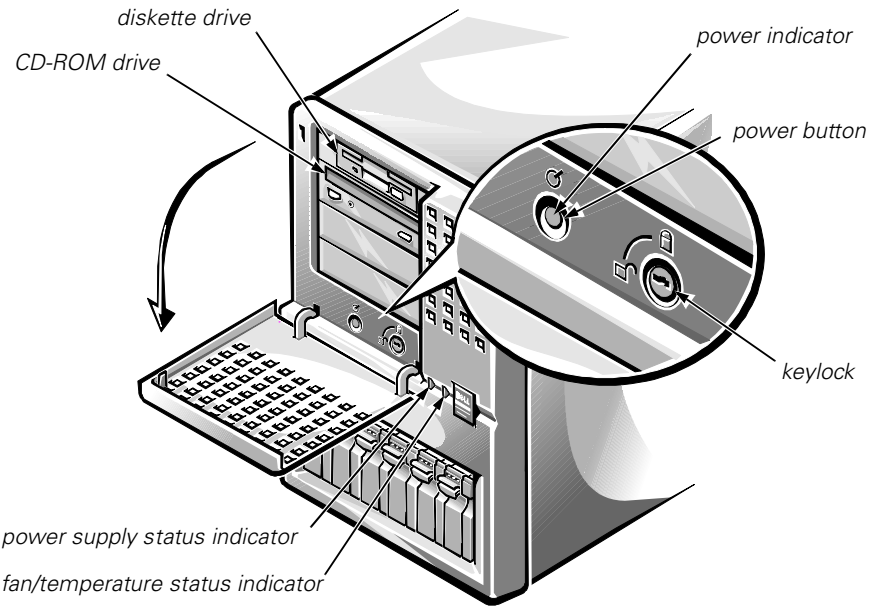
Figure 1-1. Front Panel
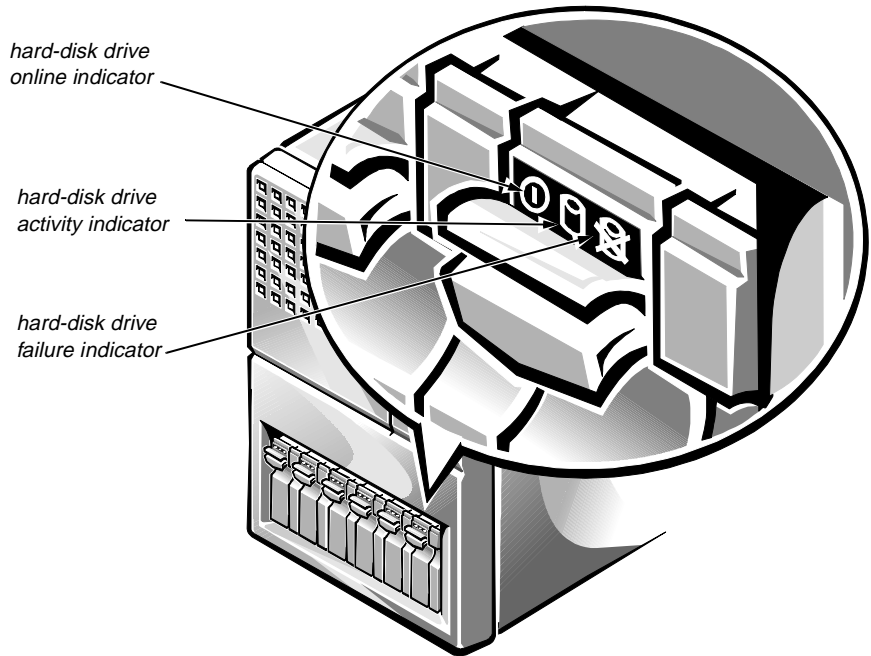
Figure 1-2. Hot-Pluggable Hard-Disk Drive Indicators

Connecting External Devices

You can connect various external devices, such as a mouse and printer, to the I/O ports and connectors on the system's back panel. The system BIOS detects the presence of external devices when you boot or reboot your system. When connecting external devices to your system, follow these guidelines:

- Check the documentation that accompanied the device for specific installation and configuration instructions.

  For example, most devices must be connected to a particular I/O port or connector to operate properly. Also, external devices like a mouse or printer usually require you to load software files called *device drivers* into memory before they will work. These software drivers help the system recognize an external device and direct its operation. Device drivers of this type are normally included with your operating system software.

- Always attach external devices *while your* system is tur*ned off.* Then turn on any external devices *before* turning on the system unless the documentation for the device specifies otherwise. (If the system does not seem to recognize the device, try turning on the system before turning on the device.)

For information about enabling, disabling, or configuring I/O ports and connectors, see Chapter 4, "Using the System Setup Program," or Chapter 5, "Using the Resource Configuration Utility." For detailed descriptions and illustrations of each port and connector on the I/O panel, see Appendix B, "I/O Ports and Connectors."

Preventing Unauthorized Access Inside the System

A keylock behind the door on the front bezel prevents unauthorized access to the hot-pluggable hard-disk drives. A second lock on the back of the unit prevents the top cover from being removed.

The PowerEdge 6300 system also includes a system intrusion switch that signals appropriate server management software if the top cover is opened.

Getting Help

If at any time you don't understand a procedure described in this guide, or if your system does not perform as expected, Dell provides a number of tools to help you. For more information on these help tools, see Chapter 11, "Getting Help," in your *Installation and Troubleshooting Guide*.

CHAPTER 2
Using the Dell Server Assistant CD

This chapter describes the bootable *Dell Server Assistant* CD and tells you how to use the utilities, diagnostics, documentation, drivers, and other items included on the CD. Most of the functions available on the *Dell Server Assistant* CD are also available using a bootable utility partition that is installed on your hard-disk drive. This chapter describes the utility partition and provides instructions for reinstalling the partition (if necessary) and information about using the utility partition menu.

Booting From the CD

The system must be running to insert the *Dell Server Assistant* CD. To boot from the CD, insert it into the PowerEdge 6300 system's CD-ROM drive and press <Ctrl><Alt><Del>. When the system boots, the CD main menu appears.

If the CD does not boot, check the following settings:

- In the System Setup program, the Secondary SCSI category must be set to On and the Boot Sequence category must be set to Diskette First (both of these settings are the defaults for their respective categories). See Chapter 4, "Using the System Setup Program," for more information.

- In the SCSI*Select* utility, the BIOS Support For Bootable CD-ROM category must be set to Enabled. See Chapter 3, "Installing and Configuring SCSI Drivers," for more information.

Navigating the CD Menus

Selections can be made from the CD menus using either a keyboard or a mouse. Associated help information is displayed in the help box at the bottom of the screen in the currently selected language (specified via a menu option).

Click Back to return to the previous menu. Click Exit (or press <Alt><x>) to exit the program. Exiting the program causes the system to reboot to the standard operating-system boot partition.

CD Main Menu

The Dell Server Assistant main menu includes the following categories, each of which has one or more options. The subsections that follow describe the options within each menu category. (The options displayed on your system may vary depending on the configuration.)

Choose Language

- Deutsch
- English
- Español
- Français

Configure the System

- Run the Resource Configuration Utility
- Configure the RAID Subsystem

Run System Utilities

- Create Utility Partition

Create Diskettes

- Create Blank Formatted Diskette
- Create Utility Diskettes
  - Create Resource Configuration Utility Diskette
  - Create RAID Configuration Utility Diskette
  - Create Diagnostics Diskette
- Create Operating System Support Diskettes
  - Create Windows NT Server 4.0 Diskettes
    - Create Driver Diskettes
    - Create RAID Driver Diskette
  - Create NetWare 4.11 Diskettes
    - Create Driver Diskette
    - Create Adaptec EZ-SCSI Diskette

Choose Language

When the system boots, you are given the option of choosing one of the following languages for the menus, help screens, messages, and online documentation:

- Deutsch
- English
- Español
- Français

After you choose a language, the main menu appears in the chosen language.

Configure the System

The options within the Configure the System category enable you to do the following:

- Configure the system's PCI devices, using the Resource Configuration Utility (RCU)
- Configure a redundant array of inexpensive disks (RAID) subsystem, if one is installed on your system

The following subsections describe these options:

Run the Resource Configuration Utility

From the Configure the System screen, you can run the RCU, which enables you to view or modify your system's configuration information. The RCU tells the system what expansion cards are installed and which expansion slots they occupy. With this information, the system automatically configures PCI expansion cards.

See Chapter 5, "Using the Resource Configuration Utility," for more information.

Configure the RAID Subsystem

This option is available only when a Dell PowerEdge Expandable RAID Controller is installed in the system. The system checks for the presence of the PowerEdge Expandable RAID Controller, and if one is present, this option is visible and functional. The system reboots automatically if you change the RAID configuration. See your PowerEdge Expandable RAID Controller documentation for more information.

Run System Utilities

The Run System Utilities category allows you to create the utility partition on the hard-disk drive of your system. The following subsection describes this option.

NOTE: The Run System Utilities category under the utility partition contains the Run System Diagnostics option. The system diagnostics must be run from the utility partition or from a diskette. See "Utility Partition" *found later in this chapter for more information.*

Create Utility Partition

The utility partition is a bootable partition on the hard-disk drive that provides most of the functions that are available on the *Dell Server Assistant* CD. Dell has installed the utility partition on your hard-disk drive; however, reinstalling the utility partition and/or its contents may be necessary if the version installed by Dell becomes damaged or is removed from the hard-disk drive.

Reinstall the utility partition and/or its contents using the *Dell Server Assistant* CD as follows:

1. **Close any open applications.**

2. **Insert the *Dell Server Assistant* CD into the CD-ROM drive, and reboot the system by pressing <Ctrl><Alt><Del>.**

   If the system does not boot from the CD, see the Dell Server Assistant documentation or see "Booting From the CD" found earlier in this chapter.

3. **From the Dell Server Assistant main menu, select Run System Utilities and then select Create Utility Partition.**

4. **Click OK on the Welcome screen.**

   The installation program surveys your system to determine the appropriate method and location for the utility partition installation.

   During this examination of your system, messages may be displayed, depending on your system configuration. If a utility partition already exists on your system, you are prompted to specify if you want to overwrite the existing partition; click OK to continue or Cancel to return to the utility partition menu. If other messages are displayed, note the information; then click OK.

   If your system meets all of the requirements, the utility partition is installed and a message is displayed indicating that the installation was successful.

5. **Click OK to return to the Run System Utilities menu.**

6. **Remove the *Dell Server Assistant* CD from the CD-ROM drive, and click Exit in the Run System Utilities menu.**

7. **Click OK when you are prompted to confirm that you want to exit the Dell Server Assistant program, and reboot your system; then click OK again.**

You can now access the utility partition by pressing <F10> when prompted during the power-on self-test (POST).

For more information about the utility partition, see "Utility Partition" found later in this chapter.

Using the Online Documents

You can access the online system documents, as well as other information, on any desktop or server system that has a browser such as Microsoft Internet Explorer or Netscape Navigator. When you put the CD in a system running the Microsoft Windows® 95 operating system or Microsoft Windows NT, the system automatically starts the browser software and displays the documentation welcome page.

From the browser, you can select the Library option to access all available online documents in **.pdf** format. Adobe™ Acrobat Reader must be used to view or print the online documents and can be installed from the CD. When you select one of the online manuals, the Adobe Acrobat Reader launches, and you can view or print the online manual.

Create Diskettes

The Create Diskettes category allows you to create blank formatted diskettes as well as diskettes of system utilities and operating system-specific drivers. The following subsections describe the options available in this category.

Create Blank Formatted Diskette

This option allows you to create blank formatted diskettes.

Create Utility Diskettes

This option allows you to create bootable utility diskettes for running the RCU and the PowerEdge Expandable RAID Controller configuration utility. The following subsections describe the choices available with this option.

Create Resource Configuration Utility Diskette

This option allows you to create a bootable system configuration utility diskette (or diskettes). Dell recommends running the RCU from a diskette so you can copy your configuration information to the diskette any time you change system configuration parameters.

Create RAID Configuration Utility Diskette

This option allows you to copy the configuration utility for the optional PowerEdge Expandable RAID Controller from the CD to a bootable diskette.

Create Diagnostics Diskette

This option allows you to create a bootable diagnostics diskette.

Create Operating System Support Diskettes

This option allows you to create a diskette that contains the software drivers for a specific operating system. You can create a diskette of drivers for one of the following supported operating systems:

- Microsoft Windows NT Server 4.0
- Novell NetWare 4.11

The following drivers are available on the CD:

- SCSI drivers
- RAID drivers (for the optional PowerEdge Expandable RAID Controller)
- Network interface controller (NIC) drivers

The following subsections describe the choices available with this option.

Create Windows NT Server 4.0 Diskettes

The following are available for the Microsoft Windows NT Server 4.0 operating system. You must create a separate diskette for each option.

- Create Driver Diskette — This option allows you to create a diskette that contains SCSI and NIC drivers for Windows NT Server 4.0. You must create a driver diskette in order to install the drivers for the correct operation of this system.
- Create RAID Driver Diskette — This option allows you to create a diskette that contains drivers for the optional PowerEdge Expandable RAID Controller for Windows NT Server 4.0.

Create NetWare 4.11 Diskettes

This option allows you to create a driver diskette and an Adaptec EZ-SCSI configuration utility diskette for use with the Novell NetWare 4.11 operating system. The following choices are available with this option:

- Create Driver Diskette — This option allows you to create a diskette that contains SCSI and NIC drivers as well as drivers for the optional PowerEdge Expandable RAID Controller for Novell NetWare 4.11.
- Create Adaptec EZ-SCSI Diskette — This option allows you to create a diskette that contains the configuration utility for Adaptec SCSI controllers. The configuration utility works with the optional Adaptec AHA-2940U2W and the built-in Adaptec 78*xx* series SCSI controllers when used with Novell NetWare 4.11. This diskette also contains MS-DOS® drivers for CD-ROM drive access, which are needed to install NetWare from an MS-DOS environment.

Utility Partition

The utility partition is a bootable partition on the hard-disk drive that provides some of the functions available on the *Dell Server Assistant* CD. Most of the applications found on the CD are contained in the utility partition, occupying approximately 10 MB of space on the system's hard-disk drive. When implemented, the partition boots and provides an executable environment for the partition's utilities. When the partition is not implemented, it is designated as a non–MS-DOS partition.

NOTE: The utility partition provides only limited MS-DOS functionality and cannot be used as a general-purpose MS-DOS partition.

To start the utility partition, press the <F10> key during POST.

Like the *Dell Server Assistant* CD, the utility partition provides a menu-driven interface from which you invoke the partition's utilities. Selections can be made using either a

keyboard or a mouse. Menu options and the associated help are displayed in the currently selected language (specified via a menu option).

As you move your cursor over an option in a menu, information about that option is displayed at the bottom of the screen.

Click Back to return to the previous menu. Click Exit (or press <Alt><x>) to exit the utility partition. Exiting the utility causes the system to reboot to the standard operating-system boot partition.

Table 2-1 provides a sample list and explanation of the options on the utility partition menu even when the *Dell Server Assistant* CD is not in the CD-ROM drive. The options displayed on your system may vary depending on the configuration.

NOTE: Although most options are available from both the Dell Server Assistant *CD and the utility partition, some options, such as accessing online documentation, are available only from the CD. The Run System Diagnostics option is only available from the utility partition.*

Table 2-1. Utility Partition Menu Options

Option	Description
Choose a Language:	
Deutsch, English, Español, Français	Allows the user to select the language in which to display menus and messages.
Configure the System:	
Run Resource Configuration Utility	Runs the RCU.
Configure RAID Subsystem	Runs the Dell PowerEdge Expandable RAID Controller configuration utility if the controller card is present on your system.
Run System Utilities:	
Run System Diagnostics	Runs the system hardware diagnostics.
Upgrade Utility Partition	Allows the user to upgrade the utility partition (for example, adding, removing, or changing features installed on the partition).
Create Diskettes:	
Create Blank Formatted Diskette	Creates a blank, formatted diskette.

NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.

Table 2-1. Utility Partition Menu Options (continued)

Option	Description
Create Utility Diskettes:	
Create RAID Configuration Utility Diskette	Creates a bootable diskette for running the Dell PowerEdge Expandable RAID Controller configuration utility (if the controller card is present on your system). The RAID configuration utility provides an alternative method for configuring the card.
Create Diagnostics Diskette	Creates a bootable diskette from which the hardware diagnostics can be run.
Create System utility Diskette	Creates a bootable diskette from which utilities, such as the Asset Tag utility, can be run.

NOTE: The options displayed on your system are dependent on your system configuration and may not include all of those listed here.

Running System Diagnostics

The system diagnostics can be run from the utility partition or from a diskette, but not from the *Dell Server Assistant* CD. From the Utility Partition menu, select Run System Utilities and then select Run System Diagnostics. To run the diagnostics from a diskette, select Create Diagnostics Diskette from the Utility Partition menu.

Before running the diagnostics, you should make a blank diskette and insert it in the diskette drive so the diagnostics programs can record critical messages and information as necessary. Use the Create Blank Formatted Diskette option to create a formatted diskette. The system hardware diagnostics are described in Chapter 5, "Running the System Diagnostics," of the *Installation and Troubleshooting Guide*.

Video Drivers

NOTES: The ATI video for the Microsoft Windows NT Server 4.0 operating system must be set up with a resolution of 640 x 480 at installation.

Windows NT Server 4.0 Service Pack 3 must be installed to use the updated drivers for ATI video.

You need to install the video drivers for the operating system you install on your PowerEdge 6300 system, unless they were installed by Dell. Use the following procedure to install the video drivers for Windows NT Server 4.0. The Novell NetWare operating system provides a textual interface and does not require video drivers.

Installing Video Drivers for Windows NT 4.0

NOTE: Video drivers must be reinstalled after every installation of Windows NT 4.0 Service Pack 3.

Select the Create Diskettes category from the Dell Server Assistant main menu, and create a diskette of software drivers for Windows NT 4.0. After you make the diskette of the drivers, use the following procedure to install the video drivers:

1. **Start Windows NT.**

2. **Log in as the administrator or as a user with administrative privileges.**

   For information on system administration, see the reference documentation for Windows NT.

3. **Click the Start button, point to Settings, and click Control Panel.**

4. **Double-click the Display icon.**

   The Display Settings window appears.

5. **Select the Settings tab.**

6. **Click Display Type, and then click Change in the Adapter box.**

   A list of available video drivers is displayed.

7. **Click Have Disk.**

8. **Insert the ATI Installation Disk into the diskette drive; then click OK in the Install From Disk window.**

9. **Make sure that ATI Technologies Inc. 3D Rage Pro (the default) is selected in the video driver list, and click Install.**

   The Installing Drivers dialog box appears.

10. **Click Yes to proceed.**

    After the files are copied from the diskette, Windows NT prompts you to restart your system. Click OK and close all open windows.

11. **Remove the video drivers diskette from the diskette drive, and restart Windows NT.**

    When you restart Windows NT, you can change the display resolution and color depth.

12. **Open the Program Manager, access the Control Panel, and select the Display icon.**

    The Display Settings window appears.

13. **Select the desired resolution, number of colors, and refresh rate.**

Asset Tag Utility

The Asset Tag utility allows you to enter an asset tag number for your system. The default System Setup screen (see Figure 4-1) does not show the asset tag number unless you enter one using this utility.

NOTE: The Asset Tag utility works only on systems running MS-DOS.

Using the Asset Tag Utility

Use the following procedure to create a system utility diskette and boot the system:

1. **If you have not already done so, create a bootable system utility diskette from the CD using the Create Resource Configuration Utility Diskette option discussed earlier in this chapter.**

2. **Insert the diskette into drive A, and reboot the system.**

NOTE: The Asset Tag utility diskette contains CD-ROM drivers that provide access to the CD-ROM drive when you boot from the diskette.

After you boot the system with the system utility diskette, you can use the Asset Tag utility to enter an asset tag number that you or your organization assign to the system. You can also use the Asset Tag utility to reenter the system's service tag number if that becomes necessary.

You can view the asset tag number using the System Setup program as described in Chapter 4, "Using the System Setup Program."

Assigning and Deleting an Asset Tag Number

An asset tag number can have up to ten characters; any combination of characters, excluding spaces, is valid. To assign or change an asset tag number, type asset and a space followed by the new number; then press <Enter>. For example, type the following command line and press <Enter>:

```
asset 1234567890
```

When prompted to verify the asset tag number, type y and press <Enter>. The system then displays the new or modified asset tag number and the service tag number.

To delete the asset tag number without assigning a new one, type asset /d and press <Enter>.

Table 2-2 lists the command-line options you can use with the Asset Tag utility. To use one of these options, type asset and a space followed by the option.

Table 2-2. Asset Tag Command-Line Options

Asset Tag Option	Description
/d	Deletes the asset tag number
/?	Displays the Asset Tag utility help screen

C H A P T E R 3
Installing and Configuring SCSI Drivers

This chapter describes how to install and configure the Dell small computer system interface (SCSI) device drivers included with your Dell PowerEdge 6300 computer system. These device drivers are designed to work with the dual Adaptec AIC-7890 low voltage differential (LVD) Ultra2/ Wide SCSI-3 controllers and the Adaptec AIC-7860 Ultra/Narrow SCSI-3 controller on the system board.

The AIC-7890 controllers support up to six internal SCSI hard-disk drives via a standard SCSI backplane board while the AIC-7860 supports up to three externally accessible SCSI devices in the system's external drive bays, such as the CD-ROM and a tape drive unit.

The Dell PowerEdge 6300 system can support up to two 1-inch SCSI drives in the external drive bay with the optional removable drive cage.

The AIC-7890, AIC-7860, and the optional AHA-2940U2W SCSI controller card are all part of the Adaptec 78*xx* series of SCSI controllers, and all use the 78*xx* series of SCSI device drivers provided by Dell. The Adaptec SCSI basic input/output system (BIOS), which is stored in your computer system's flash memory or on the optional AHA-2940U2W SCSI controller card, links these SCSI device drivers to the AIC-7890 and AIC-7860 SCSI controller chips or the optional AHA-2940U2W SCSI controller card.

If you are using an optional Dell PowerEdge Expandable RAID Controller, refer to either of the following sections, "Installing SCSI Drivers for a Dell PowerEdge Expandable RAID Controller in Windows NT 4.0" or "Installing SCSI Drivers for a Dell PowerEdge Expandable RAID Controller in Novell NetWare 4.11." You can also refer to your Dell PowerEdge Expandable RAID Controller documentation for information on installing your SCSI device drivers.

For instructions on installing SCSI hardware devices such as hard-disk drives, tape drives, or CD-ROM drives, trained service technicians should see Chapter 9, "Installing Drives in the External Bays," and Chapter 10, "Installing Hard-Disk Drives," in your *Installation and Troubleshooting Guide*. After the SCSI devices are installed, you need to install and configure one or more SCSI device drivers so that your SCSI devices can communicate with your operating system.

SCSI device drivers are provided for the following operating systems:

- Microsoft Windows NT Server 4.0
- Novell NetWare 4.11

See Chapter 2, "Using the Dell Server Assistant CD," for instructions on creating a diskette of drivers for your operating system. For instructions on configuring the SCSI device drivers, see the appropriate sections in this chapter.

Installing SCSI Drivers for a Dell Power-Edge Expandable RAID Controller in Windows NT 4.0

To install SCSI drivers for a PowerEdge Expandable RAID Controller in Windows NT 4.0, follow these steps:

1. **Boot from the *Microsoft Windows NT Server* CD, and press <F6> when the first Windows NT Setup screen appears.**

   This disables automatic detection of SCSI devices.

2. **Load the PowerEdge RAID I NT driver.**

   Press <s> for the Specify Additional Device option. Insert the PowerEdge Expandable RAID Controller driver diskette into drive A, and select PowerEdge RAID I NT Driver from the list of drivers.

3. **Press <Enter> and continue with the setup.**

   The screen should list the following SCSI device driver:

   ```
   PowerEdge RAID I NT DRIVER
   ```

   The Adaptec AHA-294*x*/AHA-394*x*/AIC-78*xx* SCSI controller needs to be manually selected.

Installing SCSI Drivers for a Dell Power-Edge Expandable RAID Controller in NetWare 4.11

To install SCSI drivers for a PowerEdge Expandable RAID Controller in NetWare 4.11, follow these steps:

1. **Before installing NetWare, use the** fdisk **utility to create an MS-DOS partition of 50 to 100 megabytes (MB) in size.**

2. **Install the EZ-SCSI software using the instructions provided with your system, and install the CD-ROM driver using the instructions provided with the drive.**

3. **Insert the *Novell NetWare 4.11* CD or the *Dell IntranetWare Support* CD into the CD-ROM drive and change to the CD-ROM drive letter.**

4. **Run** install.bat **from the CD.**

   NetWare 4.11 detects the Dell PowerEdge Expandable RAID Controller (identified as "MegaRAID" in the system message).

5. **Insert the RAID driver diskette created for NetWare 4.11 that you created from the *Dell Server Assistant* CD and press <Enter>.**

   NOTE: Do not use the drivers provided on the NetWare CD.

6. **Follow the instructions on the screen to install the RAID drivers and to complete the NetWare installation.**

The readme.txt *File*

The **readme.txt** files that are included with your SCSI device drivers (in the device driver **\pe6300\scsi** subdirectory on the CD) provide updates to the information in this chapter.

Use the editor included with your operating system to view or print the **readme.txt** file or any other readme file.

The SCSISelect Utility

The BIOS for the built-in dual Adaptec AIC-7890 and AIC-7860 SCSI controllers includes the menu-driven SCSI*Select* configuration utility, which allows you to change SCSI controller settings without opening the computer. SCSI*Select* also contains SCSI disk utilities that let you low-level format or verify the disk media of your SCSI hard-disk drives.

SCSISelect Defaults

The defaults for the optional Adaptec AHA-2940U2W SCSI controller and the built-in AIC-7890 and AIC-7860 SCSI controllers are shown in Table 3-1. These defaults are appropriate for most Peripheral Component Interconnect (PCI) systems. Run SCSI*Select* only if you need to change any of the defaults.

NOTES: The SCSISelect Utility must be run for both the AIC-7890 SCSI controllers and the AIC-7860 SCSI controller if you need to change the configuration settings.

*The term **host adapter** is used throughout this chapter to refer to the built-in AIC-7890 and AIC-7860 SCSI controllers or the optional AHA-2940U2W SCSI controller card.*

To change the settings, see the descriptions of each setting in the following subsections. To change any of the defaults or to format or verify a disk, see "Starting the SCSI*Select* Utility" found later in this chapter.

Table 3-1. SCSI Controller Defaults

Setting	Default
SCSI Bus Interface Definitions:	
Host Adapter SCSI ID	7
SCSI Parity Checking	Enabled
Host Adapter SCSI Termination	Enabled[1] Automatic[2]
Boot Device Options:	
Boot Target ID	0
Boot LUN Number	0
SCSI Device/Configuration Settings:	
Initiate Sync Negotiation	Yes (Enabled)
Maximum Sync Transfer Rate	80 MB/sec
Enable Disconnection	Yes (Enabled)
Initiate Wide Negotiation[2]	Yes (Enabled)
Send Start Unit[2]	Yes (Enabled)
BIOS Multiple LUN Support[2]	No (Disabled)
Include in BIOS Scan[2]	Yes (Enabled)
Advanced Host Adapter Settings:	
Host Adapter BIOS	Enabled
Support Removable Disks Under BIOS As Fixed Disks	Boot Only
Plug and Play SCAM Support[2]	Disabled
Reset SCSI Bus at IC Initialization[2]	Enabled
Extended BIOS Translation For DOS Drives > 1 GB	Enabled
Display <Ctrl><a> Message During BIOS Initialization	Enabled
Multiple LUN Support[1]	Disabled
BIOS Support For Bootable CD-ROM	Enabled
BIOS Support For Int 13 Extensions	Enabled
Support For Ultra2 SCSI Speed	Enabled

[1]*Appears only for the AIC-7860 controller.*

[2]*Appears only for the AIC-7890 controllers.*

NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.

SCSI Bus Interface Definitions

The basic host adapter settings are the SCSI *Select* settings most likely to require modification:

- Host Adapter SCSI ID — This option sets the host adapter's SCSI ID. The default setting is SCSI ID 7, which allows the host adapter to support narrow SCSI devices in addition to wide SCSI devices. Dell recommends that you leave the host adapter set to SCSI ID 7.

- SCSI Parity Checking — This option determines whether the host adapter verifies the accuracy of data transfer on the SCSI bus. The default is Enabled. You should disable SCSI Parity Checking if any SCSI device connected to the host adapter does not support SCSI parity; otherwise, leave it enabled. Most SCSI devices support SCSI parity. If you are unsure if a device supports SCSI parity, consult the documentation for the device.

- Host Adapter SCSI Termination — This option sets termination on the host adapter. The default for the Adaptec AIC-7860 host adapters is Enabled; the default for the AIC-7890 host adapter is Automatic. Dell recommends that you leave this option set to the default.

Boot Device Options

The boot device options allow you to specify the device from which to boot your system:

- Boot Target ID — This option specifies the SCSI ID of the device from which you boot your system. SCSI IDs are set for the hard-disk drive according to the drive's location on the backplane board for the SCSI ID of each drive location. The default for Boot Target ID is SCSI ID 0.

- Boot LUN Number — If your boot device has multiple logical unit numbers (LUNs) and Multiple LUN Support is enabled (see "Advanced Host Adapter Settings" found later in this section), this option allows you to specify a particular LUN from which to boot on your boot device. The default is LUN 0.

SCSI Device/Configuration Settings

The SCSI device/configuration settings allow you to configure certain parameters for each device on the SCSI bus. To configure a specific device, you must know the SCSI ID assigned to that device. If you are not sure of the SCSI ID, see "Using the SCSI Disk Utilities" found later in this section.

- Initiate Sync Negotiation — This option determines whether the host adapter initiates synchronous data transfer negotiation (sync negotiation) between itself and the device. The default is Yes.

  Synchronous data transfer negotiation is a SCSI feature that allows the host adapter and its attached SCSI devices to transfer data in synchronous mode. Synchronous data transfer is faster than asynchronous data transfer.

  The host adapter always responds to sync negotiation if the SCSI device initiates it. If neither the host adapter nor the SCSI device initiates sync negotiation, data is transferred asynchronously.

Normally, you should leave the Initiate Sync Negotiation enabled, because most SCSI devices support synchronous negotiation and because it allows for faster data transfer.

NOTE: Some older SCSI-1 devices do not support sync negotiation. This may cause your computer to operate erratically or hang if Initiate Sync Negotiation is set to Yes. Set Initiate Sync Negotiation to No for these devices.

- Maximum Sync Transfer Rate — This option sets the maximum synchronous data transfer rate that the host adapter supports. The host adapter supports rates up to 80 megabytes per second (MB/sec). The default is 80 MB/sec (the maximum).

  If the host adapter is set to not negotiate for synchronous data transfer, the maximum synchronous transfer rate is the maximum rate that the host adapter accepts from the device during negotiation. (This is standard SCSI protocol.)

- Enable Disconnection — This option (sometimes called *disconnect/reconnect*) determines whether the host adapter allows the SCSI device to disconnect from the SCSI bus. Enabling disconnection allows the host adapter to perform other operations on the SCSI bus while the SCSI device is temporarily disconnected. The default is Yes.

  Leave Enable Disconnection set to Yes if two or more SCSI devices are connected to the host adapter. This optimizes SCSI bus performance. If only one SCSI device is connected to the host adapter, set Enable Disconnection to No to achieve slightly better performance.

- Initiate Wide Negotiation — This option determines whether the host adapter attempts 16-bit data transfer instead of 8-bit data transfer. The default is Yes.

NOTE: Some 8-bit SCSI devices may have trouble handling wide negotiation, which may result in erratic behavior or a hang condition. For these devices, set Initiate Wide Negotiation to No.

  When this option is set to Yes, the host adapter attempts 16-bit transfer. When this option is set to No, 8-bit data transfer is used unless the SCSI device itself requests wide negotiation. The effective transfer rate is doubled when 16-bit data transfer is used because the data path for wide SCSI is twice the size of normal 8-bit SCSI.

- Send Start Unit — This option determines whether the **send start unit** command is sent to the SCSI device during the boot routine. The default is Yes.

  Setting this option to Yes reduces the load on your computer's power supply by allowing the host adapter to start SCSI devices one at a time when you boot your system. When this option is set to No, the devices are allowed to start at the same time. Most devices require you to set a jumper before they can respond to this command.

NOTE: For many devices, if Send Start Unit is set to Yes, the boot routine time will vary depending on how long it takes each drive to start.

- BIOS Multiple LUN Support — This option provides support for peripherals that contain multiple SCSI devices, such as RAID subsystems and CD-ROM changers.

- Include in BIOS Scan — This option enables you to set whether the system BIOS scans this device during system start-up. The default is Yes.

Advanced Host Adapter Settings

The advanced host adapter settings should *not* be changed unless absolutely necessary. These values are set by Dell, and changing them may cause conflicts with the SCSI devices.

- Host Adapter BIOS — This option enables or disables the host adapter BIOS. The default is Enabled.

  *NOTE: Several SCSI*Select *options are not valid unless the host adapter BIOS is enabled.*

  If you are booting from a SCSI hard-disk drive connected to the host adapter, the BIOS must be enabled. You should disable the host adapter BIOS if the peripherals on the SCSI bus (for example, CD-ROM drives) are all controlled by device drivers and do not need the BIOS.

- Support Removable Disks Under BIOS As Fixed Disks — This option controls which removable-media drives are supported by the host adapter BIOS. The default is Boot Only. The following choices are available.

  CAUTION: If a removable-media SCSI device is controlled by the host adapter BIOS, do not remove the media while the drive is on or you may lose data. If you want to be able to remove media while the drive is on, install your removable-media device driver and set this option to Disabled.

  — Boot Only. Only the removable-media drive designated as the boot device is treated as a hard-disk drive.

  — All Disks. All removable-media drives supported by the BIOS are treated as hard-disk drives.

  — Disabled. No removable-media drives are treated as hard-disk drives. In this situation, software drivers are needed because the drives are not controlled by the BIOS.

- Plug and Play SCAM Support — This option provides automatic configuration of SCSI devices in operating systems that support Plug and Play. Dell recommends that you leave this option set to Disabled.

- Reset SCSI Bus at IC Initialization — This option enables the SCSI bus to be reset when the controller is initialized. The default is Enabled.

- Extended BIOS Translation For DOS Drives > 1 GB — This option determines whether extended translation is available for SCSI hard-disk drives with capacities greater than 1 gigabyte (GB). The default is Enabled.

  When you partition a hard-disk drive larger than 1 GB, use the MS-DOS **fdisk** utility as you normally would. Because the cylinder size increases to 8 MB under

extended translation, the partition size you choose must be a multiple of 8 MB. If you request a size that is not a multiple of 8 MB, **fdisk** rounds up to the nearest whole multiple of 8 MB.

- Display <Ctrl><a> Message During BIOS Initialization — This option determines whether the `Press <CTRL><A> for SCSISelect (TM) Utility.` message appears on your screen during system start-up. The default is Enabled. If this setting is disabled, you can still run the SCSI*Select* utility by pressing <Ctrl><a> after the host adapter BIOS banner appears.

- Multiple LUN Support — This option determines whether your system supports booting from a SCSI device that has multiple LUNs. The default is Disabled. Enable this option if your boot device has multiple LUNs.

- BIOS Support For Bootable CD-ROM — This option determines whether the host adapter BIOS provides support for booting from a CD-ROM drive. The default is Enabled.

- BIOS Support For Int 13 Extensions — This option determines whether the host adapter BIOS supports disks with more than 1024 cylinders. The default is Enabled.

- Support For Ultra2 SCSI Speed — This option determines whether the host adapter supports the fast transfer rates (20–80 MB/sec). The default is Enabled.

Starting the SCSISelect Utility

You can start the SCSI*Select* utility by pressing <Ctrl><a> when the following prompt appears briefly during start-up:

```
Press <CTRL><A> for SCSISelect (TM) Utility.
```

The first menu displays the Configure/View Host Adapter Settings and SCSI Disk Utilities options.

Using SCSISelect Menus

SCSI*Select* uses menus to list options you can select. To select an option, use the up- and down-arrow keys to move the cursor to the option; then press <Enter>.

In some cases, selecting an option displays another menu. You can return to the previous menu at any time by pressing <Esc>. To restore the original SCSI*Select* default values, press <F6>.

Using the SCSI Disk Utilities

To access the SCSI disk utilities, select the SCSI Disk Utilities option from the menu that appears when you start SCSI*Select*. When the option is selected, SCSI*Select* immediately scans the SCSI bus (to determine the devices installed) and displays a list of all SCSI IDs and the device assigned to each ID.

When you select a specific ID and device, a small menu appears, displaying the Format Disk and Verify Disk Media options.

- Format Disk — This option runs a utility that allows you to perform a low-level for-mat on a hard-disk drive. Most SCSI hard-disk drives are formatted at the factory and do not need to be formatted again. The Adaptec Format Disk utility is com-patible with the vast majority of SCSI hard-disk drives.

CAUTION: The Format Disk option destroys all data on the hard-disk drive.

- Verify Disk Media — This option runs a utility that allows you to scan the media of a hard-disk drive for defects. If the utility finds bad blocks on the media, it prompts you to reassign them; if you select Yes, those blocks are no longer used. You can press <Esc> at any time to exit the utility.

Exiting SCSISelect

To exit SCSI*Select*, press <Esc> until a message prompts you to exit. (If you changed any 78*xx* series host adapter settings, you are prompted to save the changes before you exit.) At the prompt, select Yes to exit, and then press any key to reboot the com-puter. Any changes you made in SCSI*Select* take effect after the computer boots. (You can select No at the prompt if you are not ready to exit SCSI*Select*.)

Installation for Windows NT 4.0

This section provides the following information about installing the Dell SCSI drivers for the Microsoft Windows NT 4.0 operating system:

- Installing the SCSI drivers for Windows NT
- Removing a host adapter
- Swapping a host adapter
- Restoring a configuration if Windows NT fails to boot

Installation Overview

This section provides the information needed to install and use the Dell SCSI drivers for the 78*xx* series of SCSI controllers with Windows NT.

NOTE: If Windows NT was factory installed by Dell, the AIC-78U2 and AIC-78xx driv-ers are preinstalled.

The Windows NT 4.0 driver diskette you create for the Microsoft Windows NT Server operating system contains the files needed for driver installation. The diskette con-tains the following files to be used with Windows NT:

- **aic78u2.sys** — Adaptec's driver for the 7890 SCSI controller for Windows NT
- **aic78xx.sys** — Adaptec's driver for the 7860 SCSI controller for Windows NT
- **oemsetup.inf** — A file used by Windows NT Setup for driver installation
- **readme.txt** — A text file describing the Adaptec 78*xx* driver for Windows NT

Using Windows NT 4.0 to Install the Driver

To install the SCSI drivers, use the following procedure:

1. **Create the Windows NT 4.0 driver diskette from the *Dell Server Assistant* CD.**

2. **Restart Windows NT Setup.**

    Windows NT copies files to your system and automatically reboots your system.

    At the first blue screen after reboot, Windows NT Setup will display the following message:

    ```
    Setup is inspecting your computer's hardware
    configuration...
    ```

3. **Press <F6>.**

    The following message appears:

    ```
    Setup could not determine the type of one or more mass stor-
    age devices installed in your system, or you have chosen to
    manually specify an adapter.
    ```

4. **Type** s.

    A list of supported SCSI host adapters appears.

5. **Click Other.**

6. **Insert the Windows NT driver diskette you created into the diskette drive.**

7. **Click the Start button, then click Run and type** a:\ **in the Open dialog box.**

8. **Type** s.

9. **Select the host adapter from the list.**

    For the Adaptec AIC-7890 SCSI controller, select Adaptec AHA-294*x*U2/295*x*U2/ AIC-789*x* PCI Ultra2 SCSI controller (Windows NT 4.0).

    For the Adaptec-7860 SCSI controller, select Adaptec AHA-290*x*/291*x*/294*x*/394*x*/ 494*x*/AIC-78*xx* PCI SCSI Controller (Windows NT 4.0).

10. **Press <Enter>.**

    The driver is copied from the diskette to your system.

11. **Repeat steps 8 - 10 for each SCSI host adapter installed on the system.**

12. **Click Yes when prompted to restart the system, and remove the diskette from the diskette drive.**

After the system reboots, the new drivers are active. Some drive letter assignments may have changed from the previous configuration.

Removing a Host Adapter

Removing a PCI expansion-card SCSI controller is as simple as physically removing it from its slot when your computer is shut down. Windows NT boots and functions properly in this configuration, but a warning message is generated every time you boot Windows NT.

CAUTION: If you have removed a host adapter but still have other host adapters of the same type installed in your computer, do not use Windows NT Setup to remove the device driver.

To eliminate the warning message, you must update the Windows NT software configuration as follows:

1. **Select and start the Windows NT Setup program.**

   There is a brief pause while Windows NT Setup scans your hardware configuration.

2. **Select the Options pull-down menu, and then select Add/Remove SCSI Adapters.**

   The SCSI Adapter setup program displays a list of all host adapters currently installed.

3. **Select the host adapter you want to remove, and click Remove. When the Windows NT Setup program asks you for confirmation, click OK.**

   Because SCSI device drivers are loaded during system start-up and because they may be needed to load Windows NT itself, a message may appear warning you that Windows NT may not start if you remove the SCSI adapter.

4. **When you are sure you are removing the correct host adapter type, click OK.**

5. **Return to step 3 if you want to remove driver support for other types of host adapters, or click Close to exit the SCSI adapters portion of Windows NT Setup.**

6. **Close the Windows NT Setup program. When the following message appears, click OK to exit:**

   ```
   The changes you have made will not take effect until the
   computer is restarted.
   ```

   If this message does not appear, no changes have been made to the Windows NT system configuration.

7. **Restart your computer.**

NOTE: The Windows NT Setup program does not delete the device driver from your hard-disk drive; it only updates Windows NT software configuration information so that the device driver is no longer loaded during system start-up.

Swapping a Host Adapter

The procedure for swapping one type of host adapter for another is similar to the procedure for adding a host adapter, except that you make all software configuration changes while Windows NT is running—before you make the hardware changes.

1. **Install the driver for the new host adapter by following the steps in "Installation for Windows NT" found earlier in this section.**

   It is not essential to remove the device driver for the host adapter you are replacing. Windows NT dynamically detects the absence or presence of host adapter hardware, and no problems should arise if you leave the existing device driver installed. You can remove the device driver later, after you have successfully rebooted Windows NT. However, if you leave the driver in, the system alerts you with an error message about the extra device driver every time you boot. See the previous subsection, "Removing a Host Adapter."

2. **After the new device driver is installed, shut down Windows NT and replace the existing host adapter.**

3. **Restart your computer and Windows NT.**

   Some drive letter assignments may have changed from the previous configuration.

Troubleshooting for Windows NT

The boot manager for Windows NT contains recovery logic to allow you to return to the last known good configuration. If you have changed your host adapter configuration and Windows NT no longer boots, follow these steps to recover:

1. **Undo any hardware changes you have made to the computer since it was last operational.**

2. **Reboot the computer.**

   Watch the display carefully during start-up. If the following message appears, press the spacebar key, press <l> at the next screen, and then follow the instructions on the screen to continue booting with the last known good configuration:

   ```
   Press spacebar NOW to invoke the Last Known Good menu
   ```

3. **When your computer is operational again, check all of the hardware and software configuration changes you want to make. Look specifically for conflicts with parts of the existing system configuration that are not being changed.**

If you cannot determine the source of the error, contact Dell for assistance. See Chapter 11, "Getting Help," in the *Installation and Troubleshooting Guide* for instructions on contacting Dell for technical assistance.

Installation for Novell NetWare 4.11

This section provides the following information about installing the Dell SCSI drivers for NetWare 4.11:

- Installing the EZ-SCSI utility

- Installing the Novell NetWare 4.11 operating system

- Installing and updating the Dell SCSI driver for NetWare 4.11

- Automatic driver loading using **startup.ncf** and **autoexec.ncf**

- Booting a NetWare server from a SCSI drive, formatting media, and using removable media

- Troubleshooting error messages generated during initialization

Installation Overview

This subsection provides the information needed to install and use the Dell SCSI drivers for Novell NetWare 4.11. The Dell SCSI drivers for NetWare support the optional Adaptec AHA-2940U2W and all Adaptec 78*xx* series SCSI controllers.

Before you begin installation of the SCSI drivers for NetWare, you must create a diskette of drivers for NetWare 4.11 and a diskette that contains the Adaptec EZ-SCSI utility. Chapter 2, "Using the Dell Server Assistant CD," provides instructions for creating these diskettes.

The Dell SCSI drivers for NetWare are fully tested and approved for NetWare. The NetWare **scsi** subdirectory on the NetWare 4.11 drivers diskette you create contains files to be used with NetWare 4.11. The following files appear in the **scsi** subdirectory on the NetWare driver diskette:

- **readme.txt** — An American Standard Code for Information Interchange (ASCII) text file describing Adaptec's drivers for NetWare

- **aic78u2.ham** — NetWare driver for Adaptec's 7890 and AHA-2940U2W Ultra2 SCSI series host adapters

- **aha2940.ham** — NetWare driver for Adaptec's 7860 and AHA-2940UW SCSI host adapters

- **nwaspi.cdm** — Adaptec's device driver for a CD-ROM drive

- **nbi.nlm** — File required by the NetWare bus interface

- **nwpa.nlm** — File required by the NetWare bus interface

- **nwpaload.nlm** — File required by the NetWare bus interface

- **cdrom.nlm** — File required by the NetWare bus interface

In addition, the **scsi** subdirectory on your NetWare 4.11 drivers diskette contains the following files:

- **aic78u2.ddi** — A driver definition information file for the 78*xx* Ultra2 SCSI series host adapters that provides setup information to NetWare during installation; NetWare can then prompt you with parameters to be configured for the device driver during the installation process.

- **aha2940.ddi** — A driver definition information file for the AHA-2940U2W host adapter.

- **aspicd.ddi** — A device driver definition file.

- **aspitran.ddi** — A device driver definition file.

To begin driver installation, first load the EZ-SCSI utility as described in the following subsection, "Installing EZ-SCSI." Then if you are performing a first-time NetWare installation, see "Installing NetWare and the Driver" found later in this section. If NetWare is already installed in your system, see "Using NetWare to Install or Update the Driver" found later in this section.

NOTE: Your system must have a bootable version of MS-DOS installed before you can complete the Novell NetWare installation.

Installing EZ-SCSI

The Adaptec EZ-SCSI utility automatically configures the computer to use an Adaptec SCSI host adapter and the devices connected to it. The Adaptec EZ-SCSI utility also copies applications and device drivers to the computer's hard-disk drive. The configuration and installation process is explained with a series of screens. In most cases, the system and SCSI devices are configured to take full advantage of all the performance benefits of SCSI when you accept the default values suggested by these screens.

Follow these steps to install the Adaptec EZ-SCSI utility:

1. **If you have not already done so, create an Adaptec EZ-SCSI diskette for the version of NetWare you are using.**

   Chapter 2, "Using the Dell Server Assistant CD," provides instructions for creating this diskette.

2. **Insert your Adaptec EZ-SCSI diskette into the diskette drive.**

3. **Type** dosinst **and press <Enter>.**

   A message appears while the EZ-SCSI utility loads into memory.

4. **When the first EZ-SCSI screen appears, read the text carefully.**

   You can press <F1> on any screen for additional help. Press <Esc> to exit a Help screen.

5. **Press <Enter> to continue with the installation.**

6. **Follow the instructions that appear on the screen. Press <Enter> at every screen to accept the EZ-SCSI default values.**

   If you accept all the default values, the EZ-SCSI utility copies the files from the diskette to the **c:\scsi** directory. The EZ-SCSI utility creates this directory if the directory does not already exist. The EZ-SCSI utility also adds command lines to your system's configuration files (**autoexec.bat** and **config.sys**) that will load the required device drivers into memory when you boot your system.

7. **Press <Esc> to continue after the EZ-SCSI utility enters changes to your system configuration files.**

   If you want to copy the files to a different directory or control the changes to your configuration files, follow the instructions on the screen. Press <F1> on any screen to see more information.

   NOTE: If the EZ-SCSI utility is unable to locate the **mscdex.exe** *file in the* **c:\dos** *directory, it will prompt for a pathname to access this file. Without this file, the utility cannot access the system's CD-ROM drive.*

8. **When the message (**`Adaptec EZ-SCSI has been successfully installed…`**)appears on the screen, press <Enter> or <Esc> to exit the EZ-SCSI utility, and remove the Adaptec EZ-SCSI diskette from the drive. Then reboot your system by pressing <Ctrl><Alt><Del>.**

Installing NetWare 4.11 and Drivers

You need to install several updated drivers and Dell-supplied Novell patches when you install the NetWare 4.11 operating system on your system for the first time.

To install the NetWare 4.11 operating system on your PowerEdge system, use the **.ham** drivers that are provided on the *Dell Server Assistant* CD. You will need to create driver diskettes from the CD if you have not already done so. See the next section, "Creating the *Netware 4.11 Driver Updates* Diskette," for instructions on creating the driver diskettes from the *Dell Server Assistant* CD. For information about installing the **.ham** drivers in NetWare 4.11, see "Installing NetWare 4.11" found later in this document. To install the Dell-supplied Novell patches, see "Installing the Dell-Supplied Novell Patches" found later in this document.

NOTES: If the server has a redundant array of inexpensive disks (RAID) controller installed, you must set up the RAID controller and drives in a valid configuration **before** *you perform the procedures in this section. Refer to the RAID controller documentation to configure the controller and drives, and then return to this section.*

Before symmetric multiprocessing (SMP) can be installed on your system, you **must** *apply the IntraNetWare Support Pack 4.0A to the NetWare 4.11 operating system. See "Applying IntranetWare Support Pack 4.0A" found later in this document.*

Creating the Netware 4.11 Driver Updates *Diskette*

To create a driver diskette from the *Dell Server Assistant* CD for driver installation pur-
poses, perform the following steps:

1. **Insert the *Dell Server Assistant* CD into the server's CD-ROM drive and
   restart the system.**

2. **When the Dell Server Assistant main menu appears, select Create
   Diskettes and press <Enter>.**

3. **Select Create Operating Systems Support Diskettes and press <Enter>.**

4. **Select the icon for your NetWare version and press <Enter>.**

5. **Select Create Driver Diskette and press <Enter>, then select OK and
   press <Enter>.**

6. **At the prompt, insert a blank diskette into the diskette drive, select OK,
   and press <Enter>.**

7. **When the message** The diskette was created successfully
   **appears, select OK and press <Enter>, then select exit and press
   <Enter>.**

8. **At the Exit Confirmation dialog box, remove the *Dell Server Assistant* CD
   and the newly created driver diskette, select OK, and press <Enter> to
   continue the system reboot.**

NOTE: Remember to label the driver diskette; for example, label it NetWare 4.11
Driver Updates.

Preparing the Hard-Disk Drive for NetWare Installation

To prepare the hard-disk drive for NetWare installation, you must create a utility
partition on the drive (if needed), create the primary MS-DOS partition, format the
MS-DOS partition, install the **c:\dos** and **c:\scsi** subdirectories, and install certain
system files.

You do not need to create a utility partition if you are installing NetWare 4.11 for the
first time on your system. Dell shipped your system with the utility partition already
created on the hard-disk drive; you can proceed to create the primary MS-DOS parti-
tion on the drive. If you are reinstalling NetWare 4.11, you will need to delete the
utility partition and re-create it.

Using the following procedure, you can prepare the hard-disk drive using the *Dell
Server Assistant* and *Dell IntranetWare Support* CDs.

1. **If you do not need to create a utility partition on your hard-disk drive,
   go to step 2. Otherwise, perform the following steps to create a utility
   partition on your system:**

   a. Insert the *Dell Server Assistant* CD into the server's CD-ROM drive and turn
      on (or reboot) the system.

b. From the menu that appears, select Run System Utilities.

c. From the Run System Utilities menu, select Create Utility Partition.

d. At the `Welcome...` screen, select OK and press <Enter>.

e. At the message `Installation completed successfully`, select OK and press <Enter>.

f. Select Exit and press <Enter>.

g. At the Exit Confirmation dialog box, remove the *Dell Server Assistant* CD, insert the *Dell IntranetWare Support* CD, select OK, and press <Enter> to reboot the server.

2. **If you have not already done so, insert the *Dell IntranetWare Support* CD into the server's CD-ROM and reboot the system.**

3. **From the menu that appears, type** 1 **to select Create a Primary DOS Partition.**

4. **At the next menu, type** 2 **to select Run FDISK in Automated Mode.**

*NOTE: Dell recommends running the **fdisk** utility in automated mode unless you need to specify a different size for the primary MS-DOS partition. Running the **fdisk** utility in automated mode creates a 25-MB partition.*

5. **At the** `Warning...` **screen, read the information and type** y **to continue.**

The program partitions and then reboots the system.

6. **From the main menu that reappears, type** 2 **to select Format Primary DOS Partition.**

7. **When prompted, type** y **and press <Enter> to proceed with the format.**

8. **From the main menu that reappears, type** 4 **to select Recreate DOS System Files on HD.**

9. **Read the message that appears and type** y **to continue.**

The message `FILE TRANSFER COMPLETE` appears briefly, and then you are returned to the main menu.

10. **Type** q **and press <Enter> to exit the utility, then remove the *Dell IntranetWare Support* CD from the drive, and press <Ctrl><Alt><Del> to reboot the system.**

Your hard-disk drive has been prepared for NetWare installation. Continue to the next subsection, "Installing NetWare 4.11."

Installing NetWare 4.11

This section describes how to install the **aic78u2.ham** and **aha2940.ham** drivers at the same time you install NetWare 4.11. If NetWare 4.11 is already installed and you wish to install or update the **aic78u2.ham** and **aha2940.ham** drivers, refer to the Net-Ware *User's Guide* for installation instructions. Also, refer to the NetWare *User's Guide* for information about partitioning, creating a server name, and checking the IPX network number.

Follow these steps only if you are upgrading to NetWare 4.11 or installing it for the first time:

1. **Make backup copies of all Novell diskettes, and use those backup copies as your working diskettes.**

2. **Boot MS-DOS on your computer.**

3. **Change to the CD-ROM drive prompt.**

   The installation files are located in the root directory on the CD-ROM.

4. **Type** install **and press <Enter>.**

5. **Select a language at the language selection screen and press <Enter>.**

6. **Select whether you want to perform a simple or custom installation and press <Enter>.**

   If you select a simple installation, you can press <F1> to view the defaults for the installation.

7. **When prompted to install NetWare SMP, select No.**

   Even if you plan to install NetWare SMP, select No at this screen. The IntraNetWare Support Pack 4 or later must be applied before NetWare SMP can be installed. To apply IntraNetWare Support Pack 4, see "Applying IntraNetWare Support Pack 4.0A" found later in this section.

   The system now searches for existing device drivers and hardware.

8. **Press <F3> to continue through the next few screens, and then press <Insert> when you are prompted to select a hard-disk driver.**

9. **When a screen appears asking you to select a hard-disk driver, press <Insert>.**

10. **Insert the backup copy of the NetWare 4.11 driver diskette created in step 1 into the diskette drive.**

    If you have not already created this diskette, refer to Chapter 2, "Using the *Dell Server Assistant* CD," in this book for instructions.

11. **Press <F3>, and specify the path to the** aic78u2.ham **driver for NetWare (for example,** a:**).**

12. **Select the** aic78u2.ham **driver and press <Enter>.**

> *NOTE: Specific help text for each driver appears in the middle of the screen as you scroll down the list. The Loaded Drivers window below the list of available drivers displays the names of drivers that are loaded and operational. For a new installation, this list is initially empty. For a selective installation, the list shows the drivers already running.*

The system prompts you for a slot number for the device.

13. **Press <Alt><Esc> to switch to the console prompt, type** load a:\aic78u2.ham**, and press <Enter>.**

   A list of slot numbers is displayed separated by commas. Write down all slot numbers that are listed and press <Esc> to clear the command line. Press <Alt><Esc> to return to the installation screen.

14. **Enter the slot number for the driver and press <Enter>.**

15. **Press <Enter> to save the parameters and continue.**

16. **When prompted to select an additional disk driver, select Yes.**

17. **Repeat steps 12 through 16 for the** aha2940.ham **driver.**

18. **When prompted to select an additional disk driver, select No.**

   You now need to install the appropriate network adapter driver.

19. **From the Driver Actions menu, select the Select/Edit Disk or LAN Drivers option and press <Enter>.**

   The Network (LAN) Driver name box is highlighted.

20. **Press <Enter> again to go to a local area network (LAN) driver selection screen.**

21. **Press <Insert> and then press <F3>.**

22. **Verify that the driver diskette is in the diskette drive and press <Enter>.**

   A screen appears listing the available LAN drivers.

23. **Note the name of the driver you need to install and then press <Alt><Esc> to switch to the console prompt.**

24. **At the console prompt, type** load a:*driver_filename* **and press <Enter>.**

   A list of slot numbers is displayed separated by commas. Write down all slot numbers that are listed and press <Esc> to clear the command line. Press <Alt><Esc> to return to the installation screen.

25. **Highlight the driver from the LAN driver selection screen and press <Enter>.**

   A LAN driver configuration screen appears.

26. **Enter the appropriate values for the configuration parameters, including the slot number for the network adapter, pressing <Enter> after each entry.**

27. **Repeat steps 19 through 26 for each network adapter in your system.**

28. **Select Continue the Installation to create disk partitions and system volumes, and to specify volume names follow the procedures listed in the NetWare *User's Guide*.**

29. **When prompted to edit the** startup.ncf **file, find the entry** load sgscsi.cdm **and replace the entry with** load scsihd.cdm**.**

30. **Verify that the** load **command line and slot number for your host adapter is listed correctly in the** startup.ncf **file.**

    Refer to the NetWare *User's Guide* for information about editing the **startup.ncf** file.

Installing the Dell-Supplied Novell Patches

If you purchased NetWare 4.11 from Dell, the required NetWare 4.11 patches (including IntranetWare Support Pack 4.0A) from Novell are provided on the *Dell IntranetWare Support* CD. If you purchased NetWare 4.11 from another source, the required NetWare patches are available for download from Novell's World Wide Web site at **www.novell.com**. Refer to the next section "Applying IntranetWare Support Pack 4.0A" for instructions on installing IntranetWare Support Pack 4.0A from the file downloaded from Novell's Web site.

To install the patches supplied on the *Dell IntranetWare Support* CD, perform the following procedure:

1. **With the system turned on and running NetWare 4.11, insert the *Dell IntranetWare Support* CD into the server's CD-ROM drive.**

2. **At the console prompt, type** load cdrom **and press <Enter>.**

3. **Type** cd mount nwscd **and press <Enter>.**

4. **Type** nwscd:\dpatch **and press <Enter>.**

    A menu appears listing several patches (including the IntranetWare version 4.0A Support Pack), a backup option for the files being replaced by the IntranetWare 4.0A Support Pack, and a reboot option.

    The checkboxes for the patches and the IntranetWare Support Pack backup are selected; the reboot option is not. Dell recommends that you accept the defaults as displayed.

5. **Read the list of options and press <F10> to accept them.**

6.   **Read the File Copy Status screen, which contains information on the IntranetWare version 4.0A Support Pack, and press <Enter> to continue.**

The program copies files to your hard-disk drive.

7. **At the message** `IntranetWare Support Package installation is complete!`**, press <Enter>.**

8. **At the message** `NetWare v4.1x CLIB Update is complete!`**, press <Enter>.**

A screen appears listing several instructions that you must follow. The next few steps cover these instructions.

9. **Press <Enter> at the instruction screen to continue.**

10. **From the Product Installation screen, select Install Product and press <Enter>.**

11. **From the Install to Servers screen, highlight the name of the server to which you are installing and press <Enter>.**

12. **At the Start Installation dialog box, select Yes and press <Enter>.**

13. **At the first magenta information screen, read the screen and press <Enter>.**

14. **At the second magenta information screen, press <Enter>.**

15. **Select Exit and press <Enter>.**

16. **At the Exit Product Installation dialog box, select Yes and press <Enter>.**

17. **At the console prompt, type** `down` **and press <Enter> to return to "downed server" mode.**

18. **At the console prompt, type** `exit` **to return to the MS-DOS prompt.**

19. **Remove the *Dell IntranetWare Support* CD.**

20. **Reboot the server.**

Applying IntranetWare Support Pack 4.0A

Before NetWare SMP can be installed in NetWare 4.11, you must apply IntranetWare Support Pack, 4.0A. The IntraNetWare Support Pack 4.0A is an MS-DOS executable patch file (**iwsp4a.exe**) that is available for download from Novell's World Wide Web site at **www.novell.com**. For complete instructions on applying IntraNetWare Support Pack 4.0A, refer to the Novell documentation.

To install the IntranetWare Support Pack 4.0A complete these steps:

1. **Place the Support Pack file onto a workstation that is attached to the PowerEdge server.**

2. **Copy the support pack file to a volume on the server.**

3. **Expand the file by typing** `iwsp4a.exe` **and press <Enter>.**

4. **Follow the directions listed in the** iwsp4a.txt **file included with the support pack.**

When Support Pack 4.0A has been applied, you can install SMP on your system.

Installing SMP Support

To add SMP support to your NetWare 4.11 installation, use the following procedure:

1. **At the NetWare console prompt, type** `Load install` **and press <Enter>.**

2. **From the installation screen that appears, select Multi-CPU Options and press <Enter>.**

3. **From the selection screen, select Select a Platform Module and press <Enter>.**

4. **From the next selection screen, select MPS14.PSM and press <Enter>.**

   A confirmation screen appears asking if you want to load the selected module.

5. **Select Yes and press <Enter>.**

   A message screen appears.

6. **Exit the message screen, switch to the console prompt, down the server, and reboot the system to enable SMP support.**

Using startup.ncf *and* autoexec.ncf

The **startup.ncf** and **autoexec.ncf** files contain a set of commands that are executed during the boot routine. The **startup.ncf** file contains commands to load the disk drivers. Once **startup.ncf** loads disk drivers, control is passed to the **autoexec.ncf** file to complete the boot routine. For additional information on the **startup.ncf** and **autoexec.ncf** files, refer to your NetWare documentation.

To automatically load the **aic78u2.ham** driver during the boot routine, the **startup.ncf** file must contain a **load** command line that specifies the location of the driver on the hard-disk drive. To find the slot number, type `load a:\scsi\aic78u2.ham` at the console prompt and press <Enter>. A list of slot numbers is displayed separated by commas. Press <Esc> to clear the command line.

*NOTE: To load the driver from your hard-disk drive, the **aic78u2.ham** driver and **nwaspi.cdm** module must be copied from your NetWare 4.11 driver diskette to a directory on your hard-disk drive (usually, the server's start-up directory [for example, **c:\nwserver**]).*

The syntax to load the **aic78u2.ham** driver follows:

load [*pathname*]**\aic78u2.ham** [*options*] **slot=***x*

For example, the command line to load the driver from the **c:\nwserver** directory with the **verbose**= option on and a slot number of 10002 follows:

```
load c:\nwserver\aic78u2.ham verbose=y slot=10002
```

*NOTE: For each Adaptec 78xx host adapter installed, a separate **load** command line must be included in the **startup.ncf** file. The slot number (**slot=**) identifies the specific adapter.*

To modify the **startup.ncf** file, follow these steps:

1. **Type** install **at the NetWare prompt, and press <Enter>.**

2. **Select the appropriate menu choice that allows you to edit the** startup.ncf **file.**

3. **Make the necessary changes. When you are finished, press <F10>.**

Using Removable Media

The **aha2940.ham** driver module fully supports removable-media disk drives, including magneto-optical drives. Removable media is treated as a standard SCSI hard-disk drive, with some exceptions:

- The driver only recognizes and registers media with 512 bytes/sector.
- NetWare allows you to mount or dismount the media and lock or unlock the media.

These removable media options are supported by NetWare's **monitor.nlm** program.

Follow these steps to set up the removable media:

1. **Load** monitor.nlm **to display the various options.**

2. **Select Disk Information.**

   All system hard-disk drives appear.

3. **Select the removable-media device.**

   Drive status items appear as shown in Table 3-2.

Table 3-2. Drive Status Items

Menu Option	Default Value
Volume Segments on Drive[1]	Select for a list
Read After Write Verify[1]	Hardware Level
Drive Light Status[1]	Not supported
Driver Operating Status[1]	Active
Removable Drive Mount Status[2]	Mounted
Removable Drive Lock Status[2]	Not Locked

[1]   Valid for both removable and nonremovable SCSI drives

[2]   Valid for removable media only

Verify Status

The Read After Write Verify option (menu option 2) is set to Hardware Level by default. This option cannot be specified in the **startup.ncf** or **autoexec.ncf** file. However, the default can be set on the command line.

The available options are defined in Table 3-3.

Table 3-3. Read After Write Verify Options

Option Setting	Function
Disabled	All writes to SCSI disk drives are executed with the SCSI Write command (0Ah or 2Ah).
Hardware Level	All writes to SCSI disk drives are executed with the SCSI Write and Verify command (2Eh) or (if this command is not supported by the drive) with the SCSI Write command (0Ah or 2Ah), followed by the SCSI Verify command (2Fh).
Software Level	Not supported.

Mount Status

Mounting causes a drive to come online as a NetWare storage device. Dismounted drives are inactive and cannot be accessed.

Before you eject your current media, you should first dismount it (using menu option 5). When the mount status is Dismounted, you can eject the media. However, NetWare does not allow you to dismount media that are locked.

To insert your new media, wait for the drive to spin up, and then select the Removable Drive Mount Status option.

Lock Status

If your removable-media device supports the lock/unlock feature, you can lock the media (using menu option 6). The media must be in the Not Locked state before you can eject it. If the media is locked, it cannot be ejected when you press the eject button.

Using Drives Tested and Approved for NetWare

To be fully certified as NetWare "Yes, Tested and Approved," a drive and host adapter must both pass a qualification process that takes place before you see the product. The goals of NetWare testing are to simplify installation and provide the highest quality disk subsystem.

Adaptec 78*xx* series host adapters and their drivers are fully tested and approved for NetWare. This means that you can purchase a NetWare drive (certified as "Yes, Tested and Approved") from a vendor, connect it to your system or host adapter, partition it, and create a volume without any compatibility concerns.

NOTE: Dell recommends using only Dell-tested drives.

Adaptec's **aic78u2.ham** driver module is flexible enough to allow you to connect SCSI drives that are tested and approved for NetWare as well as standard SCSI drives to a single host adapter. The driver registers each hard-disk drive accordingly.

Drive registration is a user-transparent process; no user interaction is required. You can tell that the drive has been detected as NetWare-tested and NetWare-approved if the message NetWare Yes Tested and Approved is included in the drive description string that appears when you run **monitor.nlm** (disk options).

Using the NetWare Tape Drive Utility

Included with NetWare is a server-based tape drive utility called **sbackup.nlm**. This allows backup of server disk drives to a server tape drive. The **sbackup.nlm** utility supports Adaptec host adapters. Use the following procedure to load the backup utility:

1. **Load the SCSI adapter driver.**

   The syntax to load the **aic78u2.ham** driver follows:

   load [*pathname*]**\aic78u2.ham** [*options*] **slot=***x*

2. **Refer to the Novell NetWare documentation for additional instructions on loading the server backup software. Refer to the *NetWare Server Backup User's Guide* to load the** tsa **and** sbackup **modules.**

Setting Up a CD-ROM Drive With NetWare 4.11

To use a CD-ROM drive with NetWare 4.11, follow these instructions:

1. **Load** aic78u2.ham **by entering the following command line:**

   ```
   load [pathname]\aic78u2.ham slot=x
   ```

2. **Load** nwaspi.cdm **by entering the following command line:**

   ```
   load [pathname] nwaspi.cdm
   ```

   *NOTE: If **nwaspi.cdm** does not work, unload it and load it again. The first load initializes the host adapter; unloading and reloading allows the initialization to complete.*

3. **Load** cdrom.nlm **as follows:**

   ```
   load [pathname] cdrom.nlm
   ```

4. **Enter the following line at the prompt, and then note the number and name of the CD that appears:**

   ```
   cd device list
   ```

5. **Enter the number and volume name of the CD at the command line:**

   ```
   cd mount [number] [name]
   ```

   The CD-ROM is now ready to be accessed as a volume.

Optimizing Performance

The Adaptec 78*xx* SCSI bus master firmware increases the SCSI performance of the Adaptec 78*xx* series host adapters under multitasking environments. The firmware uses a paging mechanism to handle up to 255 simultaneous SCSI commands. The sequencer can simultaneously manage up to 32 tagged, or 2 nontagged, SCSI commands for each SCSI device, up to a limit of 255 SCSI commands. The firmware can queue as many commands as the operating system is able to send to the host adapter. To set this feature, enter the following command:

```
max_tags=n
```

In general, a low number for the **max_tags** option gives better sequential performance. This value varies with the level of random disk accesses and drive characteristics.

*NOTE: A large value for **max_tags** can cause starvation problems with some drives.*

Troubleshooting for NetWare

Any error that occurs while the driver is initializing prevents it from loading. If an error does occur, the driver causes the system to beep and then display a numbered error message:

```
xxx message
```

The *xxx* indicates the error code, and *message* is a descriptive line describing the error. The error codes are divided into three categories:

- 000-099 — Non–host-adapter specific
- 100-299 — Host-adapter specific
- 300-999 — Reserved

Specific error codes, such as those in the following subsections, appear only if you have installed the host adapters and drivers that generate them:

Non–Host-Adapter Specific Error Codes

The following error codes alert you to error conditions caused by factors not related to the host adapter:

`000 Failed ParseDriverParameters call`

A call to NetWare's ParseDriverParameters routine has failed. The command-line contains errors, or you pressed <Esc> at the port or slot prompt.

`001 Unable to reserve hardware, possible conflict`

The driver failed in its attempt to reserve the host adapter's hardware settings (that is, direct memory access [DMA] and interrupt request [IRQ] settings). Another card in your system may be causing a conflict with the host adapter.

`002 NetWare rejected card Failed AddDiskSystem call`

The driver failed in its attempt to register the host adapter with NetWare. The file server may not have enough memory.

`003 Invalid command line option entered > option`

An invalid option was entered on the command line. The invalid option that was entered is also displayed.

`004 Invalid command line, please enter correctly`

The driver was unable to understand the command line options you entered. Be sure you have entered these options correctly.

Host-Adapter Specific

The following error codes alert you to error conditions caused by factors related to the host adapter:

`200 No host adapter found for this driver to register`

No Adaptec 78*xx* host adapter was found in your system for the driver to register. Be sure the host adapter is properly configured and properly seated in the slot.

`203 Invalid 'device' setting`

You have entered an invalid slot setting on the command line. You can only enter slot numbers for valid host adapters. If you load without the slot option, you will be prompted to enter a valid value.

`204 Invalid 'verbose' setting, use 'y'`

You can only enter `y` for this option (**verbose=y**).

`205 Invalid 'removable' setting, use 'off'`

You can only enter `off` for this option (**removable=off**).

`206 Invalid 'fixed_disk' setting, use 'off'`

You can only enter `off` for this option (**fixed_disk=off**).

`208 SCSI present but not enabled/configured for PCI`

A host adapter is present, but its bus or device entry has not been enabled.

C H A P T E R   4
Using the System Setup Program

Each time you turn on or reboot your computer system, the system compares the hardware installed in the system to the hardware listed in the system configuration information stored in nonvolatile random-access memory (NVRAM) on the system board. If the system detects a discrepancy, it generates error messages that identify the incorrect configuration settings. The system then prompts you to enter the System Setup program to correct the setting.

You can use the System Setup program as follows:

*   To change the system configuration information after you add, change, or remove any hardware in your system

*   To set or change user-selectable options—for example, the time or date on your system

*   To enable or disable all integrated devices in your system.

CAUTION: Whenever you make changes to the System Setup program or change settings for built-in devices, you must run the Resource Configuration Utility (RCU), make any necessary changes, and save the system configuration information. Failure to do so may cause resource conflicts between Peripheral Component Interconnect (PCI) devices (such as PCI expansion cards, the built-in video controller, or the built-in small computer system interface [SCSI] host adapter). See "Configuring PCI Expansion Cards" in Chapter 5 for more information about how PCI devices are configured based on settings in the Resource Configuration Utility.

You can view the current settings any time you run the System Setup program. When you change a setting, the system reboots automatically so that the change can take effect.

After you set up your system, run the System Setup program to familiarize yourself with your system configuration information and optional settings. Dell recommends that you print the System Setup screens (by pressing the <Print Screen> key) or write down the information for future reference.

Before you use the System Setup program, you need to know the kind of diskette drive(s) and hard-disk drive(s) installed in your computer. If you are unsure of any of this information, see the Manufacturing Test Report that was shipped with your system. You can access the Manufacturing Test Report in the Dell Accessories folder.

Entering the System Setup Program

Enter the System Setup program as follows:

1. **Turn on your system.**

   If your system is already on, shut it down and then turn it on again.

2. **Press <F2> immediately after you see the following message:**

   ```
   Press <F2> for System Setup
   ```

If you wait too long and your operating system begins to load into memory, *let the system complete the load operation*; then shut down the system and try again.

NOTE: To ensure an orderly system shutdown, consult the documentation that accompanied your operating system.

You can also enter the System Setup program by responding to certain error messages. See "Responding to Error Messages" at the end of this chapter.

System Setup Screens

The two System Setup screens, Page 1 and Page 2, display the current setup and configuration information and optional settings for your system. Typical examples are illustrated in Figure 4-1. Information on the two System Setup screens is organized in five boxed areas:

- Title box

  The box at the top of both screens lists the system name, page number (Page 1 or Page 2), and the revision number of the basic input/output system (BIOS).

- Configuration options

  The box on the left half of both screens lists the categories that define the installed hardware in your computer.

  Fields beside the categories contain options or values; those that appear bright on the screen can be changed. Options or values that you cannot change because they are determined by the system appear less bright.

  Some categories have multiple fields, which may show options or values as bright or less bright depending upon what options or values you entered in other fields.

- Help

  The box on the upper-right half of both screens displays help information for the category with a currently highlighted field.

- System data

  The box in the lower-right corner of both screens displays information about your system.

- Key functions

  The line of boxes across the bottom of both screens lists keys and their functions within the System Setup program.

Using the System Setup Program

Table 4-1 lists the keys you use to view or change information on the System Setup screens and to exit the program.

Table 4-1. System-Setup Navigation Keys

Keys	Action
Tab or **↓**	Moves to the next field.
Shift **Tab** or **↑**	Moves to the previous field.
← or **→**	Cycles through the options in a field. In many fields, you can also type the appropriate value.
Page Down or **Page Up**	Scrolls through help information.
Alt **P**	Switches between Pages 1 and 2.
Esc	Exits the System Setup program and reboots the system if any changes were made. For most of the categories, any changes you make are recorded but do not take effect until the next time you boot the system. For a few categories (as noted in the help area), the changes take effect immediately.
Alt **B**	Exits the System Setup program and reboots the system, implementing any changes you have made.

configuration options　　　　　　　　*title box*　　　　　　　　*help*

```
                 Dell Computer Corporation (www.dell.com)
 Page 1 of 2       System PowerEdge® 6300/400 Setup      BIOS Version: XXX

 Time:13:17:02  Date:Wed Apr 8, 1998
                                        This category sets the time in
 Diskette Drive A: 3.5 inch, 1.44 MB    24-hour format (hours:minutes:
 Diskette Drive B: Not Installed        seconds) for the internal
                                        clock/calendar.

          Cache:  On                    To change the value in a field,
       Num Lock:  On                    enter a number or use the left-
        Speaker:  On                    or right-arrow key.

    Processor 1:  Revision B0           Changes take effect immediately.
    Processor 2:  Not Installed
    Processor 3:  Not Installed
    Processor 4:  Not Installed         Pentium® II Xeon™ Processor 400 MHz

                                         Level 2 Cache: 512 KB Integrated
                                        System Memory: 128 MB ECC DRAM
                                         Video Memory: 2 MB SGRAM
                                           Service Tag: XXXXX
                                             Asset Tag: XXXXXXXXXX

 Tab,Shift-Tab change fields ◄─,─► change values  Alt-P next  Esc exit  Alt-B reboot
```

key functions　　　　　　　　*system data*

```
                 Dell Computer Corporation (www.dell.com)
 Page 2 of 2       System PowerEdge® 6300/400 Setup      BIOS Version: XXX

 Keyboard Errors:  Report
   Boot Sequence:  Diskette First       This category sets whether
   Scan Sequence:  Slots first (H/L)    keyboard-related error
 System Password:  Not Enabled          messages are reported at
 Password Status:  Unlocked             system startup.
  Setup Password:  Not Enabled

      ────── Integrated Devices ──────
           Mouse:  On
   Serial Port 1:  Auto
   Serial Port 2:  Auto
   Parallel Port:  378h
   Parallel Mode:  PS/2
        Diskette:  Auto                 Pentium® II Xeon™ Processor 400 MHz

                                         Level 2 Cache: 512 KB Integrated
  Primary SCSI A:  On                   System Memory: 128 MB ECC DRAM
  Primary SCSI B:  On                    Video Memory: 2 MB SGRAM
  Secondary SCSI:  On                      Service Tag: XXXXX
                                             Asset Tag: XXXXXXXXXX

 Tab,Shift-Tab change fields ◄─,─► change values  Alt-P next  Esc exit  Alt-B reboot
```

Figure 4-1. System Setup Screens

System Setup Options

The following subsections explain in detail each of the options on the System Setup screens:

Time

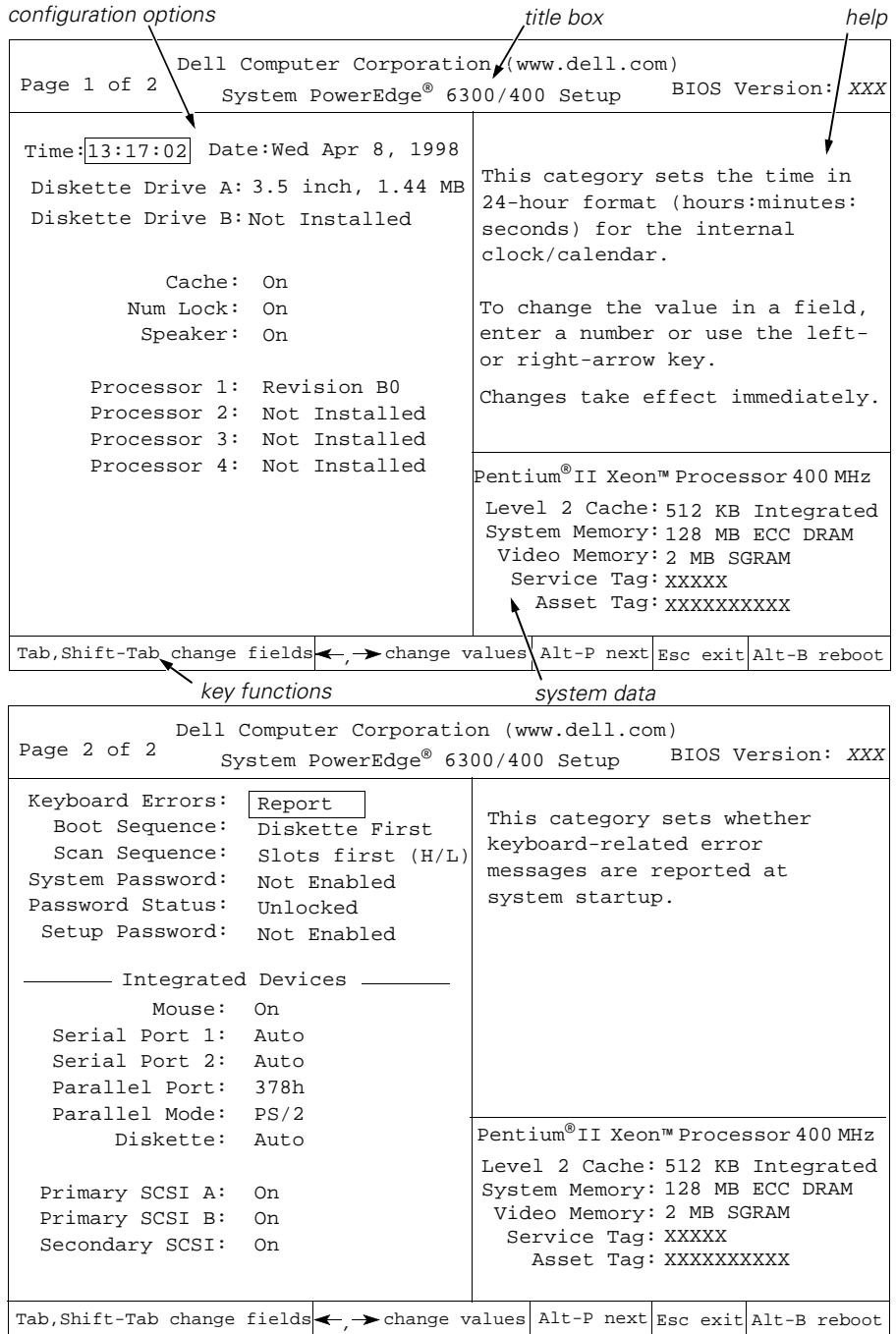Time resets the time on the computer's internal clock.

Time is kept in a 24-hour format (*hours*:*minutes*:*seconds*). To change the time, press the right-arrow key to increase the number in the highlighted field or press the left-arrow key to decrease the number. If you prefer, you can type numbers in each of the appropriate fields.

Date

Date resets the date on the computer's internal calendar.

Your system automatically displays the day of the week corresponding to the settings in the three fields that follow (*month*, *day-of-month*, and *year*).

To change the date, press the right-arrow key to increase the number in the highlighted field or press the left-arrow key to decrease the number. If you prefer, you can type numbers in the *month* and *day-of-month* fields.

Diskette Drive A and Diskette Drive B

Diskette Drive A and Diskette Drive B identify the type of diskette drive installed in your computer. With the standard cabling configuration, Diskette Drive A (the boot diskette drive) is the 3.5-inch diskette drive installed in the top externally accessible drive bay.

The settings always match the physical locations of the drives in your computer—the first drive listed on Page 1 of the System Setup screens is the top drive in your computer.

The settings are:

- 3.5 Inch, 720 KB
- 3.5 Inch, 1.44 MB
- 5.25 Inch, 360 KB
- 5.25 Inch, 1.2 MB
- Not Installed

Cache

Sets the state of the processor cache to On (default) or Off.

Num Lock

Num Lock determines whether your system boots with the Num Lock mode activated on 101- or 102-key keyboards (it does not apply to 84-key keyboards).

When Num Lock mode is activated, the rightmost bank of keys on your keyboard provides the mathematical and numeric functions shown at the tops of the keys. When Num Lock mode is turned off, these keys provide cursor-control functions according to the label on the bottom of each key.

Speaker

Speaker determines whether the built-in speaker is On (the default) or Off. Rebooting the system is required for the changes to take effect.

Processors 1, 2, 3 and 4

Processors 1, 2, 3, and 4 display the version or stepping number of each processor slot in the system. These options have no user-selectable settings.

Keyboard Errors

Keyboard Errors enables or disables reporting of keyboard errors during the power-on self-test (POST), which is a series of tests that the system performs on the hardware each time you turn on the system or press the reset button.

This option is useful when applied to self-starting servers or host systems that have no permanently attached keyboard. In these situations, selecting Do Not Report suppresses all error messages relating to the keyboard or to the keyboard controller during POST. This option does not affect the operation of the keyboard itself if a keyboard is attached to the computer.

Boot Sequence

Boot Sequence can be set to Diskette First (the default) or to Hard Disk Only.

The term *boot* refers to the system's start-up procedure. When turned on, the system "bootstraps" itself into an operational state by loading into memory a small program, which in turn loads the necessary operating system. Boot Sequence tells the system where to look for the files that it needs to load.

Diskette First

Selecting Diskette First causes the system to try booting from drive A first. If the system finds a diskette that is not bootable in the drive or finds a problem with the drive itself, it displays an error message. If it does not find a diskette in the drive, the system tries to boot from the CD-ROM, then from the hard-disk drive (drive 0), and finally from the Plug and Play network adapters.

Hard Disk Only

Selecting Hard Disk Only causes the system to attempt to boot first from the hard-disk drive and then from the Plug and Play network adapters in the order found.

Scan Sequence

This option determines the order in which PCI devices are scanned by the system, and it allows you to select the built-in SCSI controller or an optional PCI expansion-card SCSI controller as the boot device. The options are:

- Embedded Devices First
- Slots First (High/Low) (the default)
- Slots First (Low/High)

System Password

System Password displays the current status of your system's password security feature and allows you to assign and verify a new password. No one can assign a new password unless the current status is Not Enabled, which is displayed in bright characters.

The settings for the System Password are:

- Not Enabled (the default)
- Enabled
- Disabled by Jumper (jumper removed)

NOTE: Read "Using the System Password Feature" found later in this chapter for instructions on assigning a system password and using or changing an existing system password. See "Disabling a Forgotten Password" found later in this chapter for instructions on disabling a forgotten system password.

Password Status

When Setup Password is set to Enabled, Password Status allows you to prevent the system password from being changed or disabled at system start-up.

To lock the system password, you must first assign a password in Setup Password and then change Password Status to Locked. In this state, the system password cannot be changed through System Password and cannot be disabled at system start-up by pressing <Ctrl><Enter>.

To unlock the system password, you must enter the setup password in Setup Password and then change Password Status to Unlocked. In this state, the system password can be disabled at system start-up by pressing <Ctrl><Enter> and then changed through System Password.

Setup Password

Setup Password lets you restrict access to your computer's System Setup program in the same way that you restrict access to your system with the system password feature. The settings are:

- Not Enabled (the default)

- Enabled

- Disabled by Jumper (jumper removed)

NOTE: Read "Using the Setup Password Feature" found later in this chapter for instructions on assigning a setup password and using or changing an existing setup password. See "Disabling a Forgotten Password" found later in this chapter for instructions on disabling a forgotten setup password.

Mouse

Mouse enables or disables the system's built-in Personal System PS/2-compatible mouse port. Disabling the mouse allows an expansion card to use IRQ12.

Serial Port 1 and Serial Port 2

Serial Port 1 and Serial Port 2 configure the system's built-in serial ports. These options can be set to Auto (the default) to automatically configure a port, to a particular designation (COM1 or COM3 for Serial Port 1; COM2 or COM4 for Serial Port 2), or to Off to disable the port.

If you set a serial port to Auto and add an expansion card containing a port configured to the same designation, the system automatically remaps the built-in port to the next available port designation that shares the same interrupt request (IRQ) setting as follows:

- COM1 (input/output [I/O] address 3F8h), which shares IRQ4 with COM3, is remapped to COM3 (I/O address 3E8h).

- Likewise, COM2 (I/O address 2F8h), which shares IRQ3 with COM4, is remapped to COM4 (I/O address 2E8h).

*NOTE: When two COM ports share an IRQ setting, you can use either port as necessary, **but you may not be able to use them both at the same time**. If the second port (COM3 or COM4) is also in use, the built-in port is turned off.*

Parallel Port

Parallel Port configures the system's built-in parallel port. Parallel Port can be set to 378h (the default), to alternate addresses 278h or 3BCh, or to Off to disable the port.

NOTE: Do not set Parallel Port to 278h if you have an Extended Capabilities Port (ECP) device connected to the port.

Parallel Mode

Parallel Mode controls whether the system's built-in parallel port acts as an AT-compatible (unidirectional) or PS/2-compatible (bidirectional) port.

Set Parallel Mode according to the type of peripheral device connected to the parallel port. To determine the correct mode to use, see the documentation that came with the device.

Diskette

Diskette controls the operation of the system's built-in diskette drive controller.

With Auto (the default) selected, the system turns off the built-in diskette drive controller when necessary to accommodate a controller card installed in an expansion slot.

With Write Protect selected, nothing can be written to diskette drives using the system's built-in diskette drive controller. (The system can still read from the drives.) When this option is selected, the Auto option (whereby the system turns off the built-in diskette drive controller as necessary) is also in effect.

Selecting Off turns off the built-in diskette controller; this option is used primarily for troubleshooting purposes.

Primary SCSI A, Primary SCSI B and Secondary SCSI

Primary SCSI A, Primary SCSI B and Secondary SCSI turn the respective SCSI controller on or off. Selecting On (the default option) enables the built-in PCI SCSI controller and scans the associated read-only memory (ROM). For the system to boot from a drive attached to the built-in SCSI controller, the drive must be enabled. Selecting Off causes the BIOS to mask the presence of a device.

System Data

The following fields, which are not selectable, display information about the system:

- The processor line displays the microprocessor type and speed.

- Level 2 Cache displays the size of the integrated cache (512 kilobytes [KB]).

- System Memory indicates the entire amount of installed memory detected in your system, except for memory on Expanded Memory Specification (EMS) expansion cards. After adding memory, check System Memory to confirm that the new memory is installed correctly and is recognized by the system.

- Video Memory displays the amount of video memory detected in your system.

- Service Tag displays the system's five-character service tag number, which was programmed into NVRAM by Dell during the manufacturing process. Refer to this number during technical assistance or service calls. The service tag number is also accessed by certain Dell support software, including the diagnostics software.

- Asset Tag displays the customer-programmable asset tag number for the system if an asset tag number has been assigned. You can use the Asset Tag utility,

which is included with your software support utilities, to enter an asset tag number up to ten characters long into NVRAM. See "Asset Tag Utility" in Chapter 2 for information on loading the Asset Tag utility.

Using the System Password Feature

CAUTION: The password features provide a basic level of security for the data on your system. However, they are not foolproof. If your data requires more security, it is your responsibility to obtain and use additional forms of protection, such as data encryption programs.

Your Dell system is shipped to you without the system password feature enabled. If system security is a concern, you should operate your system only with system password protection.

You can assign a system password, as described in the next subsection, "Assigning a System Password," whenever you use the System Setup program. After a system password is assigned, only those who know the password have full use of the system.

When System Password is set to Enabled, the computer system prompts you for the system password just after the system boots.

To change an existing system password, you must know the password (see "Deleting or Changing an Existing System Password" found later in this section). If you assign and later *forget* a system password, you need to be able to remove the computer cover to change a jumper setting that disables the system password feature (see "Disabling a Forgotten Password" found later in this chapter). Note that when you erase the system password, you erase the setup password at the same time.

CAUTION: If you leave your system running and unattended without having a system password assigned, or if you leave your computer unlocked so that someone can disable the password by changing a jumper setting, anyone can access the data stored on your hard-disk drive.

Assigning a System Password

Before you can assign a system password, you must enter the System Setup program and check System Password.

When a system password is assigned, System Password is Enabled. When the system password feature is disabled by a jumper setting on the system board, the status shown is Disabled by Jumper. *You cannot change or enter a new system password if either of these options is displayed*.

When no system password is assigned and the password jumper on the system board is in the enabled position (its default), the status shown for System Password is Not Enabled. *Only when System Password is set to Not Enabled can you assign a system password*, using the following procedure:

1. Verify that Password Status is set to Unlocked.

For instructions on changing the setting for Password Status, see "Password Status" found earlier in this chapter.

2. **Highlight System Password, and then press the left- or right-arrow key.**

   The heading changes to Enter Password, followed by an empty seven-character field in square brackets.

3. **Type your new system password.**

   You can use up to seven characters in your password.

   As you press each character key (or the spacebar key for a blank space), a place-holder appears in the field.

   The password assignment operation recognizes keys by their location on the keyboard, without distinguishing between lowercase and uppercase characters. For example, if you have an *M* in your password, the system recognizes either *M* or *m* as correct.

   Certain key combinations are not valid. If you enter one of these combinations, the speaker emits a beep.

   To erase a character when entering your password, press the <Backspace> key or the left-arrow key.

   NOTE: To escape from the field without assigning a system password, press the <Tab> key or the <Shift><Tab> key combination to move to another field, or press the <Esc> key at any time prior to completing step 5.

4. **Press <Enter>.**

   If the new system password is less than seven characters, the whole field fills with placeholders. Then the category heading changes to Verify Password, followed by another empty seven-character field in square brackets.

5. **To confirm your password, type it a second time and press <Enter>.**

   The password setting changes to Enabled. Your system password is now set; you can exit the System Setup program and begin using your system. Note, however, that password protection does not take effect until you reboot the system by turning the system off and then on again.

Using Your System Password to Secure Your System

Whenever you turn on your system or reboot by pressing the <Ctrl><Alt><Del> key combination, the following prompt appears when Password Status is set to Unlocked:

```
Type in the password and...
— press <ENTER> to leave password
security enabled.
— press <CTRL><ENTER> to disable password security.
Enter password:
```

If Password Status is set to Locked, the following prompt appears:

```
Type the password and press <Enter>.
```

After you type the correct system password and press <Enter>, your system boots and you can use the keyboard and/or mouse to operate your system as usual.

NOTE: If you have assigned a setup password (see "Using the Setup Password Feature" found later in this chapter), the system accepts your setup password as an alternate system password.

If a wrong or incomplete system password is entered, the following message appears on the screen:

```
** Incorrect password. **

Enter password:
```

If an incorrect or incomplete system password is entered again, the same message appears on the screen.

The third and subsequent times an incorrect or incomplete system password is entered, the system displays the following message:

```
** Incorrect password. **
Number of unsuccessful password
attempts: 3
System halted! Must power down.
```

The number of unsuccessful attempts made to enter the correct system password can alert you to an unauthorized person attempting to use your system.

Even after your system is turned off and on, the previous message is displayed each time an incorrect or incomplete system password is entered.

NOTE: You can use Password Status in conjunction with System Password and Setup Password to further protect your system from unauthorized changes. For more information, see "Password Status" found earlier in this chapter.

Deleting or Changing an Existing System Password

To delete or change an existing system password, perform the following steps:

1. **Enter the System Setup program, and verify that the Password Status category is set to Unlocked.**

   Enter the System Setup program by pressing the <Ctrl><Alt><Enter> key combination. Press the <Alt><p> key combination to move to Page 2 of the System Setup screens. For instructions on changing the setting for Password Status, see "Password Status" found earlier in this chapter.

2. **Reboot your system to force it to prompt you for a system password.**

3. **When prompted, type the system password.**

4. **Press the <Ctrl><Enter> key combination to disable the existing system password, instead of pressing <Enter> to continue with the normal operation of your system.**

5. **Confirm that Not Enabled is displayed for the System Password category of the System Setup program.**

   If Not Enabled appears in the System Password category, the system password has been deleted. If you want to assign a new password, continue to step 6. If Not Enabled is *not* displayed for the System Password category, press the <Alt><b> key combination to reboot the system, and then repeat steps 3 through 5.

6. **To assign a new password, follow the procedure in "Assigning a System Password" found earlier in this section.**

Using the Setup Password Feature

Your Dell system is shipped to you without the setup password feature enabled. If system security is a concern, you should operate your system with setup password protection.

You can assign a setup password, as described in the next subsection, "Assigning a Setup Password," whenever you use the System Setup program. After a setup password is assigned, only those who know the password have full use of the System Setup program.

To change an existing setup password, you must know the setup password (see "Deleting or Changing an Existing Setup Password" found later in this section). If you assign and later *forget* a setup password, you need to remove the computer cover to change a jumper setting that disables the setup password feature (see "Disabling a Forgotten Password" found later in this chapter). Note that you erase the *system password* at the same time.

Assigning a Setup Password

A setup password can be assigned (or changed) only when Setup Password is set to Not Enabled. To assign a setup password, highlight Setup Password and press the left- or right-arrow key. The system prompts you to enter and verify the password. If a character is illegal for password use, the system emits a beep.

NOTES: The setup password can be the same as the system password.

If the two passwords are different, the setup password can be used as an alternate system password. However, the system password cannot be used in place of the setup password.

After you verify the password, Setup Password changes to Enabled. The next time you enter the System Setup program, the system prompts you for the setup password.

A change to Setup Password becomes effective immediately (rebooting the system is not required).

Operating With a Setup Password Enabled

If Setup Password is set to Enabled, you must enter the correct setup password before you can modify the majority of the System Setup options.

When you start the System Setup program, Page 2 of the System Setup screens appears with Setup Password highlighted, prompting you to type the password.

If you do not enter the correct password in three attempts, the system lets you view, but not modify, the System Setup screens—with the following exceptions:

- You can still modify Date, Time, CPU Speed, Num Lock, and Speaker.

- If System Password is not enabled and is not locked via Password Status, you can assign a system password (however, you cannot disable or change an existing system password).

NOTE: You can use Password Status in conjunction with Setup Password to protect the system password from unauthorized changes. For more information, see "Password Status" found earlier in this chapter.

Deleting or Changing an Existing Setup Password

To delete or change an existing setup password, perform the following steps:

1. **Enter the System Setup program.**

2. **Highlight Setup Password, and press the left- or right-arrow key to delete the existing setup password.**

    The setting changes to Not Enabled.

3. **If you want to assign a new setup password, follow the procedure in "Assigning a Setup Password" found earlier in this section.**

Disabling a Forgotten Password

If you forget your system or setup password, you cannot operate your system or change settings in the System Setup program, respectively, until a trained service technician opens the computer chassis, changes the password jumper setting to disable the passwords, and erases the existing passwords. This procedure is described in "Disabling a Forgotten Password" in Appendix B of the *Installation and Troubleshooting Guide.*

Responding to Error Messages

If an error message appears on your monitor screen while the system is booting, make a note of the message. Then, before entering the System Setup program, refer to "System Beep Codes" and "System Messages" in Chapter 3 of the *Installation and Troubleshooting Guide* for an explanation of the message and suggestions for correcting any errors. (An exception to this routine: It is normal to receive an error message the first time you boot your system after installing a memory upgrade. In

that situation, do not refer to "System Beep Codes" and "System Messages." Instead, follow the instructions in "Performing a Memory Upgrade" in Chapter 8 of the *Installation and Troubleshooting Guide*.)

If you are given an option of pressing either <F1> to continue or <F2> to run the System Setup program, press the <F2> key.

CHAPTER 5
Using the Resource Configuration Utility

The Resource Configuration Utility (RCU) is used to tell the system what expansion cards are installed and which expansion slots they occupy. With this information, the system automatically configures Plug and Play expansion cards and PCI expansion cards. Before your system was shipped from Dell, a technician used the RCU to enter the correct information for the expansion cards initially installed in your computer.

The RCU also monitors the resources required by any installed Peripheral Component Interconnect (PCI) expansion card. After installing or moving a PCI expansion card, you should run the RCU to update the system's database of available system resources stored in nonvolatile random-access memory (NVRAM).

CAUTION: Whenever you make changes to the System Setup program or change settings for built-in devices, you must run the RCU, make any necessary changes, and save the system configuration information. Failure to do so may cause resource conflicts between PCI devices (such as PCI expansion cards, the built-in video controller, or the built-in small computer system interface [SCSI] host adapter). See "Configuring PCI Expansion Cards" in this chapter for more information about how PCI devices are configured based on settings in the RCU.

Configuring PCI Expansion Cards

The RCU is PCI-aware and can be used to configure PCI expansion cards. Configuration information for PCI expansion cards is contained within the card, so no additional **.cfg** file is required. You should run the RCU *after* installing or moving a PCI expansion card to keep the system's database of available resources accurate.

How to Run the RCU

The RCU is included on the *Dell Server Assistant* CD shipped with your system.

You can run the RCU directly from the CD or from a diskette that you create using the CD's main menu. Dell recommends that you run the RCU from a diskette because it is not compatible with all operating systems. Also, using a diskette to run the utility

allows you to copy any system configuration changes to the diskette for safekeeping. See Chapter 2, "Using the Dell Server Assistant CD," for instructions on creating an RCU diskette.

PCI expansion cards do not require a configuration file. The PCI configuration utility in read-only memory (ROM) automatically uses the information maintained by the RCU to assign resources for PCI expansion cards.

When to Run the RCU

After the RCU has configured all your Plug and Play and PCI expansion cards, you can use the utility to *lock* the configuration of your Plug and Play and PCI expansion cards so that they are always assigned the same resources. See "Locking and Unlocking Cards" found later in this chapter for details.

NOTE: If your system detects a card configuration problem during operation, you receive a warning message directing you to run the RCU to correct the problem.

Making Selections in the RCU

The RCU uses menus to guide you through the configuration process. The menus and their options are accessed through keyboard commands.

To make a menu selection, use the up- or down-arrow key to highlight the desired option, and then press <Enter>. In the Help menu or Advanced menu, you can also select an option by pressing the key that corresponds to the highlighted letter in the selection list.

To scroll up or down a screen, press the <Page Up> or <Page Down> key, respectively.

Using Online Instructions

The RCU has online instructions for each of its procedures. If you need help at any time, press <F1> to see a help screen that offers more details about the task you are doing.

Starting the RCU

If you are running the RCU from your hard-disk drive, remove any terminate-and-stay-resident (TSR) programs from memory before starting the utility. These programs take up space in system memory even when they are not running, thus reducing the amount of memory available to the RCU. See the documentation that accompanied these programs for instructions on removing them from memory.

If you start the utility and there is not enough memory to run it, a message is displayed. If you receive such a message, run the utility from a diskette.

Follow these steps the first time you use the RCU.

To run the program from a diskette, insert into drive A the RCU diskette that you created from the *Dell Server Assistant* CD. Then either turn on your computer or reboot it by pressing <Ctrl><Alt><Del>.

1. **To run the program from your hard-disk drive, switch to the c:\rcu sub-directory, type** sd **at the operating system prompt, and press <Enter>.**

   To run the program from the Dell Server Assistant CD, restart the system from the CD. Select Configure System and then select Run RCU from the CD's main menu.

2. **When the Welcome screen appears, read the information on the screen and press <Enter>.**

   The Main Menu appears as follows:

   ```
   Main Menu

   Learn about configuring your computer
   Configure computer
   Set date
   Set time
   Maintain resource configuration diskette
   Exit from this utility
   ```

   The first option in the menu is already highlighted.

3. **Press <Enter> to read the online overview of the RCU.**

   After reading the online overview, you are ready to use the program to configure your computer for any PCI expansion cards currently installed in your computer's expansion slots.

Main Menu

The following four sections describe each of the menu options in the Main Menu and the submenus for those options.

Learn About Configuring Your Computer

The Learn About Configuring Your Computer option presents an overview of the configuration process. As you finish reading a screen, press <Enter> to view the next screen. Press <F10> to return to the Main Menu.

Configure Computer

The Configure Computer option takes you through the configuration process step by step. Use this option the first time you configure your system and every time you change your hardware configuration through the RCU.

When you select Configure Computer, the following menu appears on the screen:

```
Steps in configuring your computer
Step 1: Important Resource Configuration Information
Step 2: Add or remove boards
Step 3: View or edit details
Step 4: Examine switches or print report
Step 5: Save and exit
```

Step 1: Important Resource Configuration Information

The Step 1: Important Resource Configuration Information option uses seven informa-
tion screens to explain the configuration process. After reading the first screen, press
<Enter> to see the next one. When you have finished reading all seven screens,
press <Esc> to return to the Steps in Configuring Your Computer menu.

To review the information screens at any time while you are in the RCU, press <F1>
and select Resource Configuration from the Help menu.

Step 2: Add or Remove Boards

This step is not used on PCI-only systems.

Step 3: View or Edit Details

The RCU lets you set a variety of system options through the **.sci** file. Through this
file, you can notify the system of changes to your hardware and memory configura-
tion, manage input/output (I/O) ports, and set other system operating parameters.

Some of the categories do not offer options, but reflect installed hardware detected
by the system. These items are displayed for your information only; you cannot
change them through the utility.

Display the list of system board options as follows:

1. **Start the RCU as described in "Starting the Resource Configuration
    Utility" found earlier in this chapter.**

2. **At the Main Menu, select Configure Computer.**

3. **At the Steps in Configuring Your Computer menu, select Step 3: View or
    Edit Details.**

    A list of system board options appears on the screen. Figure 5-1 shows settings
    typical for your system.

    *NOTE: Whenever you add an expansion card to the computer, its presence is
    reflected by changes to the System Board Options screen.*

To select a category on the list of system board options, press the up- or down-arrow
key to highlight the category and press <Enter>. A pop-up menu appears, listing the
options for that category. To select an option, press the up- or down-arrow key to high-
light the option and press <Enter>.

NOTES: Several system board categories allow you to edit such resources as memory address, I/O ports, interrupt requests (IRQ), and direct memory access (DMA) channels. It may be necessary to edit these resources to resolve a configuration conflict. To view the resource screen for any device, highlight the option and press <F6>.

The edit resources feature is intended for users who are technically knowledgeable. Do not change resource settings from their defaults if you do not understand how such a change will affect system performance.

While in the Step 3: View or Edit Details menu, you can press <F7> to enter the Advanced menu. See "Advanced Menu" found later in this chapter for more information.

When you have finished making changes, save the new system configuration information and exit the utility as follows:

1. **Press <F10>, and select Step 5: Save and Exit from the Steps in Configuring Your Computer menu.**

2. **Select Save the Configuration and Restart the Computer from the menu that appears.**

```
 System - Dell System PowerEdge 6300
  RS-232 COM Port 1                         IRQ 4 PORT 3F8h-3FFh
  RS-232 COM Port 2                         IRQ 3 PORT 2F8h-2FFh
  Parallel Port                             IRQ 7 PORT 378h-37Fh
  Floppy Controller                         Enabled
  Mouse Controller                          Enabled

  Embedded - Adaptec AIC-7890 SCSI Ctrlr
       PCI Function 1                       Enabled

  Embedded - Adaptec AIC-7890 SCSI Ctrlr
       PCI Function 1                       Enabled

  Embedded - Adaptec AIC-7860 SCSI Ctrlr
       PCI Function 1                       Enabled

  Embedded - PCI VGA Controller
       PCI Function 1                       Enabled

       Standard VGA Resources              Enabled
```

Figure 5-1. View or Edit Details Screen (Example)

Step 4: Examine Switches or Print Report

The Step 3: Examine Switches or Print Report option lists the required switch and jumper settings for each expansion card in your computer. To view the settings, highlight the card and press <Enter>. Press <F7> to make a copy of or print the settings. If your computer is attached to a printer, you can print out the information or copy it to a file.

Step 5: Save and Exit

The Step 4: Save and Exit option allows you to save or cancel the configuration changes you have made. When you select this option, follow the directions on the menu that appears.

If you save your changes, the utility saves the new configuration in your system's NVRAM and in a file on your RCU diskette. Then, the utility automatically reboots your system.

If you cancel your changes, you can remain in the utility to make other changes or exit the utility without saving any changes.

Maintain System Configuration Diskette

Using the Maintain System Configuration Diskette option, you can create a backup copy of the **.sci** file or use a previously saved **.sci** file to reconfigure your system or to identically configure many other systems. You can also delete **.sci** files from your RCU diskette or the configuration diskette(s) for any hardware option.

Exit From This Utility

The Exit From This Utility option allows you to exit from the RCU and reboot your computer system.

Advanced Menu

The Advanced menu lets you lock or unlock cards in a configuration, view detailed information about the system, and maintain **.sci** files.

To see the Advanced menu, press <F7> while in the Step 3: View or Edit Details menu. The following menu appears:

```
Advanced menu

Lock/unlock boards
View additional system information menu
Set verification mode menu
Maintain SCI files menu
```

Highlight the menu category you want, and press <Enter>. Then follow the online instructions.

The following subsections describe each category.

Lock/Unlock Boards

When you *lock* an expansion card, the RCU cannot change the resources allocated to that card. *Unlocking* the card allows the system to change the resources automatically as new cards are added. The default for the Lock/Unlock Boards category is Unlocked. Dell recommends that you keep your cards unlocked so that the RCU can do its job properly.

NOTE: If changes are made to the hardware or System Setup configuration, locks may not be maintained.

View Additional System Information Menu

The RCU contains detailed information about the system board and the used and available resources. The options for the View Additional System Information Menu category are:

- Board Specifications
- System Specifications
- Used Resources
- Available Resources

The Used Resources and Available Resources options contain detailed information about resources such as IRQs, DMA channels, and I/O ports, which may be useful if you need to resolve a resource conflict.

Set Verification Mode Menu

The settings for the Set Verification Mode Menu category are Automatic (the default) and Manual. When this category is set to Automatic, the RCU automatically checks for resource conflicts and tries to resolve them. Unless you are technically knowledge-able, leave this category set to Automatic.

Maintain SCI Files Menu

Each time you use the RCU to configure your system, the system configuration information is saved in a **.sci** file and in system memory. You should save the system configuration information to a backup file that can be used to restore the information if the **.sci** file is damaged or lost. The options for the Maintain SCI Files Menu category are Open (the default) and Save As.

The Open option creates a backup file that overwrites the existing configuration. The Save As option allows you to select the filename under which you want the **.sci** file saved.

Resolving Resource Conflicts

The RCU automatically resolves resource conflicts between two PCI expansion cards. It is extremely unusual for the RCU to fail in resolving a resource conflict between two PCI expansion cards. If the RCU fails to resolve the conflict, see Chapter 11, "Getting Help," in your *Installation and Troubleshooting Guide* for information on obtaining technical assistance. If the Set Verification Mode menu category is set to Automatic, the RCU tries to resolve the conflict. If the utility cannot resolve the conflict, some devices installed in the system are deactivated and the following message is displayed:

```
Caution

The last board added caused an un-resolvable conflict in your
computer's configuration. This board has a 'De-activated' sta-
tus. You must remove this board or the one(s) it is in conflict
with in order to save a correct configuration.
```

If the caution message appears, press <Enter> to display a list of all cards installed in your computer. The deactivated card is enclosed by < > symbols.

You can remove the card(s) with which it is in conflict, or change the resources on one or more cards.

If you remove the card(s) with which the new card is in conflict, or if you want to change the resources of one or more cards, use the procedure described in the next subsection.

NOTE: Locked cards may cause resource conflicts.

To unlock a card, use the following procedure:

1. **Press <F7> in the Step 3: View or Edit Details menu (from the Steps in Configuring Your Computer menu).**

2. **Select Lock/Unlock Boards and press <Enter>.**

3. **Select the card(s) you want to unlock, and press <Enter>.**

4. **Press <F10> to exit the Advanced menu.**

A P P E N D I X   A
Technical Specifications

Table A-1. Technical Specifications

Microprocessor	
Microprocessor types	one to four Intel® Pentium® II Xeon™ processors with an internal operating frequency of 400 MHz and an external operating frequency of 100 MHz
Internal cache	512-KB to 2-MB L2 cache
Math coprocessor	internal to microprocessor
Expansion Bus	
Bus type	3 peer PCI buses: 1 x 64-bit bus and 2 x 32-bit buses
Expansion slots	4 x 64-bit and 3 x 32-bitPCI hot-pluggable slots
Memory	
DIMM sockets	(16) 168-pin sockets
DIMM capacities	32-MB, 128-MB or 256-MB buffered EDO DIMMs; must be rated at 60 ns or faster
Standard RAM (minimum)	128 MB
Maximum RAM	4 GB
External cache	none

NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.

Table A-1. Technical Specifications (continued)

Drives	
Diskette drive	one 3.5-inch, 1.44-MB diskette drive included with standard system
Tape drive	12 GB and higher (optional)
SCSI hard-disk drives	formatted capacities ranging from 4 GB to 18 GB
SCSI devices	two built-in Ultra2/LVD SCSI host adapters supporting up to six SCSI hard-disk drives in internal bays and two non hot-pluggable SCSI hard-disk drives in the optional removable media bay; built-in Ultra/Narrow SCSI host adapter supporting up to three SCSI devices in externally accessible front bays
CD-ROM drive.	one SCSI CD-ROM drive included with standard system

Ports	
Externally accessible:	
Serial	two 9-pin connectors
Parallel (bidirectional)	one 25-pin connector
Video	one 15-pin connector
PS/2-style keyboard	6-pin mini-DIN
PS/2-compatible mouse.	6-pin mini-DIN
Server management bus daisy-chain connectors.	two modular 8-pin connectors
Internally accessible:	
Ultra2/LVD SCSI controllers	two 68-pin connectors
Ultra/Narrow SCSI controller	50-pin connector
Diskette drive.	34-pin connector

Video	
Video type.	ATI Rage Pro video controller; VGA connector
Video memory (standard)	2 MB

NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.

Table A-1. Technical Specifications (continued)

Power	
AC power supply:	
Wattage	320 W per supply
Voltage	115 V at 60 Hz/230 V at 50 Hz
System battery	CR2032 3.0-V lithium coin cell

Physical	
Height (with support feet)	44.5 cm (17.5 inches)
Width.	30.5 cm (12.0 inches)
Depth.	71.1 cm (28.0 inches)
Weight (maximum configuration)	50 kg (110 lb)

Environmental	
Temperature:	
Operating	10° to 35°C (50° to 95°F)
Storage.	-40° to 65°C (-40° to 149°F)
Relative humidity	8% to 80% (noncondensing)
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz for 15 min
Storage.	-0.5 G at 3 to 200 Hz for 15 min
Maximum shock:	
Operating	6 shock pulses in the positive and negative x, y, and z axes at 50 G for 2 ms
Storage.	6 shock pulses in the positive and negative x, y, and z axes at 92 G for 2 ms
Altitude:	
Operating	–16 to 3048 m* (–50 to 10,000 ft)
Storage.	–16 to 10,600 m (–50 to 35,000 ft)

NOTE: For the full name of an abbreviation or acronym used in this table, see the Glossary.

A P P E N D I X   B
I/O Ports and Connectors

This appendix provides specific information about the input/output (I/O) ports and connectors on the back panel of the computer system.

I/O Ports and Connectors

The I/O ports and connectors on the back panel of the system are the gateways through which the computer system communicates with external devices, such as a keyboard, mouse, printer, and monitor. Figure B-1 identifies the I/O ports and connectors for your system.

Serial and Parallel Ports

The two built-in serial ports use 9-pin D-subminiature connectors on the back panel. These ports support devices such as external modems, printers, plotters, and mice that require serial data transmission (the transmission of data one bit at a time over one line).

Most software uses the term *COM* (for communications) plus a number to designate a serial port (for example, COM1 or COM2). The default designations of your system's built-in serial ports are COM1 and COM2. COM1 is the bottom connector; COM2 is on the top.

The built-in parallel port uses a 25-pin D-subminiature connector on the system's back panel. This I/O port sends data in parallel format (where eight data bits, or one byte, are sent simultaneously over eight separate lines in a single cable). The parallel port is used primarily for printers.

Most software uses the term *LPT* (for line printer) plus a number to designate a parallel port (for example, LPT1). The default designation of the system's built-in parallel port is LPT1.

Port designations are used, for example, in software installation procedures that include a step in which you identify the port to which a printer is attached, thus telling the software where to send its output. (An incorrect designation prevents the printer from printing or causes scrambled print.)
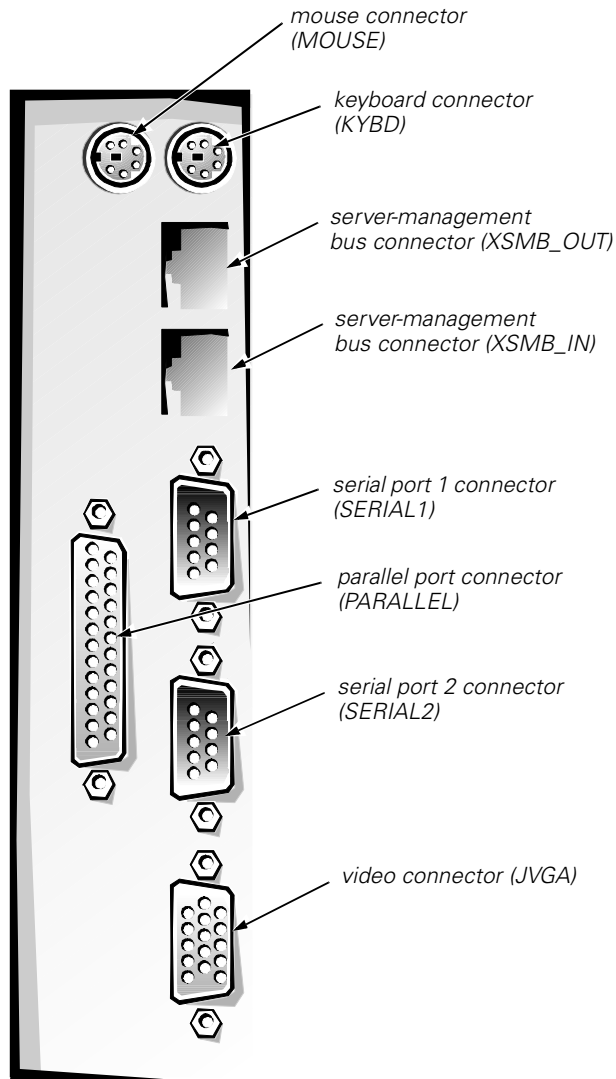
Figure B-1. I/O Ports and Connectors

Adding an Expansion Card Containing Serial or Parallel Ports

The system has an autoconfiguration capability for the serial ports. This feature lets you add an expansion card containing a serial port that has the same designation as one of the built-in ports, without having to reconfigure the card. When the system detects the duplicate serial port on the expansion card, it *remaps* (reassigns) the built-in port to the next available port designation.

Both the new and the remapped COM ports share the same interrupt request (IRQ) setting, as follows:

COM1, COM3: IRQ4 (shared setting)
COM2, COM4: IRQ3 (shared setting)

These COM ports have the following I/O address settings:

COM1: 3F8h
COM2: 2F8h
COM3: 3E8h
COM4: 2E8h

For example, if you add an internal modem card with a port configured as COM1, the system then sees logical COM1 as the address on the modem card. It automatically remaps the built-in serial port that was designated as COM1 to COM3, which shares the COM1 IRQ setting. (Note that when you have two COM ports sharing an IRQ set-ting, you can use either port as necessary *but you may not be able to use them both at the same time*.) If you install one or more expansion cards with serial ports designated as COM1 and COM3, the corresponding built-in serial port is disabled.

Before adding a card that remaps the COM ports, check the documentation that accompanied your software to make sure that the software can be mapped to the new COM port designation.

To avoid autoconfiguration, you may be able to reset jumpers on the expansion card so that the card's port designation changes to the next available COM number, leaving the designation for the built-in port as is. Alternatively, you can disable the built-in ports through the System Setup program. The documentation for your expansion card should provide the card's default I/O address and allowable IRQ settings. It should also provide instructions for readdressing the port and changing the IRQ setting, if necessary.

The built-in parallel port has autoconfiguration capability through the System Setup program; that is, if you set the parallel port to its automatic configuration and add an expansion card containing a port configured as LPT1 (IRQ7, I/O address 378h), the system automatically remaps the built-in parallel port to its secondary address (IRQ5, I/O address 278h). If the secondary port address is already being used, the built-in parallel port is turned off.

For general information on how your operating system handles serial and parallel ports, and for more detailed command procedures, see your operating system documentation.

Serial Port Connectors

If you reconfigure your hardware, you may need pin number and signal information for the serial port connectors. Figure B-2 illustrates the pin numbers for the serial port connectors, and Table B-1 lists and defines the pin assignments and interface signals for the serial port connectors.

shell
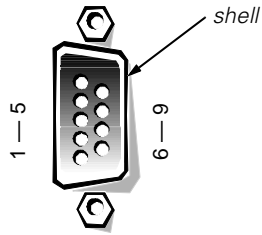
Figure B-2. Pin Numbers for the Serial Port Connectors

Table B-1. Pin Assignments for the Serial Port Connectors

Pin	Signal	I/O	Definition
1	DCD	I	Data carrier detect
2	SIN	I	Serial input
3	SOUT	O	Serial output
4	DTR	O	Data terminal ready
5	GND	N/A	Signal ground
6	DSR	I	Data set ready
7	RTS	O	Request to send
8	CTS	I	Clear to send
9	RI	I	Ring indicator
Shell	N/A	N/A	Chassis ground

Parallel Port Connector

If you reconfigure your hardware, you may need pin number and signal information for the parallel port connector. Figure B-3 illustrates the pin numbers for the parallel port connector, and Table B-2 lists and defines the pin assignments and interface signals for the parallel port connector.
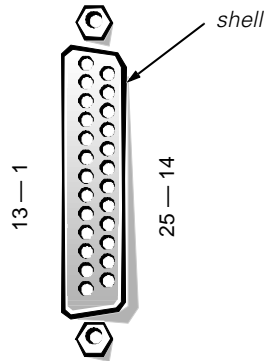
Figure B-3. Pin Numbers for the Parallel Port Connector

Table B-2. Pin Assignments for the Parallel Port Connector

Pin	Signal	I/O	Definition
1	STB#	I/O	Strobe
2	PD0	I/O	Printer data bit 0
3	PD1	I/O	Printer data bit 1
4	PD2	I/O	Printer data bit 2
5	PD3	I/O	Printer data bit 3
6	PD4	I/O	Printer data bit 4
7	PD5	I/O	Printer data bit 5
8	PD6	I/O	Printer data bit 6
9	PD7	I/O	Printer data bit 7
10	ACK#	I	Acknowledge
11	BUSY	I	Busy
12	PE	I	Paper end
13	SLCT	I	Select
14	AFD#	O	Automatic feed
15	ERR#	I	Error
16	INIT#	O	Initialize printer
17	SLIN#	O	Select in
18-25	GND	N/A	Signal ground

Keyboard and Mouse Connectors

The system uses a Personal System/2 (PS/2)-style keyboard and supports a PS/2-compatible mouse. Cables from both devices attach to 6-pin, miniature *Deutsche Industrie Norm* (DIN) connectors on the back panel of your system. The keyboard connector is on the left; the mouse connector is on the right.

A PS/2-compatible mouse works identically to an industry-standard serial mouse or bus mouse except that it has its own dedicated connector, which frees up both serial ports and does not require an expansion card. Circuitry inside the mouse detects the movement of a small ball and relays the direction to the system.

Mouse driver software can give the mouse priority with the microprocessor by issuing IRQ12 whenever new mouse movement is detected. The driver software also passes along the mouse data to the application that is in control.

Keyboard Connector

If you reconfigure your hardware, you may need pin number and signal information for the keyboard connector. Figure B-4 illustrates the pin numbers for the keyboard connector, and Table B-3 lists and defines the pin assignments and interface signals for the keyboard connector.
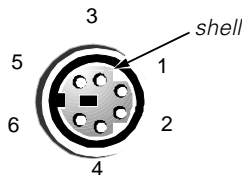
Figure B-4. Pin Numbers for the Keyboard Connector

Table B-3. Pin Assignments for the Keyboard Connector

Pin	Signal	I/O	Definition
1	KBDATA	I/O	Keyboard data
2	NC	N/A	No connection
3	GND	N/A	Signal ground
4	FVcc	N/A	Fused supply voltage
5	KBCLK	I/O	Keyboard clock
6	NC	N/A	No connection
Shell	N/A	N/A	Chassis ground

Mouse Connector

If you reconfigure your hardware, you may need pin number and signal information for the mouse connector. Figure B-5 illustrates the pin numbers for the mouse connector, and Table B-4 lists and defines the pin assignments and interface signals for the mouse connector.
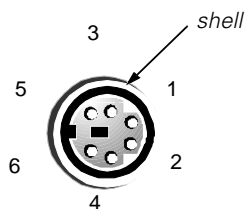
Figure B-5. Pin Numbers for the Mouse Connector

Table B-4. Pin Assignments for the Mouse Connector

Pin	Signal	I/O	Definition
1	MFDATA	I/O	Mouse data
2	NC	N/A	No connection
3	GND	N/A	Signal ground
4	FVcc	N/A	Fused supply voltage
5	MFCLK	I/O	Mouse clock
6	NC	N/A	No connection
Shell	N/A	N/A	Chassis ground

Video Connector

The system uses a 15-pin high-density D-subminiature connector on the back panel for attaching a video graphics array (VGA)-compatible monitor to your system. The video circuitry on the system board synchronizes the signals that drive the red, green, and blue electron guns in the monitor.

NOTE: Installing a video card automatically disables the system's built-in video subsystem.

If you reconfigure your hardware, you may need pin number and signal information for the video connector. Figure B-6 illustrates the pin numbers for the video connector, and Table B-5 lists and defines the pin assignments and interface signals for the video connector.
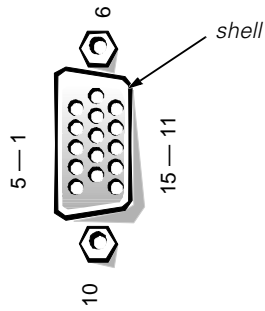
Figure B-6. Pin Numbers for the Video Connector

Table B-5. Pin Assignments for the Video Connector

Pin	Signal	I/O	Definition
1	RED	O	Red video
2	GREEN	O	Green video
3	BLUE	O	Blue video
4	NC	N/A	No connection
5–8, 10	GND	N/A	Signal ground
9	VCC	N/A	Vcc
11	NC	N/A	No connection
12	DDC data out	O	Monitor detect data
13	HSYNC	O	Horizontal synchronization
14	VSYNC	O	Vertical synchronization
15	DDC clock out	O	Monitor detect clock
Shell	N/A	N/A	Chassis ground

A P P E N D I X   C
Maintaining the System

Proper use of preventive maintenance procedures can keep the system in top operating condition and minimize the need for costly, time-consuming service procedures. This appendix contains maintenance procedures that you should perform regularly.

Data Preservation

Everyone inadvertently deletes files at one time or another. Also, hard-disk drives can fail after extended use, so it is not a question of *whether* you will eventually lose data, but *when*. To avoid such loss of data, you should regularly make backup copies of all hard-disk drive files. Frequent, regular backups are a must for anyone using a hard-disk drive.

Scheduling Backups

The frequency with which backups should be made depends on the amount of storage space on a hard-disk drive and the volatility of the data contained on the drive. Heavily used systems require more frequent backups than systems in which files are seldom changed.

Dell recommends that you back up the hard-disk drive at least once a week, with a daily backup of those files known to have been changed. Following these guidelines ensures the loss of no more than a day's work in the event of a hard-disk drive failure or if you inadvertently delete one or more important files.

As further insurance against data losses, you should keep duplicate copies of the weekly and monthly backups at an off-site location. Doing this ensures that you lose no more than a week's work, even if one of the on-site backups becomes corrupted.

Backup Devices

Tape drives are fast, convenient, and reliable devices that can back up data at rates of up to 1.5 megabytes per second (MB/sec) (sustained, without data compression) and can often run unattended. Dell offers tape drives with storage capacities in the range of 20 to 70 gigabytes (GB) (when available) per tape cartridge and recommends these drives and their associated backup software for use as system backup devices.

As a last resort, you can back up a hard-disk drive's contents on diskettes, a method that is both time-consuming and prone to human error. Also, backing up a full 4-GB hard-disk drive requires approximately 277 diskettes (when using 1.44-MB diskettes), 334 diskettes (when using 1.2-MB diskettes), or 139 diskettes (when using 2.88-MB diskettes). Therefore, if it is absolutely necessary to use diskettes as backup devices, any unwanted hard-disk drive files should be deleted before a backup procedure is started.

Recovering Data

Some hard-disk drive failures are recoverable. In these cases you may be able to recover all lost data if the proper utility software is available. Even losses such as accidentally deleted files or accidental reformatting of a hard-disk drive can be reversed with these utilities.

If the system is running MS-DOS, many apparent data loss problems are due to corruption or erasure of the hard-disk drive's master boot record (MBR), MS-DOS boot sector, or file allocation table (FAT). That is, accidental deletion of files or accidental reformatting of the hard-disk drive alters the MS-DOS boot sector, the FAT, and the root directory.

However, such accidents do not actually erase the contents of the hard-disk drive files until new data is written to the sectors containing these files. With software such as the Norton Utilities, Mace Utilities, or PC-Tools Deluxe, the data stored in these areas can often be restored, meaning that you can recover most, if not all, of the data.

Unlike using the **format** command on a hard-disk drive, using **format** on a diskette completely erases all the data on the diskette unless you use the diskette **format** program included in the Mace Utilities.

For a complete description of data recovery procedures and the software needed to perform them, see *The Paul Mace Guide to Data Recovery*, published by Brady.

Cleaning System Components

An exhaust fan in the power supply cools the power supply and system by drawing air in through various openings in the system and blowing it out the back. However, the fan also draws dust and other particles into the system, causing contaminant buildup, which results in an increase in the system's internal temperature and interferes with the operation of various system components.

To avoid these conditions, Dell recommends keeping your work environment clean to reduce the amount of dust and dirt around the system, thereby reducing the amount of contaminants drawn into the system by the power supply fan. In particular, you should keep the exterior of your system and monitor clean, and you should use a commercially available diskette-drive head-cleaning kit to remove contaminants inside your diskette drives.

Recommended Tools and Accessories

Dell recommends that you use the following tools and accessories when you clean the system:

- *A wrist grounding strap* — The proper use of a wrist grounding strap reduces the effect of electrostatic discharge (ESD), which can damage certain system components. To use a wrist grounding strap, place the strap around your wrist and attach the other end of the strap to an unpainted metal surface in the chassis, such as the power supply bracket, that is connected to chassis ground.

- *A liquid dishwashing detergent* — Use a mixture of one part liquid dishwashing detergent and three parts water to clean the exterior of the system, monitor, and keyboard. You can also add fabric softener to produce an antistatic solution that prevents dust from being attracted to the monitor screen.

- *A soft, lint-free cleaning cloth* — Moisten the cleaning cloth with the dishwashing detergent solution to clean the exterior of the system.

- *A nonabrasive diskette-drive head-cleaning kit* — Dell recommends that you use a kit that contains pretreated diskettes in individually sealed packages. These kits ensure that the cleaning solution is applied evenly over the entire diskette-drive head surface, and they prevent contamination of the heads by exposure to foreign substances.

- *A small vacuum cleaner with a brush attachment* — Use the vacuum cleaner to remove dust and dirt from the exterior of the system and keyboard.

Cleaning the System, Monitor, and Keyboard Exteriors

A conventional monitor or keyboard cover minimizes the accumulation of dust and other debris inside the monitor and keyboard when they are not in use. Also, commercially available keyboard membrane covers make it possible to use the keyboard while providing protection against foreign particles.

However, regardless of any protective covers, the monitor and keyboard must be cleaned occasionally. To clean the exterior of the system, monitor, and keyboard, follow these steps:

1. **Turn off the system, monitor, and any other attached peripherals, and disconnect them from their power sources.**

2. **Use a vacuum cleaner to remove any dust from the slots and holes on the system and between the keys on the keyboard.**

3. **Moisten a soft cleaning cloth with a solution of three parts water and one part liquid dishwashing detergent.**

   Do not soak the cloth in the solution; you must not let the solution drip inside the system or keyboard.

4. **Use the moistened cloth to wipe the system cover, the keyboard, and the exterior of the monitor, including the screen.**

Cleaning Drives

You can clean the heads of your diskette drives by using a commercially available diskette-drive head-cleaning kit. These kits include diskettes pretreated with a chemical solution to nonabrasively remove contaminants that accumulate on the drive heads during normal operation.

If the kit does not contain instructions, insert one of the pretreated diskettes into a diskette drive and turn on the system. After 20 or 30 seconds, remove the diskette from the drive. Repeat this procedure for each diskette drive in the system.

CAUTION: Do not attempt to clean drive heads with a swab. You may accidentally misalign the heads, rendering the drive inoperable.

Environmental Factors

This section discusses various environmental factors that can adversely affect system performance and longevity.

Temperature

Temperature extremes can cause a variety of problems, including premature aging and failure of chips or mechanical failure of devices. Extreme temperature fluctuations can cause chips to become loose in their sockets and can cause expansion and contraction of disk drive platters, resulting in read or write data errors. When you perform a low-level format operation on a hard-disk drive, it is important to ensure that the drive's surrounding temperature is at or near the temperature at which the drive will be operated. Failure to do so can result in relocation of the tracks on the disk platters.

To minimize the negative effects of temperature on system performance, follow these guidelines:

- Ensure that the system is operated in an environment no colder than 10° Celsius (C) (50° Fahrenheit [F]) or hotter than 35°C (95°F).

- Ensure that the system has adequate ventilation. Do not place it within a closed-in wall unit or on top of cloth material, which can act as insulation. Do not place it where it will receive direct sunlight, particularly in the afternoon. Do not place it next to a heat source of any kind, including heating vents during winter.

  Adequate ventilation is particularly important at high altitudes. System performance may not be optimum when the system is operating at high temperatures as well as high altitudes.

- Make sure that all slots and openings on the system remain unobstructed, especially the fan vent on the back of the system.

- Clean the system at regular intervals to avoid any buildup of dust and debris, which can cause a system to overheat.

- If the system has been exposed to abnormally cold temperatures, allow a two-hour warm-up period to bring it up to normal operating temperature before turning it on. Failure to do so may cause damage to internal components, particularly the hard-disk drive.

- If intermittent system failures are noticed, try reseating any socketed chips, which might have become loose due to temperature fluctuations.

Humidity

High-humidity conditions can cause moisture migration and penetration into the system. This moisture can cause corrosion of internal components and degradation of properties such as electrical resistance, thermal conductivity, physical strength, and size. Extreme moisture buildup inside the system can result in electrical shorts, which can cause serious damage to the system.

Each Dell system is rated to operate at 8 to 80 percent relative humidity, with a humidity gradation of 10 percent per hour. In storage, a Dell system can withstand from 5 to 95 percent relative humidity.

Buildings in which climate is controlled by air-conditioning in the warmer months and by heat during the colder months usually maintain an acceptable level of humidity for system equipment. However, if a system is located in an unusually humid location, a dehumidifier can be used to maintain the humidity within an acceptable range.

Altitude

Operating a system at high altitude (low pressure) reduces the efficiency of forced and convection cooling and can result in electrical problems related to arcing and corona effects. This condition can also cause sealed components with internal pressure, such as electrolytic capacitors, to fail or perform at reduced efficiency.

Each Dell system is rated to operate at altitudes from –16 to 3048 meters (m) (–50 to 10,000 feet [ft]) and can be stored at altitudes of –16 to 10,600 m (–50 to 35,000 ft).

Dust and Particles

A clean operating environment can greatly reduce the negative effects of dust and other particles, which act as insulators and interfere with the operation of a system's mechanical components. Also, in addition to regular cleaning, you should follow these guidelines to deter contamination of the system equipment:

- Do not permit smoking anywhere near the system.

- Do not permit food or drink near the system.

- Use dust covers when the system is not in use.

- Keep all diskettes in a closed diskette box when not in use.

- Close windows and outside doors to keep out airborne particles.

Corrosion

The oil from a person's fingers or prolonged exposure to high temperature or humidity can corrode the gold-plated edge connectors and pin connectors on various devices in the system. This corrosion on system connectors is a gradual process that can eventually lead to intermittent failures of electrical circuits.

To prevent corrosion, you should avoid touching contacts on boards and cards. Protecting the system from corrosive elements is especially important in moist and salty environments, which tend to promote corrosion. Also, as a further deterrent to corrosion, the system should not be used in extreme temperatures, as explained in "Temperature" found earlier in this appendix.

ESD

ESD results from the buildup of static electricity on the human body and certain other objects. This static electricity is often produced by simple movements such as walking across a carpet. ESD is a discharge of a static electrical charge, that occurs when a person whose body contains such a charge touches a component in the system. This static discharge can cause components, especially chips, to fail. ESD is a problem particularly in dry environments where the relative humidity is below 50 percent. To reduce the effects of ESD, you should observe the following guidelines:

- When working inside the system, wear a wrist grounding strap. If a wrist grounding strap is unavailable, touch an unpainted metal surface on the chassis periodically to neutralize any static charge.

- If at all possible, stand on a concrete floor while working inside the system.

- Use an antistatic floor mat when working inside the system.

- If it is necessary to work in a carpeted area, spray the carpet with an antistatic spray and allow it to dry before beginning to work inside the system.

- Keep components in their antistatic packaging until they are installed.

- Avoid wearing clothing made of wool or synthetic materials.

Electromagnetic and Radio Frequency Interference

Electromagnetic interference (EMI) and radio frequency interference (RFI) from a system can adversely affect devices such as radio and television (TV) receivers operating near the system. Radio frequencies emanating from a system can also interfere with cordless and low-power telephones. Conversely, RFI from high-power telephones can cause spurious characters to appear on the system's monitor screen.

RFI is defined as any EMI with a frequency above 10 kilohertz (kHz). This type of interference can travel from the system to other devices through the alternating current (AC) power cable and power source or through the air like transmitted radio waves. The Federal Communications Commission (FCC) publishes specific regulations to limit the amount of EMI and RFI emitted by computing equipment. Each Dell system meets these FCC regulations.

To reduce the possibility of EMI and RFI, follow these guidelines:

- Operate the system only with the system cover installed.

- Ensure that all expansion slots are covered either by a card-mounting bracket or by a metal filler bracket and that all drive bays have a drive and/or a metal insert installed. These brackets and metal inserts are available from Dell.

- Ensure that the screws on all peripheral cable connectors are securely fastened to their corresponding connectors on the back of the system.

- Always use shielded cables with metal connector shells for attaching peripherals to the system.

To prevent the possibility of RFI from a system affecting TV reception, follow these guidelines:

- Keep any TV set at least 6 ft away from the system.

- Use cable TV when possible.

- Use a directional outdoor TV antenna.

- Attach line filters to the TV set.

- Use 75-ohm coaxial cable for the TV set rather than twin-lead antenna wire.

- If interference occurs, rotate the system or the TV set 90 degrees.

Magnetism

Because they store data magnetically, diskettes and hard-disk drives are extremely susceptible to the effects of magnetism. Diskettes should never be stored near magnetic sources such as the following:

- Monitors

- TV sets

- Printers

- Telephones with real bells

- Fluorescent lights

Shock and Vibration

Excessive shock can damage the function, external appearance, and physical structure of a system. Each Dell system has been designed to operate properly even after withstanding a minimum of six consecutively executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system). Each shock pulse can measure up to 50 gravities (G) for up to 2 milliseconds (ms). In storage, the system can withstand shock pulses of 92 G for 2 ms.

Excessive vibration can cause the same problems as mentioned earlier for shock, as well as cause components to become loose in their sockets or connectors. Systems can be subject to significant vibration when being transported by vehicle or when operated in an environment with machinery that causes vibration.

Each Dell system, when operating, is designed to withstand 0.25 G (half-sine wave) at a sweep of 3 to 200 hertz (Hz) for 15 minutes. In storage, the system can withstand 0.5 G at 3 to 200 Hz for 15 minutes.

Power Source Interruptions

Systems are especially sensitive to variations in voltage supplied by the AC power source. Over-voltage, undervoltage, and transients (or *spikes*) can erase data from memory or even cause components to fail. To protect against these types of problems, power cables should always be properly grounded and one or both of the following methods should be used:

- Use one of the power protection devices described in the following section, "Power Protection Devices."

- Place the system on a dedicated power circuit (rather than sharing a circuit with other heavy electrical equipment). In general, do not allow the system to share a circuit with any of the following:

    — Copier machines

    — Air conditioners

    — Vacuum cleaners

    — Space heaters

    — Power tools

    — Teletype machines

    — Adding machines

    — Laser printers

    — Facsimile machines

    — Any other motorized equipment

Besides these appliances, the greatest threat to a system's supply of power are surges or blackouts caused by electrical storms. Whenever possible, turn off the system and any peripherals and unplug them from their power sources during thunderstorms.

If a blackout occurs—even a temporary one—while the system is turned on, turn off the system immediately and disconnect it from its power source. Leaving the system on may cause problems when the power is restored; all other appliances left on in the area can create large voltage spikes that can damage the system.

Power Protection Devices

A number of devices are available that protect against power problems, such as power surges, transients, and power failures. The following subsections describe some of these devices.

Surge Protectors

Surge protectors are available in a variety of types and usually provide a level of protection commensurate with the cost of the device. Surge protectors prevent voltage spikes, such as those caused during an electrical storm, from entering a system through the AC power source. Surge protectors, however, do not offer protection against brownouts, which occur when the voltage drops more than 20 percent below the normal AC line voltage level.

Line Conditioners

Line conditioners go beyond the overvoltage protection of surge protectors. Line conditioners keep a system's AC power source voltage at a fairly constant level and, therefore, can handle brownouts. Because of this added protection, line conditioners cost more than surge protectors—up to several hundred dollars. However, these devices cannot protect against a complete loss of power.

Uninterruptible Power Supplies

Uninterruptible power supply (UPS) systems offer the most complete protection against variations in power because they use battery power to keep the system running when AC power is lost. The battery is charged by the AC power while it is available, so once AC power is lost, the battery can provide power to the system for a limited amount of time—from 15 minutes to an hour or so—depending on the UPS system.

UPS systems range in price from a few hundred dollars to several thousand dollars, with the more expensive units allowing you to run larger systems for a longer period of time when AC power is lost. UPS systems that provide only 5 minutes of battery power let you conduct an orderly shutdown of the system, but are not intended to provide continued operation. Surge protectors should be used with all UPS systems, and the UPS system should be Underwriters Laboratories (UL) safety-approved.

A P P E N D I X   D
Regulatory Notices

FCC Notices (U.S. Only)

Most Dell computer systems are classified by the Federal Communications Commission (FCC) as Class B digital devices. However, the inclusion of certain options changes the rating of some configurations to Class A. To determine which classification applies to your computer system, examine all FCC registration labels located on the back panel of your computer, on card-mounting brackets, and on the cards themselves. If any one of the labels carries a Class A rating, your entire system is considered to be a Class A digital device. If *all* labels carry either the Class B rating or the FCC logo (**FC**), your system is considered to be a Class B digital device.

NOTE: Some Dell computer systems that are classified as Class B digital devices may include a built-in network interface controller (NIC). If your system contains a NIC, it is considered to be a Class A digital device only at the time that the NIC is being used. When the NIC is not being used, your system is considered to be a Class B digital device.

Once you have determined your system's FCC classification, read the appropriate FCC notice. Note that FCC regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

A Notice About Shielded Cables: Use only shielded cables for connecting peripherals to any Dell device to reduce the possibility of interference with radio and television reception. Using shielded cables ensures that you maintain the appropriate FCC radio frequency emissions compliance (for a Class A device) or FCC certification (for a Class B device) of this product. For parallel printers, a cable is available from Dell Computer Corporation.

Class A

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause harmful interference with radio communications. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection

against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

Class B

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

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits.

If necessary, consult a representative of Dell Computer Corporation or an experienced radio/television technician for additional suggestions. You may find the following booklet helpful: *FCC Interference Handbook, 1986*, available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00450-7.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

The following information is provided on the device or devices covered in this document in compliance with FCC regulations:

- Product name: *Dell PowerEdge 6300*
- Model number: *SML*
- Company name: Dell Computer Corporation
  Regulatory Department
  One Dell Way
  Round Rock, Texas 78682 USA
  512-338-4400

IC Notice (Canada Only)

Most Dell computer systems (and other Dell digital apparatus) are classified by the Industry Canada (IC) Interference-Causing Equipment Standard #3 (ICES-003) as Class B digital devices. To determine which classification (Class A or B) applies to your computer system (or other Dell digital apparatus), examine all registration labels located on the bottom or the back panel of your computer (or other digital apparatus). A statement in the form of "IC Class A ICES-3" or "IC Class B ICES-3" will be located on one of these labels.

Note that Industry Canada regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

> This Class B (or Class A, if so indicated on the registration label) digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.
>
> Cet appareil numérique de la Classe B (ou Classe A, si ainsi indiqué sur l'étiquette d'enregistration) respecte toutes les exigences du Reglement sur le Materiel Brouilleur du Canada.

EN 55022 Compliance (Czech Republic Only)

> This device belongs to category B devices as described in EN 55022, unless it is specifically stated that it is a category A device on the specification label. The following applies to devices in category A of EN 55022 (radius of protection up to 30 meters). The user of the device is obliged to take all steps necessary to remove sources of interference to telecommunication or other devices.
>
> Pokud není na typovém štitku počítače uvedeno, že spadá do třídy A podle EN 55022, spadá automaticky do třídy B podle EN 55022. Pro zařízení zařazená do třídy A (ochranné pásmo 30m) podle EN 55022 platí následující. Dojde−li k rušení telekomunikačních nebo jinych zařízení, je uživatel povinen provést taková opatření, aby rušení odstranil.

CE Notice

Marking by the symbol **CE** indicates compliance of this Dell system to the EMC (Electromagnetic Compatibility) directive and the LV (Low Voltage) directive of the European Community. Such marking is indicative that this Dell system meets or exceeds the following technical standards:

- EN 55022 — "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment."

    NOTE: EN 55022 emissions requirements provide for two classifications—Class A and Class B. If any one of the registration labels (located on the bottom or back panel of your computer, on card-mounting brackets, or on the cards themselves) carries an FCC Class A rating, the following warning applies to your system.

    WARNING: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

- EN 50082-1 — "Electromagnetic compatibility—Generic immunity standard Part 1: Residential, commercial, and light industry."

- IEC 801-2 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements." — Severity level 3.

- IEC 801-3 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiated electromagnetic field requirements." — Severity level 2.

- IEC 801-4 — "Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/burst requirements." — Severity level 2.

- EN60950:1992 + Amd.1:1993 + Amd.2:1993 — "Safety of Information Technology Equipment including Electrical Business Equipment."

A "Declaration of Conformity" in accordance with the preceding standards has been made and is on file at Dell Products Europe BV, Limerick, Ireland.

VCCI Notices (Japan Only)

Most Dell computer systems are classified by the Voluntary Control Council for Interference (VCCI) as Class B information technology equipment (ITE). However, the inclusion of certain options changes the rating of some configurations to Class A. To determine which classification applies to your computer system, examine the FCC classification on the registration labels located on the back panel of your computer, on card-mounting brackets, and on the cards themselves. If any one of the labels carries an FCC Class A designation, your entire system is considered to be VCCI Class A ITE. If *all* labels carry either an FCC Class B identification number or the FCC logo (**FC**), your system is considered to be VCCI Class B ITE.

Once you have determined your system's VCCI classification, read the appropriate VCCI notice. Note that VCCI regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

Class A ITE

This is a Class A product based on the standard of the Voluntary Control Council for Interference for information technology equipment. If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

Class B ITE

This is a Class B product based on the standard of the Voluntary Control Council for Interference for information technology equipment. If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

Korean Regulatory Notice

To determine which classification (Class A or B) applies to your computer system (or other Dell digital apparatus), examine all registration labels located on the bottom or back panel of your computer (or other Dell digital apparatus), on card-mounting brackets, and on the cards themselves. If any one of the labels carries a Class A rating, your entire system is considered to be a Class A digital device. If *all* labels carry either the Class B rating or the FCC logo (**FC**), your system is considered to be a Class B digital device.

NOTE: Class A devices are for business purposes. Class B devices are for non-business purposes.

Class A Device

Please note that this device has been approved for business purposes with regard to electromagnetic interference. If you find that this device is not suitable for your use, you may exchange it for a device that has been approved for use in residential as well as business environments.

Class B Device

Please note that this device has been approved for nonbusiness purposes and may be used in any environment, including residential areas.

Polish Center for Testing and Certification Notice

The equipment should draw power from a socket with an attached protection circuit (a three-prong socket). All equipment that works together (computer, monitor, printer, and so on) should have the same power supply source.

The phasing conductor of the room's electrical installation should have a reserve short-circuit protection device in the form of a fuse with a nominal value no larger than 10 amperes (A).

To completely switch off the equipment, the power supply cable must be removed from the power supply socket, which should be located near the equipment and easily accessible.

A protection mark "B" confirms that the equipment is in compliance with the protection usage requirements of standards PN-93/T-42107 and PN-89/E-06251.

Wymagania Polskiego Centrum Badań i Certyfikacji

Urządzenie powinno być zasilane z gniazda z przyłączonym obwodem ochronnym (gniazdo z kołkiem). Współpracujące ze sobą urządzenia (komputer, monitor, drukarka) powinny być zasilane z tego samego źródła.

Instalacja elektryczna pomieszczenia powinna zawierać w przewodzie fazowym rezerwową ochronę przed zwarciami, w postaci bezpiecznika o wartości znamionowej nie większej niż 10A (amperów).

W celu całkowitego wyłączenia urządzenia z sieci zasilania, należy wyjąć wtyczkę kabla zasilającego z gniazdka, które powinno znajdować się w pobliżu urządzenia i być łatwo dostępne.

Znak bezpieczeństwa "B" potwierdza zgodność urządzenia z wymaganiami bezpieczeństwa użytkowania zawartymi w PN-93/T-42107 i PN-89/E-06251.

Pozostałe instrukcje bezpieczeństwa

- Nie należy używać wtyczek adapterowych lub usuwać kołka obwodu ochronnego z wtyczki. Jeżeli konieczne jest użycie przedłużacza to należy użyć przedłużacza 3-żyłowego z prawidłowo połączonym przewodem ochronnym.

- System komputerowy należy zabezpieczyć przed nagłymi, chwilowymi wzrostami lub spadkami napięcia, używając eliminatora przepięć, urządzenia dopasowującego lub bezzakłóceniowego źródła zasilania.

- Należy upewnić się, aby nic nie leżało na kablach systemu komput-erowego, oraz aby kable nie były umieszczone w miejscu, gdzie można byłoby na nie nadeptywać lub potykać się o nie.

- Nie należy rozlewać napojów ani innych płynów na system komputerowy.

- Nie należy wpychać żadnych przedmiotów do otworów systemu komputerowego, gdyż może to spowodować pożar lub porażenie prądem, poprzez zwarcie elementów wewnętrznych.

- System komputerowy powinien znajdować się z dala od grzejników i źródeł ciepła. Ponadto, nie należy blokować otworów wentylacyjnych. Należy unikać kładzenia luźnych papierów pod komputer oraz umieszczania komputera w cias nym miejscu bez możliwości cyrkulacji powietrza wokół niego.

NOM 024 Information (Mexico Only)

The following information is provided on the device(s) described in this document in compliance with the requirements of the official Mexican standards (NOM 024):

Exporter:	Dell Computer Corporation One Dell Way Round Rock, TX 78682
Importer:	Dell Computer de México, S.A. de C.V. Rio Lerma No. 302 - 4° Piso Col. Cuauhtemoc 16500 México, D.F.
Ship to:	Dell Computer de México, S.A. de C.V. al Cuidado de Kuehne & Nagel de México S. de R.I. Avenida Soles No. 55 Col. Peñon de los Baños 15520 México, D.F.
Supply voltage:	115/230 V.C.A. ±10%
Frequency:	60/50 Hz
Current consumption:	6.0/3.0 A

Información para NOM 024 (únicamente para México)

La información siguiente se proporciona en el dispositivo o en los dispositivos descritos en este documento, en cumplimiento con los requisitos de la Norma Oficial Mexicana (NOM 024):

Exportador:	Dell Computer Corporation One Dell Way Round Rock, TX 78682
Importador:	Dell Computer de México, S.A. de C.V. Rio Lerma No. 302 - 4° Piso Col. Cuauhtemoc 16500 México, D.F.
Embarcar a:	Dell Computer de México, S.A. de C.V. al Cuidado de Kuehne & Nagel de México S. de R.I. Avenida Soles No. 55 Col. Peñon de los Baños 15520 México, D.F.
Tensión alimentación:	115/230 V.C.A. ±10%
Frecuencia:	60/50 Hz
Consumo de corriente:	6.0/3.0 A

BCIQ Notice for Taiwan Only

警告使用者：
這是甲類的資訊產品，在居住的
環境中使用時，可能會造成無線
電干擾，在這種情況下，使用者
會被要求採取某些適當的對策.

A P P E N D I X   E
Warranties and Return Policy

Limited Three-Year Warranty (U.S. Only)

Dell Computer Corporation ("Dell") manufactures its hardware products from parts and components that are new or equivalent to new in accordance with industry-standard practices. Dell warrants that the hardware products it manufactures will be free from defects in materials and workmanship. The warranty term is three years beginning on the date of invoice, as described in the following text.

Damage due to shipping the products to you is covered under this warranty. Otherwise, this warranty does not cover damage due to external causes, including accident, abuse, misuse, problems with electrical power, servicing not authorized by Dell, usage not in accordance with product instructions, failure to perform required preventive maintenance, and problems caused by use of parts and components not supplied by Dell.

This warranty does not cover any items that are in one or more of the following categories: software; external devices (except as specifically noted); accessories or parts added to a Dell system after the system is shipped from Dell; accessories or parts added to a Dell system through Dell's system integration department; accessories or parts that are not installed in the Dell factory; or DellWare® products. Monitors, keyboards, and mice that are Dell-branded or that are included on Dell's standard price list are covered under this warranty; all other monitors, keyboards, and mice (including those sold through the DellWare program) are not covered. Batteries for portable computers are covered only during the initial one-year period of this warranty.

Coverage During Year One

During the one-year period beginning on the invoice date, Dell will repair or replace products covered under this limited warranty that are returned to Dell's facility. To request warranty service, you must call Dell's Customer Technical Support within the warranty period. Refer to the chapter titled "Getting Help" in your *Installation and Troubleshooting Guide* to find the appropriate telephone number for obtaining customer assistance. If warranty service is required, Dell will issue a Return Material Authorization Number. You must ship the products back to Dell in their original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. Dell will ship the repaired or replacement products to you freight prepaid if you use an address in the continental U.S. Shipments to other locations will be made freight collect.

Dell owns all parts removed from repaired products. Dell uses new and reconditioned parts made by various manufacturers in performing warranty repairs and building replacement products. If Dell repairs or replaces a product, its warranty term is not extended.

Coverage During Years Two and Three

During the second and third years of this limited warranty, Dell will provide, on an exchange basis, replacement parts for the Dell hardware product(s) covered under this limited warranty when a part requires replacement. You must report each instance of hardware failure to Dell's Customer Technical Support in advance to obtain Dell's concurrence that a part should be replaced and to have Dell ship the replacement part. Dell will ship parts using next-business-day delivery, shipping prepaid if you use an address in the continental U.S. Shipments to other locations will be made freight collect. Dell will include a prepaid shipping container with each replacement part for your use in returning the replaced part to Dell. Replacement parts are new or reconditioned. Dell may provide replacement parts made by various manufacturers when supplying parts to you. The warranty term for a replacement part is the remainder of the limited warranty term.

You will pay Dell for replacement parts if the replaced part is not returned to Dell. The process for returning replaced parts, and your obligation to pay for replacement parts if you do not return the replaced parts to Dell, will be in accordance with Dell's Exchange Policy in effect on the date of the exchange.

You accept full responsibility for your software and data. Dell is not required to advise or remind you of appropriate backup and other procedures.

General

DELL MAKES NO EXPRESS WARRANTIES BEYOND THOSE STATED IN THIS WARRANTY STATEMENT. DELL DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW LIMITATIONS ON IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU.

DELL'S RESPONSIBILITY FOR MALFUNCTIONS AND DEFECTS IN HARDWARE IS LIMITED TO REPAIR AND REPLACEMENT AS SET FORTH IN THIS WARRANTY STATEMENT. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE (OR JURISDICTION).

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Glossary

The following list defines or identifies technical terms, abbreviations, and acronyms used in Dell user documents.

NOTE: Unless otherwise specified, these definitions may not apply to operating systems other than MS-DOS® or Microsoft® Windows®.

A
Abbreviation for ampere(s).

AC
Abbreviation for alternating current.

adapter card
An expansion card that plugs into an expansion-card connector on the computer's system board. An adapter card adds some specialized function to the computer by providing an interface between the expansion bus and a peripheral device. Examples of adapter cards include network cards, sound boards, and SCSI adapters.

ADC
Abbreviation for analog-to-digital converter.

ADI
Abbreviation for Autodesk Device Interface.

AI
Abbreviation for artificial intelligence.

ANSI
Acronym for American National Standards Institute.

application
Software designed to help you perform a specific task, such as a spreadsheet or word processor. Applications are distinct from operating system and utility software.

ASCII
Acronym for American Standard Code for Information Interchange. A text file containing only characters from the ASCII character set (usually created with a text editor, such as MS-DOS Editor or Notepad in Windows), is called an ASCII file.

ASIC
Acronym for application-specific integrated circuit.

ASPI
Advanced SCSI programming interface.

autoexec.bat *file*
When you boot your computer, MS-DOS runs any commands contained in the text file, **autoexec.bat** (after running any commands in the **config.sys** file). An **autoexec.bat** file is not required to boot MS-DOS, but provides a convenient place to run commands that are essential for setting up a consistent computing environment—such as loading mouse or network software.

backup
A copy of a program or data file. As a precaution, you should back up your computer's hard-disk drive on a regular basis. Before making a change to the configuration of your computer, you should back up important start-up files, such as

autoexec.bat and **config.sys** for MS-DOS or **win.ini** and **system.ini** for Windows.

base memory
Synonym for conventional memory. See also **conventional memory**.

BASIC
Acronym for Beginner's All-Purpose Symbolic Instruction Code, a programming language. MS-DOS includes a version of BASIC.

batch file
An ASCII text file containing a list of commands that run in sequence. Batch files must have a filename extension of **bat**.

baud rate
Data transmission speed. For example, modems are designed to transmit data at one or more specified baud rate(s) through the COM (serial) port of a computer.

BBS
Abbreviation for bulletin board service. A computer system that serves as a central location for accessing data or relaying messages by modem. For example, Dell's TechConnect BBS contains the latest version of software such as video drivers and the *Dell Directory*. If your system has a modem, you can access the BBS and download the most recent version of this software.

beep code
A diagnostic system message in the form of a series of beeps from your computer's speaker. Refer to your *Diagnostics and Troubleshooting Guide* for a complete discussion of system beep codes.

BIOS
Acronym for basic input/output system. Your computer's BIOS contains programs stored on a ROM chip. The BIOS controls the following:

- Communications between the microprocessor and peripheral devices, such as the keyboard and the video adapter

- Miscellaneous functions, such as system messages

bit
The smallest unit of information interpreted by your computer.

block
A typical unit of disk storage consisting of a small number of sectors. This term usually refers to the fundamental unit of storage provided by an operating system. See also **block size** and **striping**.

block size
The size of a block. See also **block** and **striping**.

boot routine
When you start your computer, it clears all memory, initializes devices, and loads the operating system. Unless the operating system fails to respond, you can reboot (also called warm boot) your computer by pressing <Ctrl><Alt><Del>; otherwise, you must perform a cold boot by pressing the reset button (if your computer has one) or by turning the computer off, then back on.

bootable diskette
You can start your computer from a diskette in drive A. To make a bootable diskette, insert a diskette in drive A, type `sys a:` at the command line prompt, then press <Enter>. Use this bootable diskette if your computer will not boot from the hard-disk drive.

bpi
Abbreviation for bits per inch.

bps
Abbreviation for bits per second.

BTU
Abbreviation for British thermal unit.

bus
A bus forms an information pathway between the components of a computer. Your computer contains an expansion bus that allows the microprocessor to communicate with controllers for all the

various peripheral devices connected to the computer. Your computer also contains an address bus and a data bus for communications between the microprocessor and RAM.

byte
Eight contiguous bits of information, the basic data unit used by your computer.

BZT
Abbreviation for *Bundesamt fur Zulassungen in der Telekommunikation*.

C
Abbreviation for Celsius.

cache
To facilitate quicker data retrieval, a storage area for keeping a copy of data or instructions. For example, your computer's BIOS may cache ROM code in faster RAM. Or, a disk-cache utility may reserve RAM in which to store frequently accessed information from your computer's disk drives; when a program makes a request to a disk drive for data that is in the cache, the disk-cache utility can retrieve the data from RAM faster than from the disk drive.

card-edge connector
On the bottom of an expansion card, the metal-contact section that plugs into an expansion-card connector.

CCFT
Abbreviation for cold cathode fluorescent tube.

CD-ROM
Abbreviation for compact disc read-only memory. CD-ROM drives use optical technology to read data from compact discs. Compact discs are read-only storage devices; you cannot write new data to a compact disc with standard CD-ROM drives.

CGA
Abbreviation for color graphics adapter.

cm
Abbreviation for centimeter(s).

CMOS
Acronym for complementary metal-oxide semiconductor. In computers, CMOS memory chips are often used for NVRAM storage.

COMn
The MS-DOS device names for the first through fourth serial ports on your computer are COM1, COM2, COM3, and COM4. MS-DOS supports up to four serial ports. However, the default interrupt for COM1 and COM3 is IRQ4, and the default interrupt for COM2 and COM4 is IRQ3. Therefore, you must be careful when configuring software that runs a serial device so that you don't create an interrupt conflict.

CON
The MS-DOS device name for the console, which includes your computer's keyboard and text displayed on the screen.

config.sys *file*
When you boot your computer, MS-DOS runs any commands contained in the text file, **config.sys** (before running any commands in the **autoexec.bat** file). A **config.sys** file is not required to boot MS-DOS, but provides a convenient place to run commands that are essential for setting up a consistent computing environment—such as loading device drivers with a **device=** statement.

controller
A chip or expansion card that controls the transfer of data between the microprocessor and a peripheral, such as a disk drive or the keyboard.

conventional memory
The first 640 KB of RAM. Unless they are specially designed, MS-DOS programs are limited to running in conventional memory. See also **EMM**, **expanded memory**, **extended memory**, **HMA**, **memory manager**, **upper memory area**, and **XMM**.

coprocessor
A coprocessor relieves the computer's microprocessor of specific processing tasks. A math coprocessor, for example,

handles numeric processing. A graphics coprocessor handles video rendering. The Intel® Pentium® microprocessor includes a built-in math coprocessor.

cpi
Abbreviation for characters per inch.

CPU
Abbreviation for central processing unit. See also **microprocessor**.

cursor
In character-based MS-DOS programs, the cursor is usually a block or an underscore (possibly blinking) that represents the position at which the next character typed will appear. Windows programs can design their own cursors—common cursor symbols include the pointer arrow and the text-insertion I-beam.

DAC
Acronym for digital-to-analog converter.

DAT
Acronym for digital audio tape.

dB
Abbreviation for decibel(s).

dBA
Abbreviation for adjusted decibel(s).

DC
Abbreviation for direct current.

device driver
A device driver allows the operating system or a program to interface correctly with a peripheral, such as a printer or network card. Some device drivers—such as network drivers—must be loaded from the **config.sys** file (with a **device=** statement) or as memory-resident programs (usually, from the **autoexec.bat** file). Others—such as video drivers—must load when you start the program for which they were designed.

diagnostics
See **diskette-based diagnostics**.

DIMM
Acronym for dual in-line memory module.

DIN
Acronym for *Deutsche Industrie Norm*.

DIP
Acronym for dual in-line package. A circuit board, such as a system board or expansion card, may contain DIP switches for configuring the circuit board. DIP switches are always toggle switches, with an ON position and an OFF position.

DIP switches
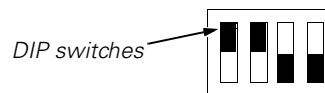
directory
Directories help keep related files organized on a disk in a hierarchical, "inverted tree" structure. Each disk has a "root" directory; for example, a `c:\>` prompt normally indicates that you are at the root directory of hard-disk drive C. Additional directories that branch off of the root directory are called *subdirectories*. Subdirectories may contain additional directories branching off of them.
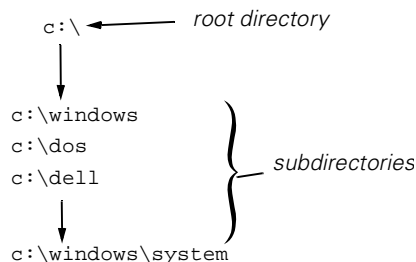
diskette-based diagnostics
A comprehensive set of diagnostic tests for your Dell computer. To use the diskette-based diagnostics, you must boot your computer from the *Dell Diagnostics Diskette*. Refer to your *Installation and Troubleshooting Guide* for a complete discussion about how to use the diskette-based diagnostics.

display adapter
See **video adapter**.

DMA
Abbreviation for direct memory access. A DMA channel allows certain types of data transfer between RAM and a device to bypass the microprocessor.

DOC
Abbreviation for Department of Communications (in Canada).

dpi
Abbreviation for dots per inch.

DPMS
Abbreviation for Display Power Management Signaling. A standard developed by the Video Electronics Standards Association that defines the hardware signals sent by a video controller to activate power management states in a video display or monitor. A monitor is said to be DPMS-compliant when it is designed to enter a power management state after receiving the appropriate signal from a computer's video controller.

DRAC
Abbreviation for Dell Remote Assistant Card.

DRAM
Abbreviation for dynamic random-access memory. A computer's RAM is usually made up entirely of DRAM chips. Because DRAM chips cannot store an electrical charge indefinitely, your computer continually refreshes each DRAM chip in the computer.

drive-type number
Your computer can recognize a number of specific hard-disk drives. Each is assigned a drive-type number that is stored in NVRAM. The hard-disk drive(s) specified in your computer's System Setup program must match the actual drive(s) installed in the computer. The System Setup program also allows you to specify physical parameters (cylinders, heads, write precomp, landing zone, and capacity) for drives not included in the table of drive types stored in NVRAM.

DS/DD
Abbreviation for double-sided/double-density.

DS/HD
Abbreviation for double-sided/high-density.

DTE
Abbreviation for data terminal equipment. Any device (such as a computer system) that can send data in digital form by means of a cable or communications line. The DTE is connected to the cable or communications line through a data communications equipment (DCE) device, such as a modem.

ECC
Abbreviation for error checking and correction.

ECP
Abbreviation for Extended Capabilities Port.

EDO
Abbreviation for extended-data output. A type of RAM chip that holds data on the chip's output data lines for a longer period of time than fast-page mode RAM chips. The EDO RAM chips are also faster than fast-page mode RAM chips.

EEPROM
Acronym for electrically erasable programmable read-only memory.

EGA
Abbreviation for enhanced graphics adapter.

EISA
Acronym for Extended Industry-Standard Architecture, a 32-bit expansion-bus design. The expansion-card connectors in an EISA computer are also compatible with 8- or 16-bit ISA expansion cards.

To avoid a configuration conflict when installing an EISA expansion card, you must use the EISA Configuration Utility. This utility allows you to specify which expansion slot contains the card and obtains information about the card's required

system resources from a corresponding EISA configuration file.

EMC
Abbreviation for Electromagnetic Compatibility.

EMI
Abbreviation for electromagnetic interference.

EMM
Abbreviation for expanded memory manager. A software utility that uses extended memory to emulate expanded memory on computers with an Intel386™ or higher microprocessor. See also **conventional memory**, **expanded memory**, **extended memory**, **memory manager**, and **XMM**.

EMS
Abbreviation for Expanded Memory Specification. See also **expanded memory**, **memory manager**, and **XMS**.

EPROM
Acronym for erasable programmable read-only memory.

ESD
Abbreviation for electrostatic discharge. Refer to "Safety Instructions" at the front of your *User's Guide* for a complete discussion of ESD.

ESDI
Acronym for enhanced small-device interface.

expanded memory
A technique for accessing RAM above 1 MB. To enable expanded memory on your computer, you must use an EMM. You should configure your system to support expanded memory only if you run application programs that can use (or require) expanded memory. See also **conventional memory**, **EMM**, **extended memory**, and **memory manager**.

expansion bus
Your computer contains an expansion bus that allows the microprocessor to communicate with controllers for peripheral devices, such as a network card or an internal modem.

expansion-card connector
A connector on the computer's system board for plugging in an expansion card.

extended memory
RAM above 1 MB. Most software that can use it, such as Windows, requires that extended memory be under the control of an XMM. See also **conventional memory**, **expanded memory**, **memory manager**, and **XMM**.

external cache memory
A RAM cache using SRAM chips. Because SRAM chips operate at several times the speed of DRAM chips, the microprocessor can retrieve data and instructions faster from external cache memory than from RAM.

F
Abbreviation for Fahrenheit.

FAT
Acronym for file allocation table. The file system structure used by MS-DOS to organize and keep track of file storage. The Microsoft Windows NT® operating system can optionally use a FAT file system structure.

FCC
Abbreviation for Federal Communications Commission.

flash memory
A type of EEPROM chip that can be reprogrammed from a utility on diskette while still installed in a computer; most EEPROM chips can only be rewritten with special programming equipment.

format
To prepare a hard-disk drive or diskette for storing files. An unconditional format deletes all data stored on the disk. The **format** command in MS-DOS 5.0 or higher includes an option that allows you to unformat a disk, if you have not yet used the disk for file storage.

ft
Abbreviation for feet.

FTP
Abbreviation for File Transfer Protocol.

g
Abbreviation for gram(s).

G
Abbreviation for gravities.

GB
Abbreviation for gigabyte(s). A gigabyte equals 1,024 megabytes or 1,073,741,824 bytes.

graphics coprocessor
See **coprocessor**.

graphics mode
See **video mode**.

guarding
A type of data redundancy that uses a set of physical drives to store data and a single, additional drive to store parity data. Using guarding, the user's data is protected from the loss of a single drive. Guarding is sometimes preferred over mirroring because it is more cost effective in systems with a very high storage capacity. However, guarded configurations are significantly slower for applications that frequently write to the array, because each attempt to write to the array requires multiple read and write commands to maintain the parity information. If this is a problem, mirroring or duplexing is a better choice. See also **mirroring**, **RAID 4**, and **RAID 5**.

GUI
Acronym for graphical user interface.

h
Abbreviation for hexadecimal. A base-16 numbering system, often used in programming to identify addresses in the computer's RAM and I/O memory addresses for devices. The sequence of decimal numbers from 0 through 16, for example, is expressed in hexadecimal notation as: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10. In text, hexadecimal numbers are often followed by *h* or preceded by *0x*. MS-DOS conventional memory—the first 640 KB of memory addresses—is from 00000h to 9FFFFh; the MS-DOS upper memory area—memory addresses between 640 KB and 1 MB—is from A0000h to FFFFFh.

heat sink
A metal plate with metal pegs or ribs that help dissipate heat. Some microprocessors include a heat sink.

HMA
Abbreviation for high memory area. The first 64 KB of extended memory above 1 MB. A memory manager that conforms to the XMS can make the HMA a direct extension of conventional memory. See also **conventional memory**, **memory manager**, **upper memory area**, and **XMM**.

host adapter
A host adapter implements communication between the computer's bus and the controller for a peripheral. (Hard-disk drive controller subsystems include integrated host adapter circuitry.) To add a SCSI expansion bus to your system, you must install the appropriate host adapter.

HPFS
Abbreviation for the High Performance File System option in the Windows NT operating system.

Hz
Abbreviation for hertz.

I/O
Abbreviation for input/output. The keyboard and a printer, for example, are I/O devices. In general, I/O activity can be differentiated from computational activity. For example, when a program sends a document to the printer, it is engaging in I/O activity; when the program sorts a list of terms, it is engaging in computational activity.

ID
Abbreviation for identification.

interlacing

A technique for increasing video resolution by only updating alternate horizontal lines on the screen. Because interlacing can result in noticeable screen flicker, most users prefer noninterlaced video adapter resolutions.

internal microprocessor cache

An instruction and data cache built in to the microprocessor. The Pentium microprocessor, for example, includes a 16-KB internal cache, which is set up as an 8-KB read-only instruction cache and an 8-KB read/write data cache.

IP

Abbreviation for Internet Protocol.

IPX

Acronym for internetwork packet exchange.

IRQ

Abbreviation for interrupt request. A signal that data is about to be sent to or received by a peripheral travels by an IRQ line to the microprocessor. Each peripheral connection must be assigned an IRQ number. For example, the first serial port in your computer (COM1) is assigned to IRQ4 by default. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

ISA

Acronym for Industry-Standard Architecture. A 16-bit expansion bus design. The expansion-card connectors in an ISA computer are also compatible with 8-bit ISA expansion cards.

ITE

Abbreviation for information technology equipment.

JEIDA

Acronym for Japanese Electronic Industry Development Association.

K

Abbreviation for kilo-, indicating 1,000.

KB

Abbreviation for kilobyte(s), 1,024 bytes.

KB/sec

Abbreviation for kilobyte(s) per second.

Kb(s)

Abbreviation for kilobit(s), 1,024 bits.

Kbps

Abbreviation for kilobit(s) per second.

key combination

A command requiring that you press multiple keys at the same time. For example, you can reboot your computer by pressing the <Ctrl><Alt><Del> key combination.

kg

Abbreviation for kilogram(s), 1,000 grams.

kHz

Abbreviation for kilohertz, 1,000 hertz.

LAN

Acronym for local area network. A LAN system is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

lb

Abbreviation for pound(s).

LCD

Abbreviation for liquid crystal display. A low-power display often used for notebook computers. An LCD consists of a liquid crystal solution between two sheets of polarizing material. An electric current causes each crystal to act like a shutter that can open to allow light past or close to block the light.

LED

Abbreviation for light-emitting diode. An electronic device that lights up when a current is passed through it.

LIF

Acronym for low insertion force. Some computers use LIF sockets and connectors to allow devices such as the microprocessor chip to be installed or removed with minimal stress to the device.

LIM
Acronym for Lotus/Intel/Microsoft. LIM usually refers to version 4.0 of the EMS.

LN
Abbreviation for load number.

local bus
On a computer with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. Some local-bus designs allow peripherals to run at the same speed and with the same width data path as the computer's microprocessor.

LPTn
The MS-DOS device names for the first through third parallel printer ports on your computer are LPT1, LPT2, and LPT3.

LUN
Acronym for logical unit number.

LVD
Acronym for low voltage differential.

m
Abbreviation for meter(s).

mA
Abbreviation for milliampere(s).

mAh
Abbreviation for milliampere-hour(s).

math coprocessor
See **coprocessor**.

MB
Abbreviation for megabyte(s). The term *megabyte* means 1,048,576 bytes; however, when referring to hard-disk drive storage, the term is often rounded to mean 1,000,000 bytes.

MBR
Abbreviation for master boot record.

MDA
Abbreviation for monochrome display adapter.

memory
A computer can contain several different forms of memory, such as RAM, ROM, and video memory. Frequently, the word *memory* is used as a synonym for RAM; for example, an unqualified statement such as "…a computer with 8 MB of memory" refers to a computer with 8 MB of RAM.

memory address
A specific location, usually expressed as a hexadecimal number, in the computer's RAM.

memory manager
A utility that controls the implementation of memory in addition to conventional memory, such as extended or expanded memory. See also **conventional memory**, **EMM**, **expanded memory**, **extended memory**, **HMA**, **upper memory area**, and **XMM**.

MGA
Abbreviation for monochrome graphics adapter.

MHz
Abbreviation for megahertz.

microprocessor
Because it is the primary computational chip inside the computer, it is customary to refer to the microprocessor as "the computer's brain." The microprocessor contains an arithmetic processing unit and a control unit. Software written for one microprocessor must usually be revised to run on another microprocessor. *CPU* is a synonym for microprocessor.

min
Abbreviation for minute(s).

mirroring
A type of data redundancy that uses a set of physical drives to store data and one or more sets of additional drives to store duplicate copies of the data. Mirroring is the preferred data redundancy technique in lower-capacity systems and in systems where performance is extremely important. See also **guarding**, **RAID 1**, and **RAID 10**.

mm
Abbreviation for millimeter(s).

MMX
The microprocessors for this system include media enhancement technology which is designed to handle complex multimedia and communications software.

mouse
A pointing device that controls the movement of the cursor on a screen. Mouse-aware software allows you to activate commands by clicking a mouse button while pointing at objects displayed on the screen.

ms
Abbreviation for millisecond(s).

MS-DOS
Abbreviation for Microsoft Disk Operating System.

MTBF
Abbreviation for mean time between failures.

multifrequency monitor
A monitor that supports several video standards. A multifrequency monitor can adjust to the frequency range of the signal from a variety of video adapters.

mV
Abbreviation for millivolt(s).

NiCad
Acronym for nickel cadmium.

NiMH
Abbreviation for nickel-metal hydride.

NLM
Acronym for NetWare® Loadable Module.

NMI
Abbreviation for nonmaskable interrupt. A device sends an NMI to signal the microprocessor about hardware errors, such as a parity error.

noninterlaced
A technique for decreasing screen flicker by sequentially refreshing each horizontal line on the screen.

ns
Abbreviation for nanosecond(s), one billionth of a second.

NTFS
Abbreviation for the NT File System option in the Windows NT operating system.

NVRAM
Abbreviation for nonvolatile random-access memory. Memory that does not lose its contents when you turn off your computer. NVRAM is used for maintaining the date, time, and system setup options.

OTP
Abbreviation for one-time programmable.

parallel port
An I/O port used most often to connect a parallel printer to your computer. You can usually identify a parallel port on your computer by its 25-hole connector.

parameter
A value or option that you specify to a program. A parameter is sometimes called a *switch* or an *argument*.

partition
You can divide a hard-disk drive into multiple physical sections called *partitions* with the **fdisk** command. Each partition can contain multiple logical drives. For example, you could partition a 200-MB hard-disk drive into two physically separate partitions with

three logical drive assignments, as shown in the following table.

Partitioning the Hard-Disk Drive

Physical Partitions and Sizes
Partition 1 120 MB Partition 2   80 MB

Logical Drive Assignments and Sizes
Drive C 120 MB Drive D   50 MB Drive E   30 MB

After partitioning the hard-disk drive, you must format each logical drive with the **format** command.

PC Card
Slightly larger than a credit card, a PC Card is a removable I/O card—such as a modem, LAN, SRAM, or flash memory card—that adheres to the PCMCIA standards. See also **PCMCIA**.

PCI
Abbreviation for Peripheral Component Interconnect. A standard for local-bus implementation developed by Intel Corporation.

PCMCIA
Abbreviation for Personal Computer Memory Card International Association. See also **PC Card**.

peripheral device
An internal or external device—such as a printer, a disk drive, or a keyboard—connected to a computer.

PGA
Abbreviation for pin grid array, a type of microprocessor socket that allows you to remove the microprocessor chip.

pixel
Arranged in rows and columns, a pixel is a single point on a video display. Video resolution—640 x 480, for example—is expressed as the number of pixels across by the number of pixels up and down.

POST
Acronym for power-on self-test. Before the operating system loads when you turn on your computer, the POST tests various system components such as RAM, the disk drives, and the keyboard.

ppm
Abbreviation for pages per minute.

PQFP
Abbreviation for plastic quad flat pack, a type of microprocessor socket in which the microprocessor chip is permanently mounted.

PRN
A synonym for the MS-DOS device name LPT1.

program diskette set
The set of diskettes from which you can perform a complete installation of an application program. When you reconfigure a program, you often need its program diskette set.

protected mode
An operating mode supported by 80286 or higher microprocessors, protected mode allows operating systems to implement:

- A memory address space of 16 MB (80286 microprocessor) to 4 GB (Intel386 or higher microprocessor)

- Multitasking

- Virtual memory, a method for increasing addressable memory by using the hard-disk drive

The Windows NT 32-bit operating system runs in protected mode. MS-DOS cannot run in protected mode; however, some programs that you can start from MS-DOS—such as Windows—are able to put the computer into protected mode.

PS/2
Abbreviation for Personal System/2.

PVC
Abbreviation for polyvinyl chloride.

QIC

Abbreviation for quarter-inch cartridge.

RAM

Acronym for random-access memory. The computer's primary temporary storage area for program instructions and data. Each location in RAM is identified by a number called a *memory address*. Any information stored in RAM is lost when you turn off your computer.

RAID

Acronym for redundant array of inexpensive disks. This phrase was introduced by David Patterson, Garth Gibson, and Randy Katz at the University of California at Berkeley in 1987. The goal of RAID is to use multiple small, inexpensive disk drives to provide high storage capacity and performance while maintaining or improving the reliability of the disk subsystem.

Patterson, Gibson, and Katz described five different methods, which are known as RAID levels 1 through 5. Each level uses one or more extra drives to provide a means of recovering data lost when a disk fails, so that the effective failure rate of the whole disk subsystem becomes very low.

Recently, Katz has defined a sixth method, RAID 6, which improves reliability even further, and a configuration that provides no data recovery has popularly become known as RAID 0.

RAID 0

RAID 0 is commonly called *striping*. This was not originally defined as a RAID level but has since come into popular use. In this array configuration, data is written sequentially across the available disks and no redundancy is provided. RAID 0 configurations provide very high performance but relatively low reliability. RAID 0 is the best choice when DSA controller cards are duplexed. See also **striping**.

RAID 1

RAID 1 is commonly called *mirroring*. RAID 1 also uses striping, so RAID 1 may be regarded as the mirroring of RAID 0 configurations. RAID 1 is the best choice

in high-availability applications that require high performance or relatively low data capacity. See also **mirroring**, **RAID 10**, **striping**.

RAID 4

RAID 4 is commonly called *guarding*. It uses data striping, like RAID 0, but adds a single, dedicated parity drive. The parity data stored on this drive can be used to recover data lost from a single failed drive. RAID 4 configurations write data slowly because parity data has to be generated and written to the parity drive, and the generation of the parity data frequently requires reading data from multiple physical drives. See also **guarding** and **striping**.

RAID 5

RAID 5, like RAID 4, is commonly called *guarding*. RAID 5 is identical to RAID 4, except that the parity data is distributed evenly across all physical drives instead of a parity drive. In configurations using a large number of physical drives in which a large number of simultaneous small write operations are being performed, RAID 5 offers potentially higher performance than RAID 4. RAID 4 and RAID 5 configurations are appropriate in high-availability applications where performance is less critical or where high data capacity is required. See also **guarding**.

RAID 10

RAID 10 is a *mirroring* technique in which data is duplicated across two identical RAID 0 arrays or hard-disk drives. All data on a physical drive in one array is duplicated, or *mirrored*, on a drive in the second array. Mirroring offers complete redundancy of data for greater data security. See also **mirroring**, **RAID 1,** and **striping**.

RAMDAC

Acronym for random-access memory digital-to-analog converter.

read-only file

A read-only file is one that you are prohibited from editing or deleting. A file can have read-only status if:

• Its read-only attribute is enabled.

- It resides on a physically write-protected diskette.

- It is located on a network in a directory to which the system administrator has assigned read-only rights to you.

real mode
An operating mode supported by 80286 or higher microprocessors, real mode imitates the architecture of an 8086 microprocessor. Designed to run in real mode, MS-DOS (unassisted by additional software techniques) can address only 640 KB of conventional memory.

refresh rate
The frequency, measured in Hz, at which the screen's horizontal lines are re-charged. A monitor's refresh rate is also referred to as its *vertical frequency*.

REN
Abbreviation for ringer equivalence number.

RFI
Abbreviation for radio frequency interference.

RGB
Abbreviation for red/green/blue.

ROM
Acronym for read-only memory. Your computer contains some programs essential to its operation in ROM code. Unlike RAM, a ROM chip retains its contents even after you turn off your computer. Examples of code in ROM include the program that initiates your computer's boot routine and the POST.

rpm
Abbreviation for revolutions per minute.

RTC
Abbreviation for real-time clock. Battery-powered clock circuitry inside the computer that keeps the date and time after you turn off the computer.

SCSI
Acronym for small computer system interface. An I/O bus interface with faster data transmission rates than standard ports. You can connect up to seven devices to one SCSI interface.

SDMS
Abbreviation for SCSI device management system.

SDRAM
Abbreviation for synchronous dynamic random-access memory.

SEC
Abbreviation for single-edge connector cartridge.

sec
Abbreviation for second(s).

serial port
An I/O port used most often to connect a modem or a mouse to your computer. You can usually identify a serial port on your computer by its 9-pin connector.

shadowing
A computer's system and video BIOS code is usually stored on ROM chips. Shadowing refers to the performance-enhancement technique that copies BIOS code to faster RAM chips in the upper memory area (above 640 KB) during the boot routine.

SRAM
Abbreviation for static random-access memory. Because SRAM chips do not require continual refreshing, they are substantially faster than DRAM chips. SRAM is used mostly for external cache memory.

striping
In composite drivers with two or more physical drives, the drive array sub-system uses a method of data storage called *striping*. With this method, data is divided into a series of pieces called *blocks* and each data block is stored on a different physical drive. When each drive contains a block of data, the process

starts over with the first physical drive. By carefully selecting the size of the data block, the chance that the information needed can be read from or written to multiple physical drives at once is increased, greatly increasing the performance of the composite drive. See also **block**, **block size**, and **RAID**.

SVGA

Abbreviation for super video graphics array. See also **VGA**.

switch

See **parameter**.

sync negotiation

Sync negotiation is a SCSI feature that allows the host adapter and its attached SCSI devices to transfer data in synchronous mode. Synchronous data transfer is faster than asynchronous data transfer.

syntax

The rules that dictate how you must type a command or instruction so that the computer will understand it.

system board

As the main circuit board, the system board usually contains most of your computer's integral components, such as the following:

- Microprocessor
- RAM
- Expansion-card connectors
- Controllers for standard peripheral devices, such as the keyboard
- Various ROM chips

Frequently used synonyms for system board are *motherboard* and *logic board*.

system diskette

System diskette is a synonym for *bootable diskette*.

system memory

System memory is a synonym for *RAM*.

System Setup program

System Setup program options allow you to configure your computer's hardware. Some options in the System Setup program require that you reboot the computer in order to make a hardware-configuration change. Because the System Setup program is stored in NVRAM, any options that you set remain in effect until you change them again.

system.ini *file*

When you start Windows, it consults the **system.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **system.ini** file records which video, mouse, and keyboard drivers are installed for Windows.

Running the Control Panel or Windows Setup program may change options in the **system.ini** file. On other occasions, you may need to change or add options to the **system.ini** file manually with a text editor, such as Notepad.

terminator

Some devices, especially disk drives, contain a terminator to absorb and dissipate excess current. When more than one such device is connected in a series, you may need to remove the terminator—or change a jumper setting to disable it—unless it is the last device in the series. However, some devices have terminators that should never be removed or disabled.

text editor

An application program for editing text files consisting exclusively of ASCII characters. MS-DOS Editor and Notepad (in Windows) are text editors, for example. Most word processors use proprietary file formats containing binary characters, although some can read and write text files.

text mode

See **video mode**.

TFT

Abbreviation for thin film transistor. A flat-panel display for notebook computers where each pixel is controlled by one to four transistors.

tpi
Abbreviation for tracks per inch.

TSR
Abbreviation for terminate-and-stay-resident. A TSR program runs "in the background." Most TSR programs implement a predefined key combination (sometimes referred to as a "hot key") that allows you to activate the TSR program's interface while running another MS-DOS program. When you finish using the TSR program, you can return to the other application program and leave the TSR program resident in memory for later use.

Because MS-DOS is not designed to support multiple programs running simultaneously, TSR programs can sometimes cause memory conflicts. When troubleshooting, rule out the possibility of such a conflict by rebooting your computer without starting any TSR programs.

TV
Abbreviation for television.

UL
Abbreviation for Underwriters Laboratories.

UMB
Abbreviation for upper memory blocks. See also **conventional memory**, **HMA**, **memory manager**, and **upper memory area**.

upper memory area
The 384 KB of RAM located between 640 KB and 1 MB. If the computer has an Intel386 or higher microprocessor, a software utility called a *memory manager* can create UMBs in the upper memory area, in which you can load device drivers and memory-resident programs. See also **conventional memory**, **HMA**, and **memory manager**.

UPS
Abbreviation for uninterruptible power supply. A battery-powered unit that automatically supplies power to your computer in the event of an electrical failure.

USOC
Abbreviation for Universal Service Ordering Code.

utility
A program used to manage system resources— memory, disk drives, or printers, for example. The **diskcopy** command for duplicating diskettes and the **himem.sys** device driver for managing extended memory are utilities included in MS-DOS.

V
Abbreviation for volt(s).

VAC
Abbreviation for volt(s) alternating current.

VCCI
Abbreviation for Voluntary Control Council for Interference.

VDC
Abbreviation for volt(s) direct current.

VDE
Abbreviation for *Verband Deutscher Elektrotechniker*.

VDS
Abbreviation for Virtual Direct Memory Access Services.

VESA
Acronym for Video Electronics Standards Association.

VGA
Abbreviation for video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than EGA and CGA, the previous standards.

To display a program at a specific resolution, you must install the appropriate video drivers and your monitor must support the resolution. Similarly, the number of colors that a program can display depends on the capabilities of the monitor, the video driver, and the amount of memory installed for the video adapter.

VGA feature connector
On some systems with a built-in VGA video adapter, a VGA feature connector allows you to add an enhancement adapter, such as a video accelerator, to your computer. A VGA feature connector can also be called a *VGA pass-through connector*.

video adapter
The logical circuitry that provides—in combination with the monitor or display—your computer's video capabilities. A video adapter may support more or fewer features than a specific monitor offers. Typically, a video adapter comes with video drivers for displaying popular application programs and operating environments in a variety of video modes.

On most current Dell computers, a video adapter is integrated into the system board. Also available are many video adapter cards that plug into an expansion-card connector.

Video adapters can include memory separate from RAM on the system board. The amount of video memory, along with the adapter's video drivers, may affect the number of colors that can be simultaneously displayed. Video adapters can also include their own coprocessor chip for faster graphics rendering.

video driver
Graphics-mode application programs and operating environments, such as Windows, often require video drivers in order to display at a chosen resolution with the desired number of colors. A program may include some "generic" video drivers. Any additional video drivers may need to match the video adapter; you can find these drivers on a separate diskette with your computer or video adapter.

video memory
Most VGA and SVGA video adapters include VRAM or DRAM memory chips in addition to your computer's RAM. The amount of video memory installed primarily influences the number of colors that a program can display (with the appropriate video drivers and monitor capability).

video mode
Video adapters normally support multiple text and graphics display modes. Character-based software (such as MS-DOS) displays in text modes that can be defined as *x* columns by *y* rows of characters. Graphics-based software (such as Windows) displays in graphics modes that can be defined as *x* horizontal by *y* vertical pixels by *z* colors.

video resolution
Video resolution—640 x 480, for example—is expressed as the number of pixels across by the number of pixels up and down. To display a program at a specific graphics resolution, you must install the appropriate video drivers and your monitor must support the resolution.

virtual 8086 mode
An operating mode supported by Intel386 or higher microprocessors, virtual 8086 mode allows operating environments—such as Windows—to run multiple programs in separate 1-MB sections of memory. Each 1-MB section is called a *virtual machine*.

virtual memory
A method for increasing addressable RAM by using the hard-disk drive. (MS-DOS does not support true virtual memory, which must be implemented at the operating system level.) For example, in a computer with 8 MB of RAM and 16 MB of virtual memory set up on the hard-disk drive, the operating system would manage the system as though it had 24 MB of physical RAM.

virus
A self-starting program designed to inconvenience you. Virus programs have been known to corrupt the files stored on a hard-disk drive or to replicate themselves until a system or network runs out of memory.

The most common way that virus programs move from one system to another is via "infected" diskettes, from which they copy themselves to the hard-disk

drive. To guard against virus programs, you should do the following:

- Periodically run a virus-checking utility on your computer's hard-disk drive

- Always run a virus-checking utility on any diskettes (including commercially sold software) before using them

VL-Bus™

An abbreviation for VESA® local bus. A standard for local bus implementation developed by the Video Electronics Standards Association.

VLSI

Abbreviation for very–large-scale integration.

Vpp

Abbreviation for peak-point voltage.

VRAM

Abbreviation for video random-access memory. Some video adapters use VRAM chips (or a combination of VRAM and DRAM) to improve video performance. VRAM is dual-ported, allowing the video adapter to update the screen and receive new image data at the same time.

W

Abbreviation for watt(s).

win.ini *file*

When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **win.ini** file records what printer(s) and fonts are installed for Windows. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard-disk drive.

Running the Control Panel or Windows Setup program may change options in the **win.ini** file. On other occasions, you may need to change or add options to the **win.ini** file manually with a text editor, such as Notepad.

write-protected

Read-only files are said to be *write-protected*. You can write-protect a 3.5-inch diskette by sliding its write-protect tab to the open position and a 5.25-inch diskette by placing an adhesive label over its write-protect notch.

XMM

Abbreviation for extended memory manager, a utility that allows application programs and operating environments to use extended memory in accordance with the XMS. See also **conventional memory**, **EMM**, **expanded memory**, **extended memory**, and **memory manager**.

XMS

Abbreviation for eXtended Memory Specification. See also **EMS**, **extended memory**, and **memory manager**.

ZIF

Acronym for zero insertion force. Some computers use ZIF sockets and connectors to allow devices such as the microprocessor chip to be installed or removed with no stress applied to the device.

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