Dell® PowerEdge® 2300 Systems

USER'S GUIDE

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March 1998 P/N 32267

Safety Instructions

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

When Using Your Computer System

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

- To help avoid damaging your computer, be sure the voltage selection switch on the power supply is set to match the alternating current (AC) power available at your location:
  - 115 volts (V)/60 hertz (Hz) in most of North and South America and some Far Eastern countries such as Japan, South Korea, and Taiwan
  - 230 V/50 Hz in most of Europe, the Middle East, and the Far East

  Also be sure your monitor and attached peripherals are electrically rated to operate with the AC power available in your location.
- To help avoid possible damage to the system board, wait 5 seconds after turning off the system before removing a component from the system board or disconnecting a peripheral device from the computer.
- To help prevent electric shock, plug the computer and peripheral power cables into properly grounded power sources. These cables are equipped with 3-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 3-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.
- 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. If the computer gets wet, consult your *Installation and Troubleshooting Guide.*

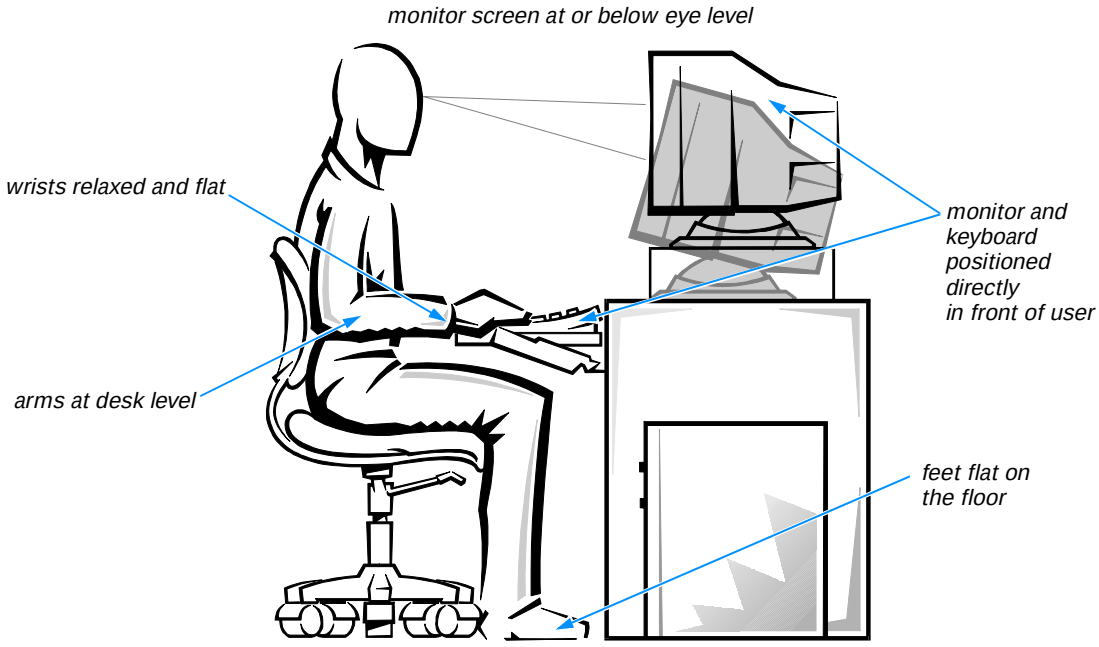
- Do not push any objects into the openings of your computer. Doing so can cause fire or electric shock by shorting out interior components.
- Keep your computer away from radiators and heat sources. Also, do not block cooling vents. Avoid placing loose papers underneath your computer; do not place your 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.



When Working Inside Your Computer

Before you remove the computer cover, perform the following steps in the sequence indicated.

CAUTIONS: Do not attempt to service the computer system yourself, except as explained in this guide and elsewhere in Dell documentation. Always follow installation and service instructions closely.

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

1. **Turn off your computer and any peripherals.**
2. **Disconnect your computer and peripherals from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

   Doing so reduces the potential for personal injury or shock.

3. **Touch an unpainted metal surface on the chassis, such as the metal around the card-slot openings at the back of the computer, before touching anything inside your computer.**

   While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components.

In addition, take note of these safety guidelines when appropriate:

- 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.
- Handle components and cards with care. Don't touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a microprocessor chip by its edges, not by its pins.

Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside your computer. To prevent static damage, discharge static electricity from your body before you touch any of your computer's electronic components, such as the microprocessor. You can do so by touching an unpainted metal surface on the computer chassis.

As you continue to work inside the computer, periodically touch an unpainted metal surface to remove any static charge your body may have accumulated.

In addition to the preceding precautions, you can also take the following steps to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until you are ready to install the component in your computer. Just before unwrapping the antistatic packaging, be sure to discharge static electricity from your body.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

The following caution may appear throughout this document to remind you of these precautions:

CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

Preface

About This Guide

This guide is intended for anyone who uses the Dell PowerEdge 2300 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 computers. 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 computer.
- 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) or an Industry-Standard Architecture (ISA) expansion card is added, removed, or repositioned in the computer, or when the memory size or settings for one of the built-in devices is changed.
- Chapter 6, "Working Inside Your Computer," and Chapter 7, "Installing SCSI Hard-Disk Drives," are intended for users who need to access the system's interior for installing or removing system components or hard-disk drives.
- 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 2300 systems.
- Appendix E, "Warranties and Return Policy," describes the warranties for Dell PowerEdge 2300 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 1.1 With Dell OpenManage 3.1 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 2300 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 computer 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)

Contents

Chapter 1 Introduction 1-1

System Features 1-1
Supported Operating Systems 1-3
Front Panel 1-4
Connecting External Devices 1-6
Preventing Unauthorized Access Inside the Computer 1-6
Getting Help 1-6

Chapter 2 Using the Dell Server Assistant CD 2-1

Booting From the CD 2-1
Navigating the CD Menus 2-1
CD Main Menu 2-2
Choose Language 2-3
Configure the System 2-3
Run the Resource Configuration Utility 2-3
Configure the RAID Subsystem 2-3
Run System Utilities 2-3
Create Utility Partition 2-4
View Online Documents 2-5
View the System User's Guide 2-5
View the System Installation and Troubleshooting Guide 2-5
View the PowerEdge SDS 100 User's Guide 2-5
View the PowerEdge SDS 100 Installation and Troubleshooting Guide 2-5
Create Diskettes 2-5
Create Blank Formatted Diskette 2-5
Create Utility Diskettes 2-5
Create Operating System Support Diskettes 2-6
Utility Partition 2-7
Running System Diagnostics 2-7

Video Drivers 2-9
Installing Video Drivers for Windows NT 4.0 2-9
Asset Tag Utility 2-10
Using the Asset Tag Utility 2-10
Assigning and Deleting an Asset Tag Number 2-10

Chapter 3 Installing and Configuring SCSI Drivers 3-1

Installing SCSI Drivers for a Dell PowerEdge Expandable RAID Controller in Windows NT 4.0 3-2
The **readme.txt** File 3-2
The SCSISelect Utility 3-2
SCSISelect Default Settings 3-3
SCSI Bus Interface Definitions 3-4
Boot Device Options 3-5
SCSI Device/Configuration Settings 3-5
Advanced Host Adapter Settings 3-6
Starting the SCSISelect Utility 3-8
Using SCSISelect Menus 3-8
Using the SCSI Disk Utilities 3-8
Exiting SCSISelect 3-9
Installation for Windows NT 4.0 3-9
Installation Overview 3-9
Installing Windows NT and the Driver for the First Time 3-10
Using Windows NT to Install or Update the Driver 3-10
Installing or Updating the SCSI Driver With Windows NT 4.0 3-10
Removing a Host Adapter 3-11
Swapping a Host Adapter 3-12
Troubleshooting for Windows NT 3-12
Installation for Novell NetWare 4.11 3-13
Installation Overview 3-13
Installing EZ-SCSI 3-14
Installing NetWare 4.11 3-15
Applying intraNetWare Support Pack 4 3-17
Using SCSI Devices 3-18
Formatting Media 3-18
Using Removable Media 3-18
Using Drives Tested and Approved for NetWare 3-20
Using the NetWare Tape Backup Utility 3-20
Setting Up a CD-ROM Drive With NetWare 4.11 3-21
Optimizing Performance 3-21
Troubleshooting for NetWare 3-22
Non–Host-Adapter Specific Error Codes 3-22
Host-Adapter Specific 3-22

Chapter 4 Using the System Setup Program 4-1

Entering the System Setup Program 4-2
System Setup Screens 4-2
Using the System Setup Program 4-3
System Setup Categories 4-5
- Time 4-5
- Date 4-5
- Diskette Drive A and Diskette Drive B 4-5
- Reserved Memory 4-5
- CPU Speed 4-6
- Num Lock 4-6
- Reset Button 4-6
- Processor 1 and Processor 2 4-6
- Fan Speed 4-6
- System Alert 4-7
- Keyboard Errors 4-7
- Boot Sequence 4-7
  - Diskette First 4-7
  - Hard Disk Only 4-7
- Scan Sequence 4-8
- System Password 4-8
- Password Status 4-8
- Setup Password 4-9
- Mouse 4-9
- Serial Port 1 and Serial Port 2 4-9
- Parallel Port 4-9
- Parallel Mode 4-10
- Diskette 4-10
- Speaker 4-10
- Primary SCSI and Secondary SCSI 4-10
- System Data Categories 4-10

Using the System Password Feature 4-11
- Assigning a System Password 4-11
- Using Your System Password to Secure Your System 4-13
- Deleting or Changing an Existing System Password 4-14

Using the Setup Password Feature 4-14
- Assigning a Setup Password 4-15
- Operating With a Setup Password Enabled 4-15
- Deleting or Changing an Existing Setup Password 4-15

Disabling a Forgotten Password 4-16
Responding to Error Messages 4-17

Chapter 5 Using the Resource Configuration Utility 5-1

Configuring ISA and PCI Expansion Cards 5-1
How to Run the Resource Configuration Utility 5-2
When to Run the Resource Configuration Utility 5-2
Making Selections in the RCU 5-3
Using Online Instructions 5-3
Starting the Resource Configuration Utility 5-3
Main Menu 5-4
Learn About Configuring Your Computer 5-4
Configure Computer 5-5
Step 1: Important Resource Configuration Information 5-5
Step 2: Add or Remove Boards 5-5
Step 3: View or Edit Details 5-7
Step 4: Examine Switches or Print Report 5-10
Step 5: Save and Exit 5-10
Maintain System Configuration Diskette 5-11
Exit From This Utility 5-11
Advanced Menu 5-11
Lock/Unlock Boards 5-11
View Additional System Information Menu 5-12
Set Verification Mode Menu 5-12
Maintain SCI Files Menu 5-12
Resolving Resource Conflicts 5-12
Removing a Card That Conflicts With the Card You Just Installed 5-13

Chapter 6 Working Inside Your Computer 6-1

Before Your Begin 6-1
Safety First—For You and the Computer 6-1
Removing and Replacing the Computer Covers 6-2
Computer Orientation 6-2
Removing the Computer Covers 6-2
Replacing the Computer Covers 6-4
Inside the Chassis 6-5

Chapter 7 Installing SCSI Hard-Disk Drives 7-1

Installing SCSI Hard-Disk Drives in the Internal Drive Bays 7-2
SCSI Hard-Disk Drive Configuration 7-3
Partitioning and Formatting SCSI Hard-Disk Drives 7-4
Formatting High-Capacity SCSI Hard-Disk Drives 7-4

Installing and Removing SCSI Hard-Disk Drives 7-4
Hot-Pluggable SCSI Hard-Disk Drives 7-4
Installing a SCSI Hard-Disk Drive 7-6
Removing a SCSI Hard-Disk Drive 7-7
Configuring a 2 x 2 or 2 x 3 SCSI Non–Hot-Pluggable Backplane Board 7-7
Configuring a Non–Hot-Pluggable Backplane Board as a Split Backplane 7-8
Configuring a Non–Hot-Pluggable Backplane Board as a Single Backplane . . . 7-8
Configuring the Boot Device 7-8

Appendix A Technical Specifications A-1

Appendix B I/O Ports and Connectors B-1

I/O Ports and Connectors B-1
Serial and Parallel Ports B-1
Adding an Expansion Card Containing Serial or Parallel Ports. B-2
Serial Port Connectors B-3
Parallel Port Connector B-4
Keyboard and Mouse Connectors B-6
Keyboard Connector B-6
Mouse Connector B-7
Video Connector. B-7
Server-Management Bus Connector B-9

Appendix C Maintaining the System C-1

Data Preservation C-1
Scheduling Backups C-1
Backup Devices C-1
Recovering Data C-2
Cleaning System Components C-2
Recommended Tools and Accessories C-3
Cleaning the Computer, Monitor, and Keyboard Exteriors. C-3
Cleaning Drives C-4
Environmental Factors. C-4
Temperature. C-4
Humidity C-5
Altitude C-5
Dust and Particles C-5
Corrosion C-6
ESD C-6
Electromagnetic and Radio Frequency Interference C-6
Magnetism C-7

Shock and Vibration C-7
Power Source Interruptions C-8
Power Protection Devices C-8
Surge Protectors C-9
Line Conditioners C-9
Uninterruptible Power Supply C-9

Appendix D Regulatory Notices D-1

FCC Notices (U.S. Only) D-1
Class A D-1
Class B D-2
IC Notice (Canada Only) D-2
EN 55022 Compliance (Czech Republic Only) D-3
CE Notice D-4
VCCI Notices (Japan Only) D-4
Class A ITE D-5
Class B ITE D-5
Korean Regulatory Notice D-5
Class A Device D-5
Class B Device D-5
Polish Center for Testing and Certification Notice D-6
Wymagania Polskiego Centrum Badań i Certyfikacji D-6
Pozostałe instrukcje bezpieczeństwa D-6
NOM 024 Information (Mexico Only) D-7
Información para NOM 024 (únicamente para México) D-8
BCIQ Notice for Taiwan Only D-8

Appendix E Warranties and Return Policy E-1

Limited Three-Year Warranty (U.S. Only) E-1
Coverage During Year One E-1
Coverage During Years Two and Three E-2
General E-2
Limited Three-Year Warranty (Canada Only) E-3
Coverage During Year One E-3
Coverage During Years Two and Three E-4
General E-4
“Total Satisfaction” Return Policy (U.S. and Canada Only) E-5

Glossary

Index

Figures

Figure 1-1. Front Panel 1-5
Figure 1-2. Hot-Pluggable Backplane Drive Indicators 1-5
Figure 4-1. System Setup Screens 4-4
Figure 5-1. View or Edit Details Screen (Example) 5-10
Figure 6-1. Computer Orientation 6-2
Figure 6-2. Opening the Front Bezel 6-3
Figure 6-3. Removing the Computer Covers 6-4
Figure 6-4. Inside the Chassis—Back/Right Side View 6-6
Figure 6-5. System Board Features 6-7
Figure 6-6. System Board Jumpers 6-8
Figure 7-1. Internal Drive Hardware 7-2
Figure 7-2. SCSI Hard-Disk Drive ID Numbering 7-3
Figure 7-3. Hard-Disk Drive Indicators 7-5
Figure 7-4. Installing a SCSI Hard-Disk Drive Carrier 7-6
Figure B-1. I/O Ports and Connectors B-2
Figure B-2. Pin Numbers for the Serial Port Connectors B-4
Figure B-3. Pin Numbers for the Parallel Port Connector B-5
Figure B-4. Pin Numbers for the Keyboard Connector B-6
Figure B-5. Pin Numbers for the Mouse Connector B-7
Figure B-6. Pin Numbers for the Video Connector B-8
Figure B-7. Pin Numbers for the Server-Management Bus Connector B-9

Tables

Table 2-1. Utility Partition Menu Options 2-8
Table 2-2. Asset Tag Command-Line Options 2-11
Table 3-1. Default SCSI Controller Settings 3-3
Table 3-2. Drive Status Options 3-19
Table 3-3. Read After Write Verify Options 3-19
Table 4-1. System-Setup Navigation Keys 4-3
Table 7-1. SCSI Backplane Board Characteristics 7-1
Table 7-2. SCSI Hard-Disk Drive Indicator Patterns 7-5
Table A-1. Technical Specifications A-1
Table B-1. Pin Assignments for the Serial Port Connectors B-4
Table B-2. Pin Assignments for the Parallel Port Connector B-5
Table B-3. Pin Assignments for the Keyboard Connector B-6
Table B-4. Pin Assignments for the Mouse Connector B-7
Table B-5. Pin Assignments for the Video Connector B-8
Table B-6. Pin Assignments for the Server-Management Bus Connector B-9

CHAPTER 1
Introduction

Dell® PowerEdge® 2300 systems are high-speed, upgradable server systems designed around the Intel® Pentium® II family of microprocessors. The PowerEdge 2300 systems provide both high-performance Peripheral Component Interconnect (PCI) and Industry-Standard Architecture (ISA) expansion slots to allow for future expansion of your system.

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

System Features

The PowerEdge 2300 systems offer the following major features:

- One or two Intel Pentium II microprocessors with an internal operating frequency of 333, 350, or 400 megahertz (MHz) and an external bus speed of 66 MHz (333-MHz processor) or 100 MHz (350- and 400-MHz processors).

  The Pentium II 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) 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 is available by installing a second Pentium II microprocessor. Symmetric multiprocessing greatly improves overall system performance by dividing microprocessor operations between the two 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 a second microprocessor, you must order a microprocessor upgrade kit from Dell. Not all versions of the Pentium II microprocessor will work properly as a second

microprocessor. The upgrade kit from Dell contains the correct version of the microprocessor for use as a second microprocessor, as well as instructions for performing the upgrade. The second microprocessor must have the same internal operating frequency as the first.

- A minimum of 64 megabytes (MB) of system memory, upgradable to a maximum of 1 gigabyte (GB) by installing combinations of 64- and 128-MB unbuffered dual in-line memory modules (DIMMs), or 256-MB registered SDRAM DIMMs in the four DIMM sockets on the system board.

  The unbuffered 72-bit-wide error checking and correction (ECC) SDRAM DIMMs installed in PowerEdge 2300 systems support ECC to check for and correct memory errors. ECC is performed by the memory controller in the system chip set.

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

The system board includes the following built-in features:

- Six PCI and two ISA expansion-card connectors, located on the system board. PCI slots 1 through 4 are unshared slots; PCI slot 5 is shared with ISA slot 5 and PCI slot 6 is shared with ISA slot 6.
- An integrated advanced graphics port (AGP) 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 (nonupgradable). Maximum resolutions are 1024 x 768 pixels with 256 colors noninterlaced. In 800- x 600-pixel and 640- x 480-pixel resolutions, 16.7 million colors are available for true-color graphics.
- An integrated 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 super I/O controller resides on the ISA bus.

  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), bidirectional (Personal System/2 [PS/2]-compatible), or extended capabilities port (ECP).

- An integrated Adaptec AIC-7890 Ultra2/low-voltage differential (LVD) small computer system interface (SCSI) host adapter that supports up to six 1-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.

  Three SCSI backplane options include a non–hot-pluggable 2 x 2 backplane, non–hot-pluggable 2 x 3 backplane, and hot-pluggable 1 x 6 backplane. The hot-pluggable 1 x 6 backplane supports hot-pluggable SCSI hard-disk drive installation and removal. The integrated SCSI controller resides on the PCI local bus for optimum performance.

- An integrated Adaptec AIC-7860 Ultra/Narrow SCSI-III host adapter that supports up to three externally accessible SCSI devices in the external drive bays.
- Integrated server management circuitry that monitors operation of the system fans as well as critical system voltages and temperatures. The integrated server management circuitry works in conjunction with the HP OpenView Network Node Manager Special Edition (NNM SE) and the Dell Hardware Instrumentation Package (HIP) software package.
- A PS/2-style keyboard port and a PS/2-compatible mouse port.

Standard PowerEdge 2300 systems include a 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 computer system:

- Video drivers for displaying many popular application programs 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 computer. For more information on this program, see Chapter 4, "Using the System Setup Program."
- The Resource Configuration Utility, which allows you to configure installed ISA expansion cards through software rather than by hand. For more information, see Chapter 5, "Using the Resource Configuration Utility."
- Enhanced security features available through either the System Setup program or the Resource Configuration Utility, including a user password and a supervisor password.
- Diagnostics for evaluating your computer's components and devices. For information on using the system diagnostics, see Chapter 2, "Using the Dell Server Assistant CD," 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 2300 systems:

- Windows NT Server 4.0
- NetWare 4.11

NOTE: Installation services and support for other operating systems are available through Dell Plus. For more information, see Chapter 11, "Getting Help," in your Installation and Troubleshooting Guide.

Front Panel

The following controls and indicators are located on the computer's front panel (see Figure 1-1):

- The *power button* on the front panel controls the alternating current (AC) input power to the system's 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.
- The *reset button* on the front panel saves wear and tear on system components by allowing you to reboot (restart) the computer without turning the power off and then on again. For more information about using the reset button, see "Reset Button" in Chapter 4.
- When any SCSI hard-disk drive is being accessed, the green *drive access indicator* on the front panel lights up.
- The yellow *drive failure indicator* lights up if a hard-disk drive failure has occurred.
- The yellow *system fault indicator* lights up if a fan failure, excessive system or microprocessor temperature sensor reading, or other system alert occurs.

NOTE: The power button and the reset button are recessed into the computer's front panel to prevent accidentally turning off or resetting the computer and losing valuable data.

If a hot-pluggable backplane is present in your system, three indicator lights adjacent to each of the SCSI hard-disk drive bays provide the following information on the drive in that bay (see Figure 1-2):

- The green *drive online indicator* (identified by a round icon) lights up when the hard-disk drive is receiving power.
- The green *drive activity indicator* (identified by a cylinder-shaped icon) lights up when data is being transferred to or from the hard-disk drive.
- If an optional Dell PowerEdge Expandable RAID Controller host adapter card is installed in the system, the amber *drive failure indicator* (identified by a triangular icon) blinks if a disk failure is detected.

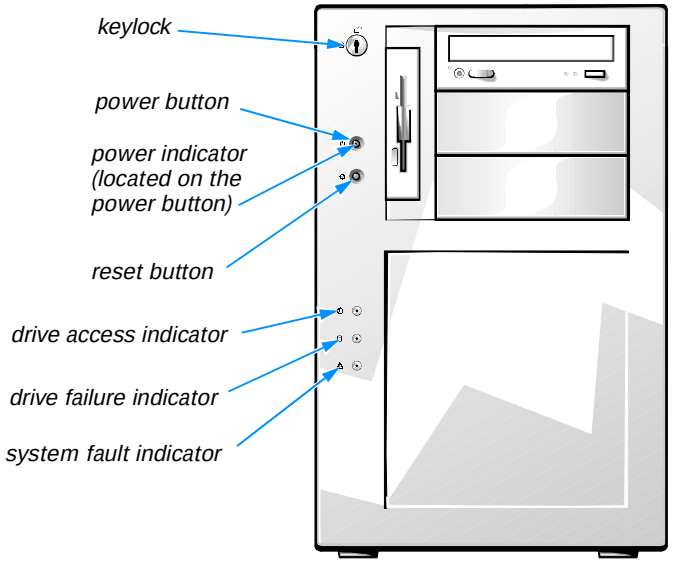


Figure 1-1. Front Panel

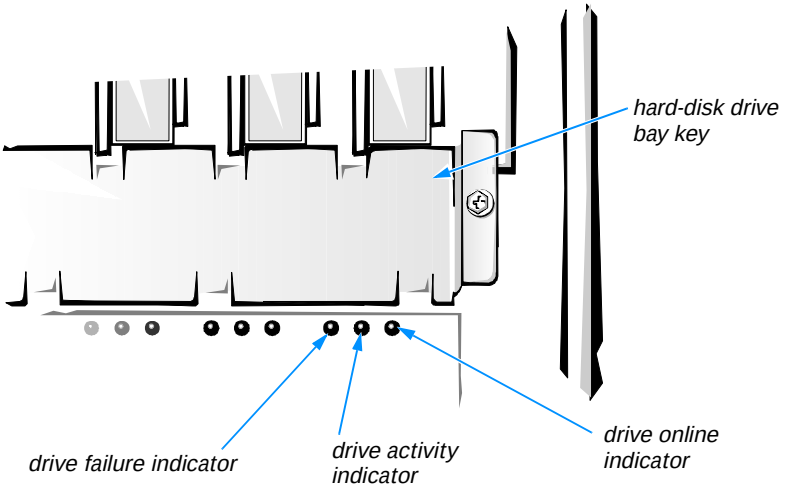


Figure 1-2. Hot-Pluggable Backplane Drive Indicators

Connecting External Devices

You can connect various external devices, such as a mouse and printer, to the I/O ports and connectors on the computer'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 computer, 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 computer 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 computer is turned off*. Then turn on any external devices *before* turning on the computer unless the documentation for the device specifies otherwise. (If the computer does not seem to recognize the device, try turning on the computer 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 "I/O Ports and Connectors" in Appendix B.

Preventing Unauthorized Access Inside the Computer

A keylock on the front bezel prevents unauthorized access to the inside of the computer. The computer covers cannot be removed with the bezel locked.

The PowerEdge 2300 systems also include a system intrusion switch that signals appropriate server management software if the computer bezel 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.

This chapter also describes how to install various software drivers for the supported operating systems.

Booting From the CD

The system must be running to insert the CD. To boot from the CD, insert it into the PowerEdge 2300 system's CD-ROM drive and press the reset button. When the system boots, the CD main menu appears.

If the CD does not boot, check the following:

- 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 options 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 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

View Online Documents

- View the System User's Guide
- View the System Installation and Troubleshooting Guide
- View the PowerEdge SDS 100 User's Guide
- View the PowerEdge SDS 100 Installation and Troubleshooting Guide

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 Diskette
    - Create RAID Driver Diskette
  - — Create NetWare 4.x 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 Peripheral Component Interconnect (PCI) and Industry-Standard Architecture (ISA) devices, using the Resource Configuration Utility
- 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 Resource Configuration Utility, which enables you to view or modify your system's configuration information. The Resource Configuration Utility is used to tell the system what expansion cards are installed and which expansion slots they occupy. With this information, the system automatically configures PCI and Plug and Play ISA expansion cards and can tell you how to configure non-Plug and Play ISA expansion cards manually by setting jumpers or switches.

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 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 application programs.**
2. **Insert the *Dell Server Assistant* CD into the CD-ROM drive, and reboot the system by pressing the reset button or <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 <Ctrl><Alt><F10> during the POST.

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

View Online Documents

The Use Online Documents category includes all available online manuals. Selecting one of the online manuals launches the Adobe™ Acrobat viewer (included on the CD) and allows you to view or print the online manual in the language that you selected earlier.

NOTE: You can also view the portable document format (PDF) files from the HTML interface on the CD-ROM, or you can copy the PDF files from the CD and use them under your native operating system.

The following subsections describe the options available in this category.

View the System User's Guide

This option allows you to view the online *System User's Guide*.

View the System Installation and Troubleshooting Guide

This option allows you to view the *Installation and Troubleshooting Guide*.

View the PowerEdge SDS 100 User's Guide

This option allows you to view the online *PowerEdge SDS 100 User's Guide*.

View the PowerEdge SDS 100 Installation and Troubleshooting Guide

This option allows you to view the *PowerEdge SDS 100 Installation and Troubleshooting Guide*.

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 system configuration utility 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 system configuration utility 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 troubleshooting 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:

- Small computer system interface (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

Following are the choices 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.
- 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.x 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.*x* operating system. Following are the choices 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.*x*.
- 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.*x*.

Utility Partition

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

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

To start the utility partition, press the <Ctrl><Alt><F10> key during power-on self-test (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 generic 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.*

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 the Create Diagnostics Diskette category from the Utility Partition menu.

Before running the diagnostics, insert a blank diskette 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 the formatted diskette. The system hardware diagnostics are described in Chapter 5, "Running the Dell Diagnostics," of the *Installation and Troubleshooting Guide*.

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 Resource Configuration Utility.
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 update the utility partition (for example, adding, removing, or changing features installed on the partition).
Create diskettes:	
Create blank diskette	Creates a blank, formatted diskette.
Create utility diskettes:	
Create Resource Configuration Utility library diskette	Creates a diskette containing the configuration (**.cfg**) files for commonly used ISA expansion cards. This diskette is used with the bootable Resource Configuration Utility diskette.
Create RAID configuration 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.

Video Drivers

You will need to install the video drivers for the operating system you install on your PowerEdge 2300 system, unless they were installed by Dell. Use the following procedure to install the video drivers for Windows NT 4.0. NetWare provides a textual interface and does not require video drivers.

Installing Video Drivers for Windows NT 4.0

Select the Create Diskettes category from the Dell Server Assistant CD Main Menu, and create a diskette of software drivers for Windows NT 4.0. After you make the diskette of 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 drive A; then click OK in the Install From Disk window.**
9. **Make sure that ATI Technologies Inc. 3D Rage Pro (the default option) 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 drive A, 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 computer. 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.**

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 computer. You can also use the Asset Tag utility to reenter the computer'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

CHAPTER 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 2300 computer system. These device drivers are designed to work with the Adaptec AIC-7890 LVD Ultra2 Wide SCSI-3 controller and the Adaptec AIC-7860 Ultra/Narrow SCSI-3 controller on the system board.

The AIC-7890 supports 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.

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 Controllers, refer to the next section, "Installing SCSI Drivers for a Dell PowerEdge Expandable RAID Controller in Windows NT 4.0," or 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 Drives in the Internal Bays," in your *Installation and Troubleshooting Guide*. After the SCSI devices you plan to use are installed, you may 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 PowerEdge 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 II 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 II NT DRIVER from the list of drivers.

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

   The screen should list the following SCSI device drivers:

   ```
   Adaptec AHA-294X/AHA-394X/AIC-87XX SCSI Controller
   PowerEdge RAID II NT DRIVER
   ```

The readme.txt File

The **readme.txt** files that are included with your SCSI device drivers (in the device driver subdirectories in the **\pe2300\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 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 Default Settings

Default settings 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 default settings are appropriate for most Peripheral Component Interconnect (PCI) systems. Run SCSI*Select* only if you need to change any of the default settings.

*NOTES: The SCSI*Select *Utility must be run for both the AIC-7890 and AIC-7860 SCSI controllers 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.*

For situations in which you might want or need to change the settings, see the descriptions of each setting in the following subsections. To change any of the default settings or to format or verify a disk, see "Starting the SCSISelect Utility" found later in this chapter.

Table 3-1. Default SCSI Controller Settings

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:	
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 Command[2]	Yes (Enabled)
BIOS Multiple LUN Support[2]	No (Enabled)
Include in BIOS Scan[2]	Yes (Enabled)

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

2 *Appears only for the AIC-7890 controller.*

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

Table 3-1. Default SCSI Controller Settings *(continued)*

Setting	Default
Advanced Host Adapter:	
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 Drivers > 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 Ultra SCSI Speed	Enabled

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

2 *Appears only for the AIC-7890 controller.*

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 identification (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 setting 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 setting for the Adaptec AIC-7860 host adapters is Enabled; the default setting 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 settings allow you to specify the device from which to boot your computer:

- Boot Target ID — This option specifies the SCSI ID of the device from which you wish to boot your system. SCSI IDs are set for the hard-disk drive according to the drive's location on the backplane board (see Figure 7-2 for the SCSI ID of each drive location). The default setting 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 setting 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 setting 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 setting 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 setting 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 setting 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 setting 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 Command — This option determines whether the **start unit** command is sent to the SCSI device during the boot routine. The default setting 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 computer. 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 Command 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 autoloading tape drives and CD-ROM changers.
- Include in BIOS Scan — This option enables you to set whether the system BIOS scans this device during system startup. The default setting 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 setting 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 setting 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 setting 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 setting is Enabled.

CAUTION: Back up your hard-disk drive before you change the translation scheme. All data is erased when you change from one translation scheme to another.

The standard translation scheme for SCSI host adapters provides a maximum accessible capacity of 1 GB. To support hard-disk drives larger than 1 GB, the 78*xx* series host adapters include an extended translation scheme that supports hard-disk drives as large as 8 GB, with a maximum partition size of 2 GB under the MS-DOS operating system.

Extended BIOS translation is used only with MS-DOS 5.0 or later. It is not necessary to enable this setting if you are using another operating system such as Novell NetWare.

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 setting 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 setting 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 setting 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 setting is Enabled.
- Support For Ultra SCSI Speed — This option determines whether the host adapter supports the fast transfer rates (20–40 megabytes per second [Mbps]). The default setting 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 format on a hard-disk drive. Most SCSI disk drives are formatted at the factory and

do not need to be formatted again. The Adaptec Format Disk utility is compatible with the vast majority of SCSI 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 computer. 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 and/or updating 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.

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 **scsi** subdirectory on the diskette contains the following files to be used with Windows NT:

- **aic78xx.sys** — Adaptec's 78*xx* series driver 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

If you are installing Windows NT for the first time, see the following subsection, "Installing Windows NT and the Driver," to begin driver installation. If Windows NT is already installed in your system, see "Using Windows NT to Install or Update the Driver" found later in this section.

Installing Windows NT and the Driver for the First Time

Windows NT 4.0 has SCSI drivers for the Adaptec 78*xx* series of SCSI controllers integrated into the operating system. When you load the operating system software, the drivers are automatically loaded. However, Dell recommends that you update the **aic78xx.sys** driver using the diskette of drivers that you created from the *Dell Server Assistant* CD. To install or update the **aic78xx.sys** driver for Windows NT 4.0, see the next subsection.

Using Windows NT to Install or Update the Driver

This section describes how to install or update the **aic78xx.sys** driver if Windows NT is already installed. If you are installing Windows NT for the first time, see the previous subsection, "Installing Windows NT and the Driver."

Installing or Updating the SCSI Driver With Windows NT 4.0

Follow these instructions only if Windows NT 4.0 is already installed:

1. **Click the Start button, point to Settings, and click Control Panel.**
2. **Double-click the SCSI Adapters icon.**
3. **Click the Driver tab and then click Add.**
4. **Click Have Disk.**
5. **Insert the Windows NT 4.0 driver diskette you created into drive A.**
6. **In the Copy Manufacturer's Files From: field, type** `a:\scsi\` **and click OK.**
7. **Select Adaptec AHA-294x/AHA-394x/AHA4944 or 78xx PCI SCSI Controller (NT 4.0). Then click OK.**
8. **If the following message appears, click New to replace the existing driver:**

   ```
   The driver(s) for this SCSI Adapter are already on the system. Do you want to use the currently installed driver(s) or install new one(s).
   ```

9. **If the following message appears, type** `a:\scsi\` **in the dialog box and click Continue:**

   ```
   Please enter the full path to Adaptec's installation files.

   These files are located in \SCSI on the Dell Windows NT 4.0 Driver diskette.
   ```

   The driver is copied from the diskette to your system.

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

After the system reboots, the new driver is 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 bootup 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 "Installing or Updating the Driver With Windows NT 4.0" 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 and/or updating the Dell SCSI driver for NetWare 4.11
- Using command line options that can be specified when the driver is loaded
- 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.
- **aspitran.dsk** — Adaptec's ASPI® transport layer driver for NetWare.
- **aspicd.dsk** — 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.
- **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 then prompts 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 see "Installing NetWare 4.11" found later in this section to install NetWare 4.11 for the first time.

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 is an MS-DOS application that 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 computer 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 diskette drive A.**

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 computer's configuration files (**autoexec.bat** and/or **config.sys**) that will load the required device drivers into memory when you boot your computer.

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 computer'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 computer by pressing <Ctrl><Alt><Del>.**

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 NetWare *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 internetwork packet exchange (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 default settings for the installation.

7. **When prompted to install NetWare Symmetrical Multiprocessing (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" 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 disk driver.**

9. **When a screen appears asking you to select a 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," for instructions.

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

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

19. **To load the driver automatically at server start-up, make sure the** startup.ncf **file includes the** load **command line and correct slot number for your host adapter.**

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

Applying intraNetWare Support Pack 4

Before NetWare SMP can be installed in NetWare 4.11, you must apply intraNetWare Support Pack, version 4 or later. The intraNetWare Support Pack 4 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**.

To install the intraNetWare Support Pack 4, complete these steps:

1. **Boot the system in MS-DOS.**
2. **Change to the directory containing the Support Pack** iwsp4a.exe **file.**
3. **To expand the file, type** `iwsp4a.exe` **at the MS-DOS prompt and press <Enter>.**

   NOTE: This file contains directory paths that could exceed the MS-DOS limits. The file must be extracted in a root level directory on your local drive or on a NetWare volume that accepts longer paths.

4. **Load the NetWare server by typing** `server.exe` **at the MS-DOS prompt and pressing <Enter>.**
5. **At the server console prompt, type** `load install` **and press <Enter>.**
6. **Select Product Options.**
7. **Select Install a Product Not Listed.**
8. **Depending on where the intraNetWare Support Pack files are located, complete one of the following steps:**

   a. From the local volume, **sys:**, press <F3> and specify the path, including the volume name (for example, `sys:\`*[directory]*).

   b. From a different server on the network, press <F3> and specify the full path including the server name (for example, *[server_name]*`\vol1:\`*[directory]*).

   c. From a local drive on a client using the **rconsole** utility, press <F4>.

9. **Press <Enter>.**
10. **Press <F10> to accept the marked options and continue.**
11. **After the files finish copying, review the** .ncf **files for accuracy; then bring down the server and restart it to complete the installation of the intraNetWare Support Pack.**
12. **Press <Enter> to end.**

Using SCSI Devices

The subsections that follow provide procedures and tips on the following topics:

- Formatting media
- Using removable media
- Using drives that are tested and approved for NetWare
- Using the NetWare tape backup utility
- Setting Up a CD-ROM drive with NetWare 4.11

Formatting Media

NetWare's **install.nlm** program lets you optionally format a hard-disk drive for use with NetWare. If you are using SCSI drives, the program allows you to low-level format several SCSI drives simultaneously. The NetWare format procedure is not the same as using **fdisk** or **format** under MS-DOS.

CAUTION: You should *not* use NetWare to format a hard-disk drive that contains partitions for other operating systems because that information may be destroyed.

NOTE: When you select a hard-disk drive to format, the **install.nlm** *program prompts you to enter an interleave value from 1 to 9. You may also enter an interleave value of 0 (zero). When formatting SCSI hard-disk drives or removable drives on the Adaptec 78*xx *host adapter SCSI bus, Dell recommends that you use an interleave value of 0. This 0 interleave value instructs the hard-disk drive to use its optimal interleave value. This option was unavailable in NetWare 3.0.*

Using Removable Media

The **aic78u2.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 options appear as shown in Table 3-2.

Table 3-2. Drive Status Options

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. Refer to the NetWare *User's Guide* for information about using the **load** command-line options.

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 computer 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 Backup Utility

Included with NetWare is a server-based tape backup 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*

   The ASPI layer (**aspitran.dsk**) is automatically loaded.

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. **Ensure that the CD-ROM driver for NetWare 4.11 (**aha2940.ham**) is loaded. If necessary, load the driver by entering the following command line:**

   `load [`*pathname*`]\aha2940.ham slot=`*x*

2. **Load** aspicd.dsk **by entering the following command line:**

   `load [`*pathname*`]\aspicd.dsk`

NOTE: If **aspicd.dsk** *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 or volume name of the CD at the command line:**

   `cd mount [`*number*`]`

   or

   `cd mount [`*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 computer 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 for some unknown reason. 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 computer 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.

CHAPTER 4
Using the System Setup Program

Each time you turn on your computer system or press the reset button, 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

CAUTION: Whenever you make changes to the System Setup program or add, reposition, or remove Industry-Standard Architecture (ISA) expansion cards, add or remove memory, or change settings for built-in devices, you must run the Resource Configuration Utility, 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 ISA and 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 at any time. However, 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 <Ctrl><Alt><Enter> immediately after you see the following message:**

   ```
   Press <Ctrl><Alt><Enter> 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.

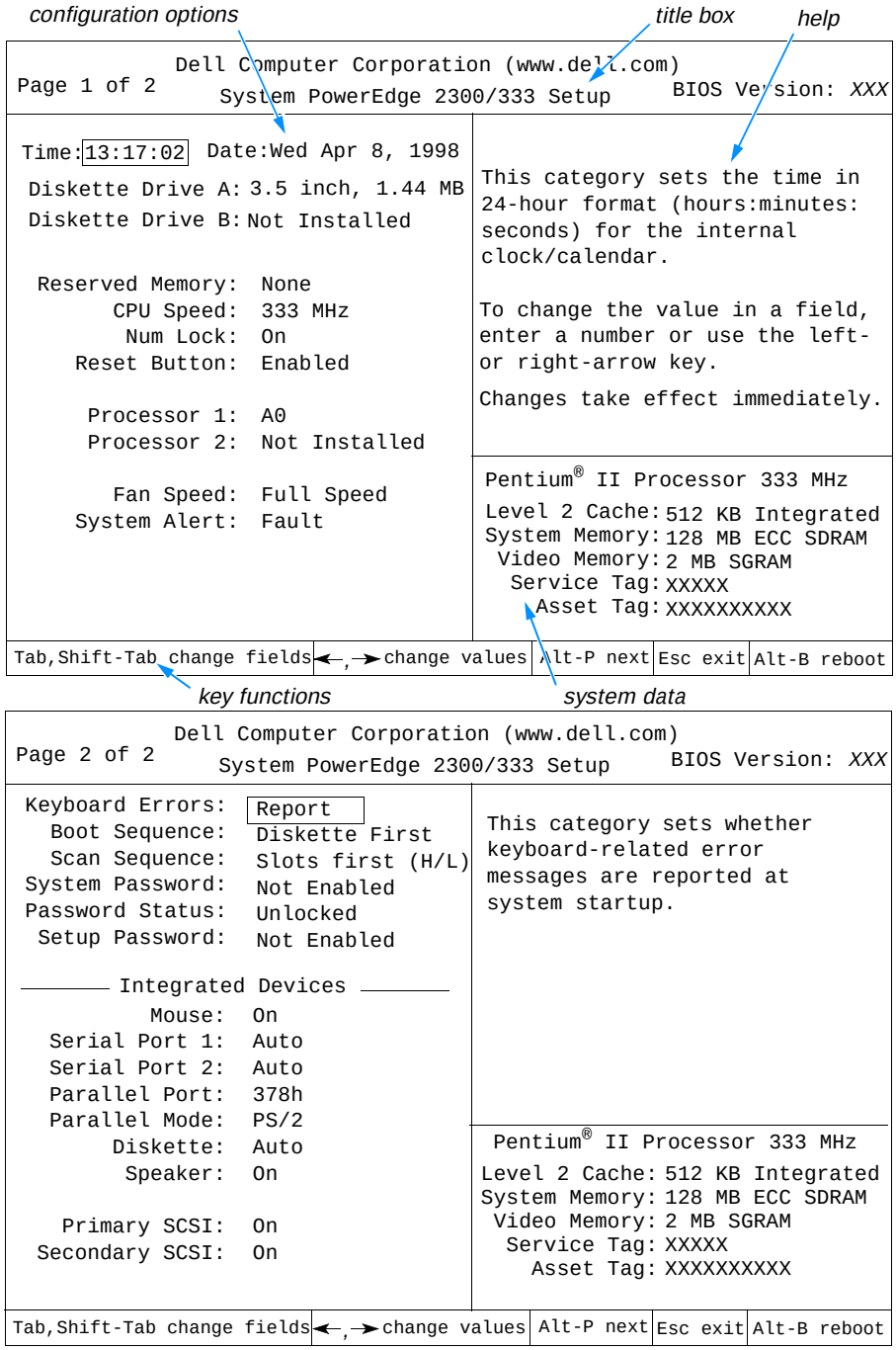


Figure 4-1. System Setup Screens

System Setup Categories

The following subsections explain in detail each of the categories 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 category options 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 options 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

Reserved Memory

Reserved Memory allows you to designate a region of system board memory that can be supplied by an expansion card. You should not enable the reserved memory feature unless you are using an expansion card that requires special addressing.

For example, you may have a memory expansion card that needs to be addressed starting at 15 MB. Selecting the 15M - 16M option in the Reserved Memory category specifies that the base memory from 15 to 16 MB come from the memory expansion card (the base memory below the 15-MB address comes from the dual in-line memory modules [DIMMs] on the system board).

The Reserved Memory category has the following options:

- None (the default option)
- 15M - 16M

CPU Speed

CPU Speed indicates the processor speed at which your system boots.

Press the left- or right-arrow key to toggle the CPU Speed category between the resident microprocessor's rated speed (the default) and a lower compatibility speed, which lets you accommodate speed-sensitive application programs.

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.

Reset Button

Setting this category to Enabled (the default) allows the system to be reset when the reset button is pushed.

Processor 1 and Processor 2

Processor 1 and Processor 2 display the status of each processor slot in the system. These categories have no user-selectable options.

Fan Speed

The Fan Speed category has the following options:

- Full Speed (the default option)
- Noise Reduced

System Alert

The System Alert category has the following options:

- Fault (the default option)
- Warning

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 category 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 option) 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 hard-disk drive (drive 0). If the hard-disk drive is not bootable, the system tries to boot from the Plug and Play network adapters in the order found.

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 category 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 (H/L) (the default)
- Slots First (L/H)

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 options for the System Password category are:

- Not Enabled (the default option)
- 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 setup password in the Setup Password category and then change the Password Status category to Locked. In this state, the system password cannot be changed through the System Password category and cannot be disabled at system start-up by pressing <Ctrl><Enter>.

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

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 options are:

- Not Enabled (the default option)
- 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 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 categories can be set to Auto (the default option) 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 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. This category 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 Enhanced 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 this category 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 option) 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 and tape 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.

Speaker

Speaker determines whether the onboard speaker is On (the default) or Off. A change to this category takes effect immediately (rebooting the system is not required).

Primary SCSI and Secondary SCSI

Primary SCSI 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 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 Categories

The following categories, 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 this category 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 the System Password category 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 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 the System Password category.

When a system password is assigned, the option shown in the System Password category is Enabled. When the system password feature is disabled by a jumper setting

on the system board, the option 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 setting), the option shown for the System Password category is Not Enabled. *Only when this category is set to Not Enabled can you assign a system password*, using the following procedure:

1. **Verify that the Password Status category is set to Unlocked.**

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

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

   The category 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 placeholder 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 pressing the reset button or by turning the system off and then on again.

Using Your System Password to Secure Your System

Whenever you turn on your system, press the reset button, or reboot the system by pressing the <Ctrl><Alt><Del> key combination, the following prompt appears on the screen when the Password Status category 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 the Password Status category 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 the Password Status category 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 the Setup Password category is set to Not Enabled. To assign a setup password, highlight the Setup Password category 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, the Setup Password setting changes to Enabled. The next time you enter the System Setup program, the system prompts you for the setup password.

A change to the Setup Password category 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 categories.

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

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

- You can still modify the Date, Time, CPU Speed, Num Lock, and Speaker categories.
- If System Password is not enabled and is not locked via the Password Status category, you can assign a system password (however, you cannot disable or change an existing system password).

NOTE: You can use the Password Status category 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 the Setup Password category, 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 until you remove the computer cover, change the password jumper setting to disable the passwords, and erase the existing passwords.

To disable a forgotten password, perform the following steps:

1. **Remove the computer cover according to the instructions in "Removing the Computer Covers" in Chapter 6.**

CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

2. **Remove the jumper plug from the PASSWD jumper to disable the password feature.**

   See Figure 6-6 for the location of the password jumper (labeled "PASSWD") on the system board. Refer to "Jumpers and Switches—A General Explanation" in Appendix B of the *Installation and Troubleshooting Guide* for information about the system's jumpers.

3. **Replace the computer cover.**

4. **Reconnect your computer and peripherals to their power sources, and turn them on. Proceed to step 5 if you want to assign a new password.**

   Booting your system with the PASSWD jumper plug removed erases the existing password(s).

NOTE: Before you assign a new system and/or setup password, you must replace the PASSWD jumper plug.

5. **Repeat step 1.**

6. **Replace the PASSWD jumper plug.**

7. **Replace the computer cover, and then reconnect the computer and peripherals to their power sources and turn them on.**

   Booting with the PASSWD jumper installed reenables the password feature. When you enter the System Setup program, both password categories appear as Not Enabled, meaning that the password feature is enabled but that no password has been assigned.

8. **Assign a new system and/or setup password.**

   To assign a new system password, see "Assigning a System Password" found earlier in this chapter. To assign a new setup password, see "Assigning a Setup Password" found earlier in this chapter.

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 Peripheral Component Interconnect (PCI) expansion cards and can tell you how to configure non-Plug and Play Industry-Standard Architecture (ISA) expansion cards manually by setting jumpers or switches. 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 add, reposition, or remove Industry-Standard Architecture (ISA) expansion cards, add or remove memory, or change settings for built-in devices, you must run the Resource Configuration Utility, 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 ISA and PCI Expansion Cards" in Chapter 5 for more information about how PCI devices are configured based on settings in the Resource Configuration Utility.

Configuring ISA and PCI Expansion Cards

Whenever you add, remove, or reposition an ISA expansion card, use the RCU to reconfigure your system. The utility reads the card's corresponding configuration file (**.cfg** file), which describes the card's characteristics and required system resources, and then uses this information to create a conflict-free configuration.

The RCU is PCI-aware and can also 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.

If the RCU is not aware of an installed ISA expansion card, resource conflicts can arise. *For this reason, it is extremely important to enter information about ISA expansion cards into the RCU.* In addition, certain ISA graphics adapter cards and multiport serial cards require some memory or caching reconfiguration provided by the RCU

How to Run the Resource Configuration Utility

The RCU is included on the *Dell Server Assistant* CD shipped with your system. This CD includes an RCU directory that contains the main program plus a directory of **.cfg** files for many—but not all—ISA expansion cards.

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.

When you buy an ISA expansion card, copy the appropriate configuration file (contained in the **.cfg** directory on the diskette) to your RCU diskette. If the **.cfg** directory does not contain a configuration file for your ISA expansion card, use the generic ISA card configuration file, which is included in the **.cfg** directory on the CD. Instructions for using the generic **.cfg** file are included in "Adding an Expansion Card" found later in this chapter.

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

CAUTION: You *must* use the RCU when you add an ISA expansion card to your computer. For an ISA card, use the specific configuration file for your expansion card, if one is available, rather than the generic ISA card configuration file. The generic ISA card configuration file cannot be used to identify potential resource conflicts or proper jumper and switch settings.

When to Run the Resource Configuration Utility

Whenever you add or remove non-Plug and Play ISA expansion cards, you must run the RCU to ensure that no two cards attempt to use the same resources (such as interrupt request [IRQ] lines).

Run the program *before* adding or removing any non-Plug and Play ISA expansion cards. The RCU can identify and resolve any resource conflicts and indicate the proper

jumper and switch settings for each expansion card to avoid such conflicts. Running the program first helps you determine how to configure a non-Plug and Play ISA expansion card before you install it in your computer.

After you have run the RCU for your non-Plug and Play ISA expansion cards and it 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 Resource Configuration Utility

NOTES: Your system's default hardware configuration allows updating of the configuration information. However, if the ISA_CLR jumper on the system board is installed, the configuration information cannot be updated until the jumper plug is removed.

If you have reason to think the jumper setting has been changed, check the jumper before attempting to make a configuration change. For information on the ISA_CLR jumper location and settings, see Figure B-1 and Table B-1, respectively, in the Installation and Troubleshooting Guide.

If you are running the RCU from your hard-disk drive, remove any 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. Later, if a card is added, removed, or repositioned, you must follow the procedure described in "Step 2: Add or Remove Boards" found later in this chapter.

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

   ***To run the program from your hard-disk drive*, switch to the** c:\rcu **subdirectory, 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 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 system 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 or any ISA expansion cards that will be installed in your computer's expansion slots.

Main Menu

The following five 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 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 information 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

When you select the Step 2: Add or Remove Boards option, the RCU lists all the expansion slots in your computer. (You may have to press <Page Down> to view the entire list.)

If you copied a card's configuration file to your RCU diskette or to the RCU configuration subdirectory (**rcu**) on your hard-disk drive, the card name appears in the expansion slot in which the card is installed.

The first time you run the RCU, select Step 2: Add or Remove Boards to verify that the system has detected and acknowledged any expansion cards Dell installed when you purchased your system. Use this option whenever you add or remove an expansion card and every time you reposition a card from one expansion slot to another in your computer.

To add, reposition, or remove an expansion card, highlight the corresponding expansion slot and press <Ins> to add, <F7> to reposition, or <Del> to remove the card. The utility guides you through the steps required to add, remove, or reposition a card's configuration file within the RCU. If there are no resource conflicts, the system configuration information is saved to a system configuration (**.sci**) file when you exit the utility.

Adding an Expansion Card

Before you add an ISA expansion card, you must add the card's **.cfg** file to the utility. Configuration information for PCI expansion cards is contained within the card, so no **.cfg** file is required.

*NOTE: Use the following procedure **before** an ISA expansion card is installed. See "When to Run the RCU" found earlier in this chapter for more detailed information.*

1. **Start the RCU as described in "Starting the RCU" found earlier in this chapter.**
2. **At the Main Menu, select Configure Computer.**
3. **At the Steps in Configuring Your Computer menu, select Step 2: Add or Remove Boards.**

   A list of expansion slots and the cards installed in them appears on the screen.
4. **Highlight the expansion slot in which the card will be installed, press <Ins>, and follow the online instructions.**

   If the utility asks for the option configuration diskette, insert the diskette that accompanied your expansion card.

   If the utility asks for the system configuration diskette, insert your RCU diskette.

   If the utility asks for the **.cfg** file library diskette, insert the diskette of **.cfg** files.
5. **From the list of configuration files listed by the utility, choose the one that corresponds to the card you want to add.**

   The utility asks you to confirm your choice, and then it prompts you to select the expansion slot in which the card will be installed.

   If you are adding an ISA expansion card, insert your **.cfg** diskette to find the **.cfg** file for that card. If the **.cfg** file for the expansion card you are installing is not on the diskette, select Generic ISA Board from the list of configuration files.

   *NOTE: Alternatively, if you know the resources used by the expansion card, you can press <F5> and bring up a menu that lets you create the **.cfg** file.*

   For all ISA expansion cards, use the Step 4: Examine Switches or Print Report option (under the Steps in Configuring Your Computer menu) to check the switch and jumper settings on the new card. Configure the new card as indicated before it is installed in your computer.
6. **Press <F10>, select Step 5: Save and Exit, and follow the online instructions to save the current system configuration information.**

   Remember to save a printout or written copy of your new configuration. The utility may prompt you to check the jumper and switch settings on the new card. Follow the online instructions to see an illustration of the new card's settings.

Repositioning an Expansion Card

Use the following procedure *before* an ISA expansion card is repositioned but *after* a PCI expansion card is repositioned. See "When to Run the Resource Configuration Utility" found earlier in this chapter for more detailed information.

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 2: Add or Remove Boards.**

   A list of expansion slots and the cards in them appears on the screen.

4. **Highlight the name of the card you want to reposition, press <F7>, and follow the online instructions.**

5. **Press <F10>, select Step 5: Save and Exit, and follow the online instructions to save the current system configuration information.**

   Remember to save a printout or written copy of the new information.

Removing an Expansion Card

Use the following procedure *before* an ISA expansion card is removed but *after* a PCI expansion card is removed. See "When to Run the Resource Configuration Utility" found earlier in this chapter for more detailed information.

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 2: Add or Remove Boards.**

   A list of expansion slots and the cards installed in them appears on the screen.

4. **Highlight the name of the card you want to remove, press <Del>, and follow the online instructions.**

5. **Press <F10>, select Step 5: Save and Exit, and follow the online instructions to save the current system configuration information.**

   Remember to save a printout or written copy of the new information.

If there are no resource conflicts, the configuration information is saved to a system configuration (**.sci**) file when you exit the utility. If there is a resource conflict, you must resolve it before completing the configuration. For more information, see "Resolving Resource Conflicts" found later in this chapter.

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 configuration, 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 highlight the option and press <Enter>.

NOTES: Several system board categories allow you to edit such resources as memory address, I/O ports, IRQs, 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 category, 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.**

The following system board options are available on the View or Edit Details screen (see Figure 5-1):

System - Dell System PowerEdge 2300

- RS-232 COM Port 1
- RS-232 COM Port 2
- Parallel Port
- Floppy Controller
- Mouse Controller

- PCI 3 - Adaptec Ultra/Ultra Wide SCSI Ctrlr
  - PCI Function 1
- Embedded - PCI Host Bridge
  - PCI Function 1
- Embedded - PCI-PCI Bridge - Bus 1
  - PCI Function 1
- Bus 1, 0 - PCI VGA Controller
  - PCI Function 1
  - Standard VGA Resources
- Embedded - DEC PCI-PCI Bridge (21152)
  - PCI Function 1
- Bus 2, 4 - Adaptec AIC-7890 SCSI Ctrlr
  - PCI Function 1
- Bus 2, 6 - Adaptec AIC-7860 SCSI Ctrlr
  - PCI Function 1

NOTE: You can clear the system configuration parameters from NVRAM by placing a jumper on the ISA_CLR jumper pins and then booting the system with the jumper in place. See Table B-1 in the Installation and Troubleshooting Guide *for information about the jumper.*

System - Dell System PowerEdge 2300

```
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

PCI 3 - Adaptec Ultra/Ultra Wide SCSI Ctrlr
     PCI Function 1                        Enabled

Embedded - PCI Host Bridge
     PCI Function 1                        Enabled

Embedded - PCI-PCI Bridge - Bus 1
     PCI Function 1                        Enabled

Bus 1,0 - PCI VGA Controller
     PCI Function 1                        Enabled
     Standard VGA Resources                Enabled

Embedded - DEC PCI-PCI Bridge (21152)
     PCI Function 1                        Enabled

Bus 2,4 - Adaptec AIC-7890 SCSI Ctrlr
     PCI Function 1                        Enabled

Bus 2,6 - Adaptec AIC-7860 SCSI Ctrlr
     PCI Function 1                        Enabled
```

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

Step 4: Examine Switches or Print Report

The Step 4: 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>. For ISA expansion cards, it is important to compare the jumper and switch settings listed on the screen to the actual settings on the card.

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 5: 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 displays.

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 copy **.cfg** files and delete **.sci** and **.cfg** files from your RCU diskette, your diskette of **.cfg** files, 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 setting 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: The RCU ignores the Lock/Unlock Boards setting for the PCI host bridge and the PCI-PCI bridge devices.

View Additional System Information Menu

The RCU contains detailed information about the system board, the ISA expansion cards installed in your computer, 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 knowledgeable, 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.

However, resource conflicts between ISA expansion cards are routine. 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, the card you just installed is 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 want to remove the card, press <Del> and follow the online instructions. Remove the card from your computer when the utility prompts you to do so. (For instructions on removing the expansion card, see "Removing an Expansion Card" in Chapter 8 of the *Installation and Troubleshooting Guide*.)

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.**

Removing a Card That Conflicts With the Card You Just Installed

If there is a resource conflict between two ISA expansion cards and you want to remove the card that conflicts with the one you just installed, use the following procedure:

1. **From the Steps in Configuring Your Computer menu, select Step 2: Add or Remove Boards and press <Enter>.**

   From the list of expansion slots and cards, select the card in conflict with the one installed, and press <Del>. When the utility asks you to confirm your command, press <Enter>. Then press <Esc> to return to the Steps in Configuring Your Computer menu.

2. **Select Step 5: Save and Exit, and press <Enter>.**

3. **Select Save the Configuration and Restart the Computer, and press <Enter>.**

   The system reboots with the new system configuration information.

4. **If you deleted an expansion-card configuration file from the previously saved system configuration information, remove the card from your computer.**

   For instructions on removing the expansion card, see "Removing an Expansion Card" in Chapter 8 of the *Installation and Troubleshooting Guide*.

CHAPTER 6
Working Inside Your Computer

Your Dell computer system supports a variety of internal options that expand system capabilities. This chapter tells you how to remove the computer cover and familiarizes you with the internal components you may handle if you install Dell hardware options. For instructions on installing internal components such as expansion cards, system board options, and tape and CD-ROM drives, refer to the *Installation and Troubleshooting Guide*.

Before Your Begin

To make working inside your computer easier, make sure you have adequate lighting and a clean work space. If you should have to disconnect cables or remove expansion cards temporarily, note the location and orientation of each component so that you can reassemble the system correctly.

You will use the information in this section every time you install a hardware option inside your computer. Read this section carefully, because the information is not repeated elsewhere in this guide.

Safety First—For You and the Computer

The procedures in this guide require that you remove the covers and work inside the computer. While working inside the computer, do not attempt to service the computer except as explained in this guide and elsewhere in Dell documentation. Always follow the instructions closely.

Working inside the computer is safe—if you observe the following precautions.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF THE EQUIPMENT

Before starting to work on the computer, perform the following steps in the sequence listed:

1. **Turn off the computer and all peripherals.**
2. **Disconnect the computer, peripherals, and power supplies from their power sources. Also disconnect any telephone or telecommunication**

lines from the computer. Doing so reduces the potential for personal injury or shock.

3. **Touch an unpainted metal surface on the computer chassis, such as the power supply, before touching anything inside the computer.**

4. **While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components.**

In addition, Dell recommends that you periodically review the safety instructions at the front of this guide.

Removing and Replacing the Computer Covers

To troubleshoot problems inside the computer, you need to remove one or both of the computer covers.

Computer Orientation

When following the procedures in this guide, assume that the locations or directions relative to the computer are as shown in Figure 6-1

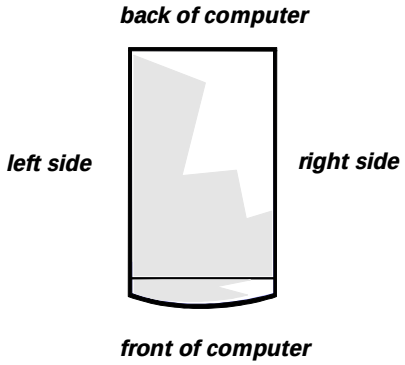


Figure 6-1. Computer Orientation

Removing the Computer Covers

Use the following procedure to remove the computer covers:

1. **Observe the precautions in "Safety First—For You and the Computer" found earlier in this chapter. Also observe the safety instructions at the front of this guide.**

2. **Turn the keylock on the front bezel of the computer to the unlocked position.**

3. **Grasp the bezel on either side of the external drive bays and pull it slightly away from the chassis to release the two detents on the back of the bezel.**

4. **Pivot the bezel downwards (see Figure 6-2) until it is at right angles to the computer chassis.**

5. **Grasp the bezel along the edge adjacent to the computer chassis, and unsnap the bezel to remove it from the chassis.**

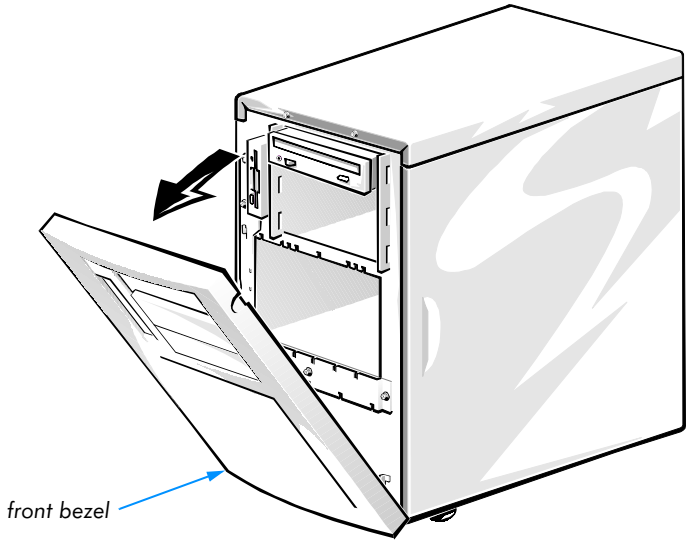


Figure 6-2. Opening the Front Bezel

6. **Loosen the three thumbscrews along the front edge of one of the side covers (see Figure 6-3).**

7. **Slide one cover a half-inch (about a centimeter) or so toward the front of the computer, grasping the top of the cover at both ends. Rotate the top edge of the cover away from the chassis, and lift it away from the chassis.**

8. **Repeat steps 6 and 7 to remove the remaining side cover, if necessary.**

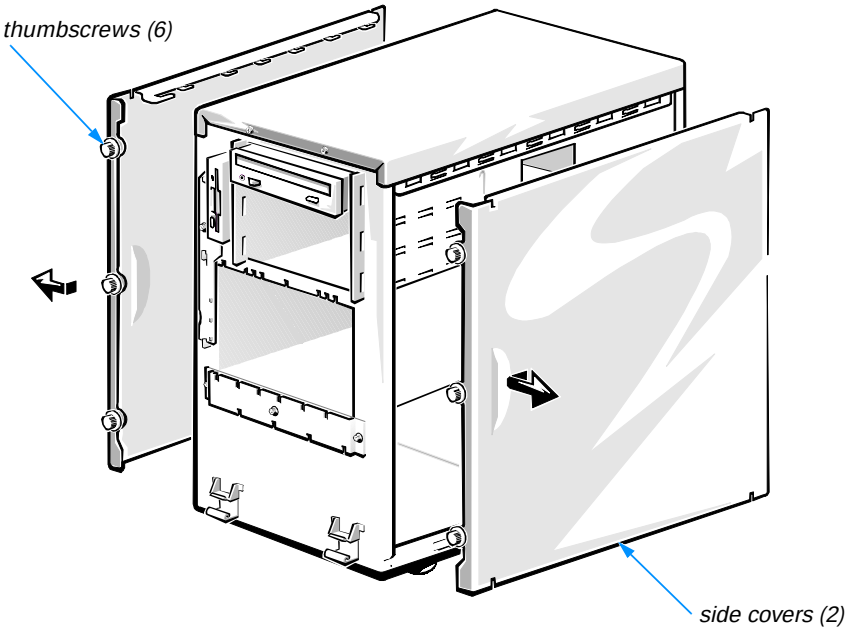


Figure 6-3. Removing the Computer Covers

Replacing the Computer Covers

Use the following procedure to replace a computer cover:

1. **Check all cable connections, especially those that might have come loose during your work. Fold cables out of the way so that they do not catch on the computer cover.**

   CAUTION: Make sure that there are no cables or cable connectors lying on the top diskette drive in the upper drive cage. Foreign objects on top of the drive can interfere with drive operation and permanently damage the drive.

2. **Check that no tools or extra parts (including screws) are left inside the computer.**
3. **Fit the cover over the side rail at the bottom of the chassis, and slide it closed.**
4. **Secure the cover with the three thumbscrews.**
5. **Make sure the keylock is in the unlocked position.**
6. **Snap the tabs at the inside bottom of the computer bezel into the metal catches on the chassis, and pivot the bezel upward into the closed position.**
7. **Set the keylock to the locked position.**

Inside the Chassis

In Figure 6-4 the right computer cover is removed to provide interior views from the right sides. This illustration also identifies features on the front of the computer. Refer to these illustrations to locate interior features and components discussed later in this guide.

When you look inside the computer, note the *direct current (DC) power cables* leading from the power supply. These cables supply power to the system board, small computer system interface (SCSI) backplane board, externally accessible drives, and any expansion cards that connect to external peripherals.

The wide, flat ribbon cable is the *interface cable* for internal drives. For non-SCSI drives, an interface cable connects each drive to an interface connector on the system board or on an expansion card. For SCSI devices, two interface cables connect externally accessible SCSI devices and the SCSI backplane board to a SCSI host adapter either on the system board or on an expansion card.

The *system board*—the large, vertical, printed circuit board at the left side of the chassis—holds the computer's control circuitry and other electronic components (see Figure 6-5). Some hardware options are installed directly on the system board. The *external drive bays* provide space for up to three half-height 5.25" drives, typically CD-ROM drives or tape drives. The diskette drive bay holds a 3.5" diskette drive. The *internal drive bays* provide space for up to six SCSI hard-disk drives. These hard-disk drives are connected to a SCSI host adapter on the system board or on an expansion card, via the *SCSI backplane board*.

During an installation or troubleshooting procedure, you may be required to change a *jumper* or switch setting on the system board, an expansion card, or a drive. Figure 6-6 shows the location of the system board jumpers. For more information about the system board jumpers, see Appendix B, "Jumpers and Switches," in the *Installation and Troubleshooting Guide*

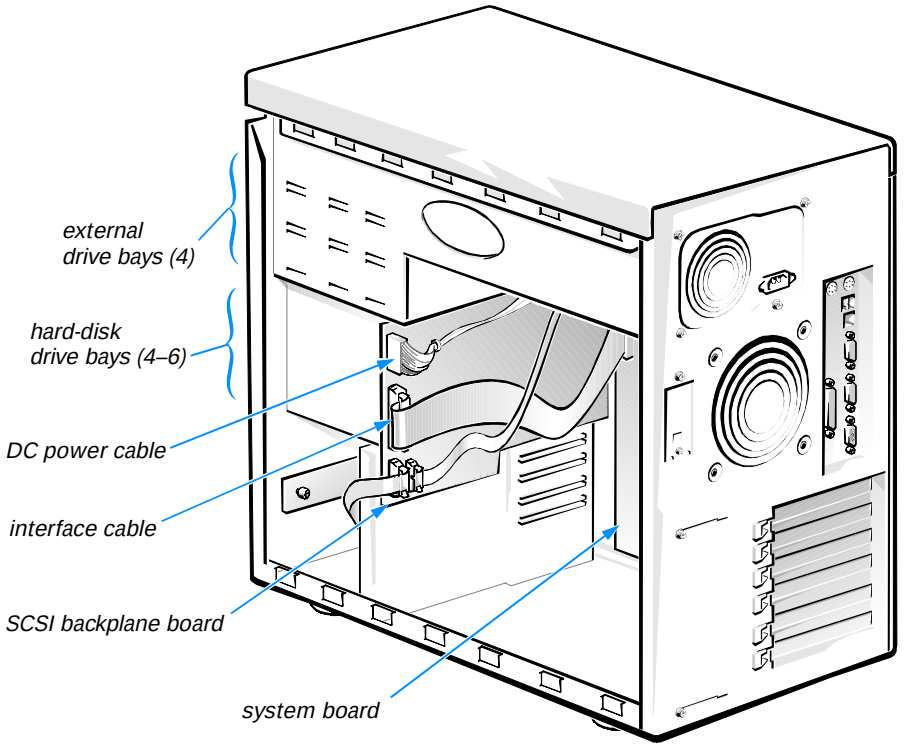


Figure 6-4. Inside the Chassis—Back/Right Side View

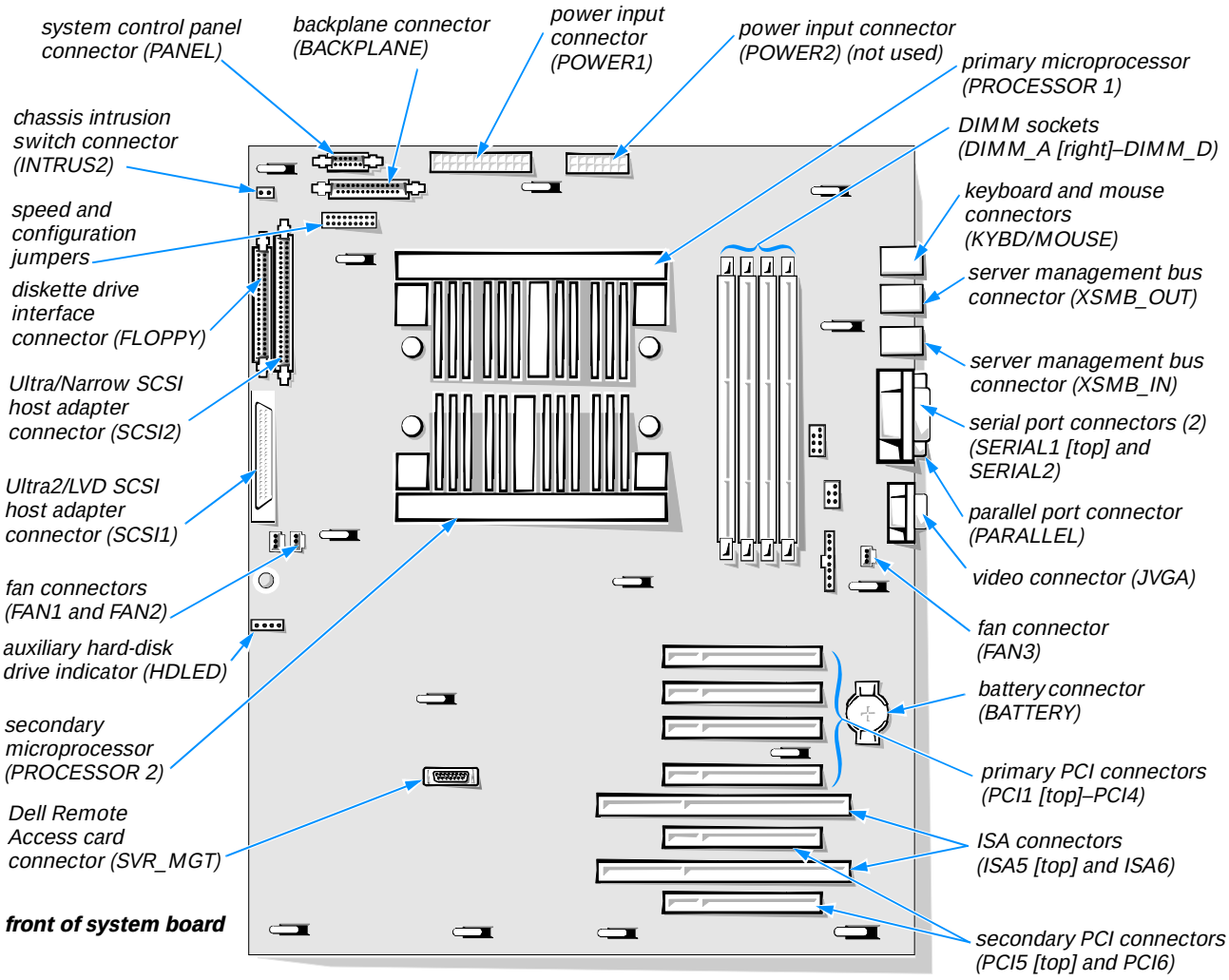


Figure 6-5. System Board Features

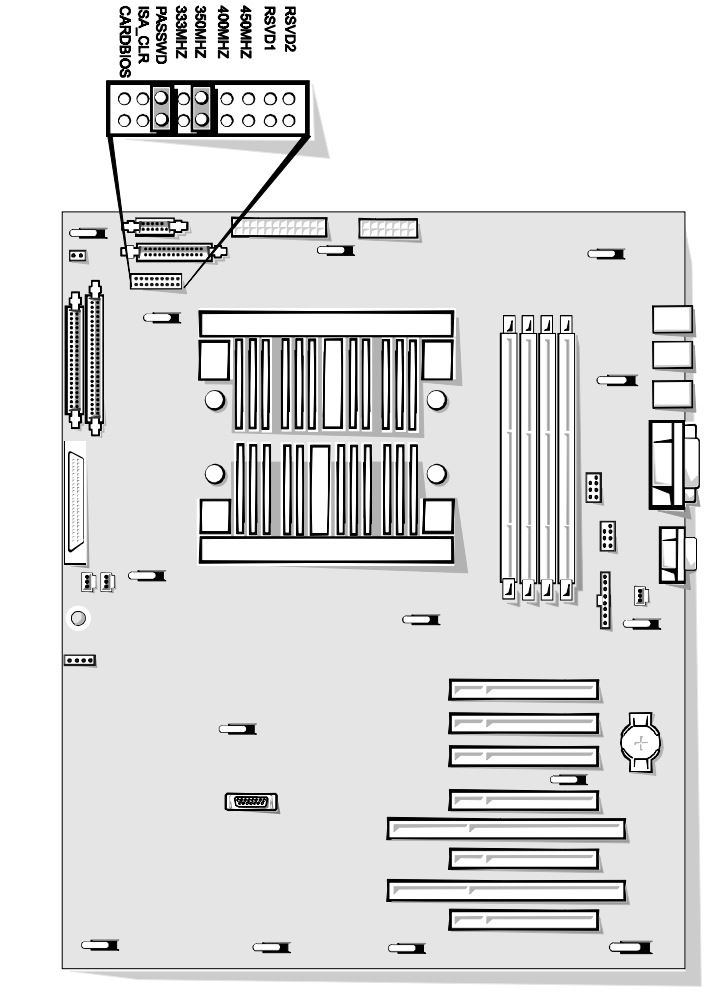


Figure 6-6. System Board Jumpers

CHAPTER 7
Installing SCSI Hard-Disk Drives

This chapter describes how to install and configure small computer system interface (SCSI) hard-disk drives in the computer's internal drive bays. For information on installing SCSI CD-ROM drives and SCSI tape drives in the external drive bays, see Chapter 9, "Installing Drives in the External Bays," in the *Installation and Trouble-shooting Guide*.

Dell PowerEdge 2300 systems include a SCSI backplane board, which greatly simplifies cabling and configuration for SCSI hard-disk drives. SCSI identification (ID) and termination for SCSI hard-disk drives are both configured by the SCSI backplane board, rather than on individual drives.

Three SCSI backplane board options are available, as shown in Table 7-1

Figure 7-1 illustrates the internal drive bays, the 1 x 6 hot-pluggable SCSI backplane board, and the Ultra2/LVD SCSI interface cable. The Ultra2/LVD SCSI interface cable has two connectors:

- The connector at one end attaches to the Ultra2/LVD SCSI host adapter connector labeled "SCSI1" on the system board, or to an optional SCSI host adapter card such as the Dell PowerEdge Expandable RAID Controller host adapter card.
- The connector at the other end of the cable attaches to the connector labeled "SCSIA" on the SCSI backplane board.

Table 7-1. SCSI Backplane Board Characteristics

Backplane Type	Hot-pluggable Drive Support	Duplexing Support	Hard-Disk Drive Size	Drive Indicator Code Support
2 x 2 back-plane board	No	Yes	16-inch drives	No
2 x 3 back-plane board	No	Yes	1-inch drives	No
1 x 6 back-plane board	Yes*	No	1-inch drives	Yes

* *Backplane board must be controlled by the Dell PowerEdge Expandable RAID Controller host adapter card.*

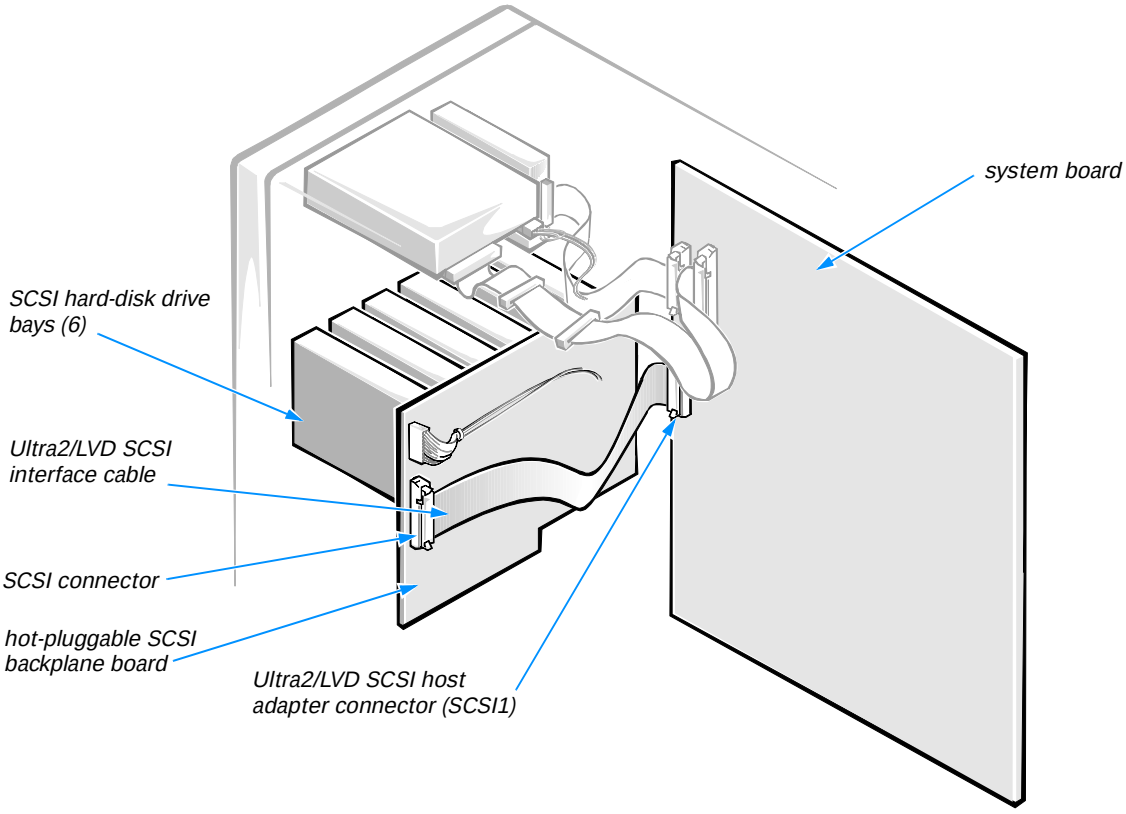


Figure 7-1. Internal Drive Hardware

Installing SCSI Hard-Disk Drives in the Internal Drive Bays

SCSI hard-disk drives are supplied by Dell in special drive carriers that fit in the internal drive bays (see Figure 7-3).

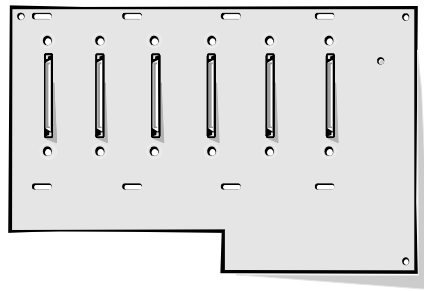
NOTES: For maximum performance, install Ultra2/LVD drives exclusively. Although you can install a mixture of Ultra2/LVD and Ultra hard-disk drives, they will operate at the slower Ultra transfer rate.

Dell recommends that you use only drives that it has tested and approved for use with the SCSI backplane board.

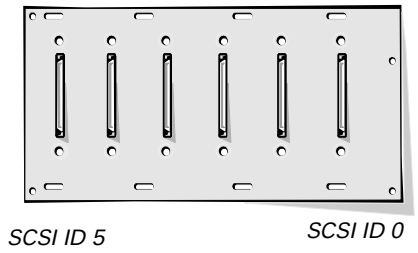
SCSI Hard-Disk Drive Configuration

The SCSI drive must be configured as follows:

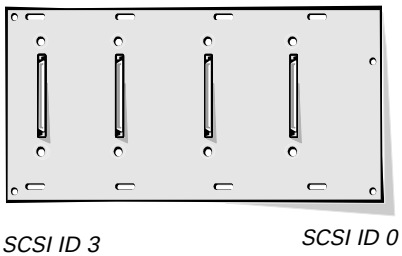
- Disable termination on the drive. The SCSI backplane board provides termination for the SCSI bus.
- Set the SCSI ID on all drives to 0. All SCSI ID numbers for the drives are set by the SCSI backplane board, as shown in Figure 7-2.
- Configure the drive so that the drive motor waits for a Start Unit command from the SCSI host adapter before spinning.



1 x 6 hot-pluggable SCSI backplane board



2 x 3 non–hot-pluggable SCSI backplane board



2 x 2 non–hot-pluggable SCSI backplane board

Figure 7-2. SCSI Hard-Disk Drive ID Numbering

Partitioning and Formatting SCSI Hard-Disk Drives

You may need to use different programs than those provided with the operating system to partition and format SCSI hard-disk drives. See Chapter 3, "Installing and Configuring SCSI Drivers," for information and instructions.

Formatting High-Capacity SCSI Hard-Disk Drives

When formatting a high-capacity SCSI hard-disk drive, be sure to allow enough time for the formatting to complete. Long format times for these drives are normal. A 9-gigabyte (GB) hard-disk drive can take up to 2.5 hours to format.

CAUTION: Do not turn off or reboot your system while the drive is being formatted. Turning off or rebooting your system while the drive is being formatted can cause a drive failure.

Installing and Removing SCSI Hard-Disk Drives

The following subsections describe how to remove and install SCSI hard-disk drive carriers in the computer's internal drive bays.

Hot-Pluggable SCSI Hard-Disk Drives

Dell PowerEdge 2300 systems with a PowerEdge Expandable RAID Controller host adapter card *and* a 1 x 6 hot-pluggable SCSI backplane board installed support hot-pluggable drive installation and removal.

Before attempting to remove or install a drive while the system is running, see the documentation for the PowerEdge Expandable RAID Controller host adapter card to ensure that the SCSI host adapter is configured correctly to support hot-pluggable drive removal and insertion.

CAUTION: Hot-pluggable drive installation and removal is *not* supported for systems *without* a PowerEdge Expandable RAID Controller host adapter card. Removing a drive in this situation will result in a loss of data.

Indicator Codes For Hot-Pluggable SCSI Hard-Disk Drives

If a 1 x 6 hot-pluggable SCSI backplane board is installed in the Dell PowerEdge 2300 system, three light-emitting diode (LED) indicators adjacent to each of the six SCSI hard-disk drive bays provide information on the status of the SCSI hard-disk drives (see Figure 7-3). The SCSI backplane board firmware controls the drive online and drive failure indicators.

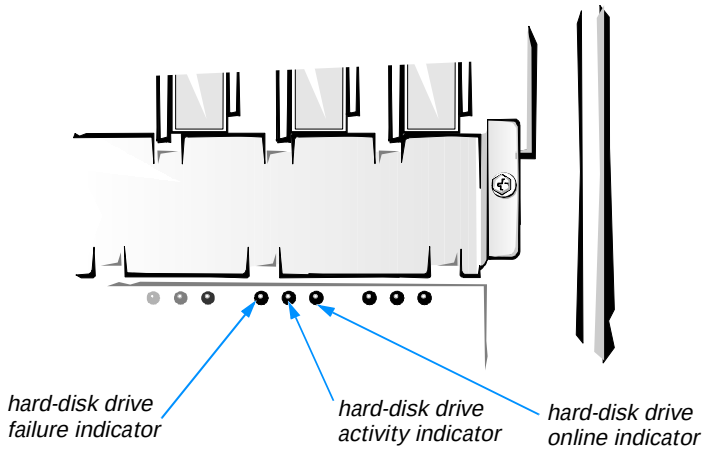


Figure 7-3. Hard-Disk Drive Indicators

Table 7-2 lists the drive indicator patterns established by the SCSI backplane board firmware. Different patterns are displayed as drive events occur in the system. For example, in the event of a hard-disk drive failure, the "drive failed" pattern appears. After the drive is selected for removal, the "drive being prepared for removal" pattern appears, followed by the "drive ready for insertion or removal" pattern. After the replacement drive is installed, the "drive being prepared for operation" pattern appears, followed by the "drive online" pattern.

NOTE: If you do not have a Dell PowerEdge Expandable RAID Controller host adapter card installed, you will see only the "drive online" and "drive bay empty" indicator patterns.

Table 7-2. SCSI Hard-Disk Drive Indicator Patterns

Condition	Indicator Pattern
Identify drive	All three drive status indicators blink simultaneously.
Drive being prepared for removal	The three drive status indicators flash sequentially.
Drive ready for insertion or removal	All three drive status indicators are off.
Drive being prepared for operation	The drive online indicator is on. The drive activity light may flash briefly.
Drive bay empty	All three drive status indicators are off.
Drive predicted failure	The drive online indicator is on. The drive failure indicator blinks on briefly each second.

Table 7-2. SCSI Hard-Disk Drive Indicator Patterns *(continued)*

Condition	Indicator Pattern
Drive failed	The drive online indicator turns off. The drive failure indicator blinks off briefly each second.
Drive rebuilding	The drive online indicator blinks rapidly.
Drive online	The drive online indicator is on.

Installing a SCSI Hard-Disk Drive

Install a SCSI hard-disk drive in an internal drive bay as follows:

1. **If the computer does not support hot-pluggable hard-disk drives, shut down the system.**
2. **Open the computer's bezel.**
3. **If a non–hot-pluggable SCSI backplane board is installed in the computer, release the locking bar in front of the hard-disk drive carriers.**
4. **With the hard-disk drive facing towards the right-hand side of the computer (or facing downwards in rack-mounted systems), align the edge of the carrier with a notch in the hard-disk drive bay key and insert the carrier into the drive bay (see Figure 7-4).**

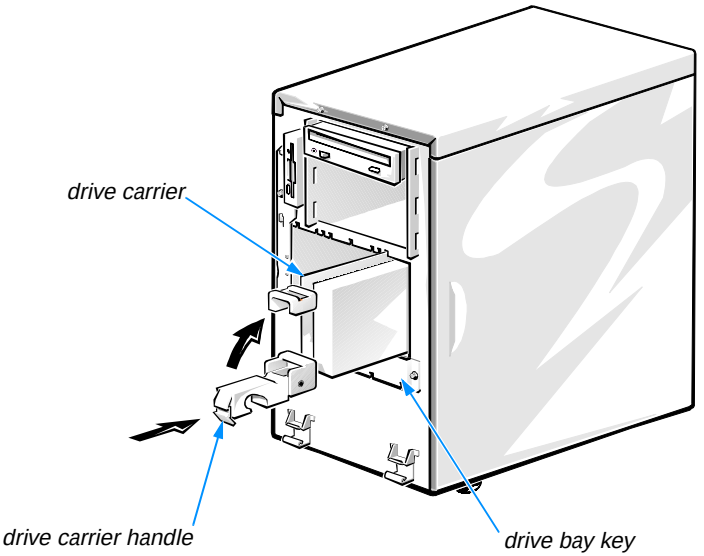


Figure 7-4. Installing a SCSI Hard-Disk Drive Carrier

5. **Close the drive carrier handle until it clicks to lock the drive in place.**

6. **Close the locking bar (non–hot-pluggable backplane systems only) and computer bezel.**

7. **Install any required SCSI device drivers.**

   See Chapter 3, "Installing and Configuring SCSI Drivers," for information.

8. **If the hard-disk drive is a new drive, run the SCSI Devices Test Group in the Dell Diagnostics.**

   See Chapter 5, "Running the Dell Diagnostics," in the *Installation and Trouble-shooting Guide* for more information.

Removing a SCSI Hard-Disk Drive

Remove a SCSI hard-disk drive from an internal drive bay as follows:

1. **If the computer does not support hot-pluggable hard-disk drives, shut down the system.**

2. **Open the computer's front bezel.**

3. **If a non–hot-pluggable SCSI backplane board is installed in the computer, release the locking bar in front of the hard-disk drive carriers.**

4. **For hot-pluggable SCSI hard-disk drives, wait until the drive status indicators adjacent to the drive bay signal that the drive may be removed safely.**

   If the drive has been online, the drive status indicators flash sequentially as the drive is powered down.

   When all indicators are turned off, the drive is ready for removal.

5. **Press the tab on the drive-carrier handle, and open to release the carrier (see Figure 7-4).**

6. **Slide the carrier toward you until it is free of the drive bay.**

7. **Close the locking bar (non–hot-pluggable backplane systems only) and computer bezel.**

Configuring a 2 x 2 or 2 x 3 SCSI Non–Hot-Pluggable Backplane Board

You can configure a 2 x 2 or 2 x 3 non–hot-pluggable SCSI backplane board as a split backplane board or a single backplane board, depending on how the backplane board is connected. (Figures B-3 and B-4 in Appendix B, "Jumpers and Switches," show the location of the connectors on the SCSI backplane boards.)

Configuring a Non–Hot-Pluggable Backplane Board as a Split Backplane

To configure a 2 x 2 or 2 x 3 SCSI backplane board as a split backplane, connect the backplane board to two SCSI channels, such as:

- The computer's on-board Ultra2/LVD host adapter and a SCSI host adapter card
- A SCSI host adapter card with two SCSI channels, such as the PowerEdge Expandable RAID Controller card
- Two SCSI host adapter cards

In split-backplane mode, the drives connected to the backplane board are divided as follows:

- On a 2 x 2 backplane board, the SCSI channel attached to connector SCSIA on the SCSI backplane board supports SCSI slots 0 and 1 (see Figure 7-2). The SCSI channel attached to connector SCSIB on the backplane board supports SCSI slots 2 and 3.
- On a 2 x 3 backplane board, the SCSI channel attached to connector SCSIA on the SCSI backplane board supports SCSI slots 0, 1, and 2 (see Figure 7-2). The SCSI channel attached to connector SCSIB on the backplane board supports SCSI slots 3, 4, and 5.

The system automatically configures the backplane board as a split backplane if two SCSI interface cables are connected—no jumper or software changes are required.

Configuring a Non–Hot-Pluggable Backplane Board as a Single Backplane

To configure a 2 x 2 or 2 x 3 non–hot-pluggable SCSI backplane board as a single backplane, connect the backplane board to the computer's on-board Ultra2/LVD host adapter, using connector SCSIA on the SCSI backplane board.

Configuring the Boot Device

If you plan to boot the system from a hard-disk drive, the drive must be attached to the primary (or boot) controller or SCSI host adapter card. The primary controller is automatically determined by the specific system configuration. In descending order of precedence, the system boot order is CD-ROM, diskette, PCI1, PCI2, PCI3, PCI4, PCI5, PCI6, and built-in SCSI host adapter (supporting the internal drives).

APPENDIX A
Technical Specifications

Table A-1. Technical Specifications

Microprocessor	
Microprocessor types	single or dual Intel Pentium II microprocessor with an internal operating frequency of 333, 350, or 400 MHz and an external operating frequency of 66 MHz (333 MHz) or 100 MHz (350 or 400 MHz).
Internal cache	32-KB L1 cache, 512-KB L2 cache
Math coprocessor	internal to microprocessor
Expansion Bus	
Bus type	PCI, ISA bus
Expansion slots	two full-length and two half-length dedicated PCI; two shared, full-length PCI or 8- or 16-bit ISA
Memory	
DIMM sockets	four 168-pin sockets
DIMM capacities	64- and 128-MB unbuffered DIMMs or 256-MB registered DIMMs; must be rated for 100-MHz operation
Standard RAM (minimum)	64 MB
Maximum RAM	1 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, 144-MB diskette drive included with standard system
Tape drive	12 GB and higher
SCSI hard-disk drives	formatted capacities ranging from 4 GB to 18 GB
SCSI devices	built-in Ultra2/LVD SCSI host adapter supporting up to six SCSI hard-disk drives in internal bays; 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 controller	68-pin connector
Ultra/Narrow SCSI controller	50-pin connector
Diskette drive	34-pin connector
SDS_SMB connector	6-pin header connector

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

Table A-1. Technical Specifications (continued)

Video	
Video type	ATI RAGE PRO AGP video controller; VGA connector
Video memory (standard)	2 MB
Power	
AC power supply:	
Wattage	300 W
Voltage	115 V at 60 Hz/230 V at 50 Hz
System battery	CR2032 3-V lithium coin cell
Physical	
Height (with support feet)	43.9 cm (10.3 inches)
Width	26.1 cm (17.3 inches)
Depth	59.2 cm (23.3 inches)
Weight (maximum configuration)	25 kg (55 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

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

Table A-1. Technical Specifications *(continued)*

Environmental	
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.

APPENDIX 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.

I/O Ports and Connectors

The I/O ports and connectors on the back panel of the computer 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 computer'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 computer'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 computer'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.)

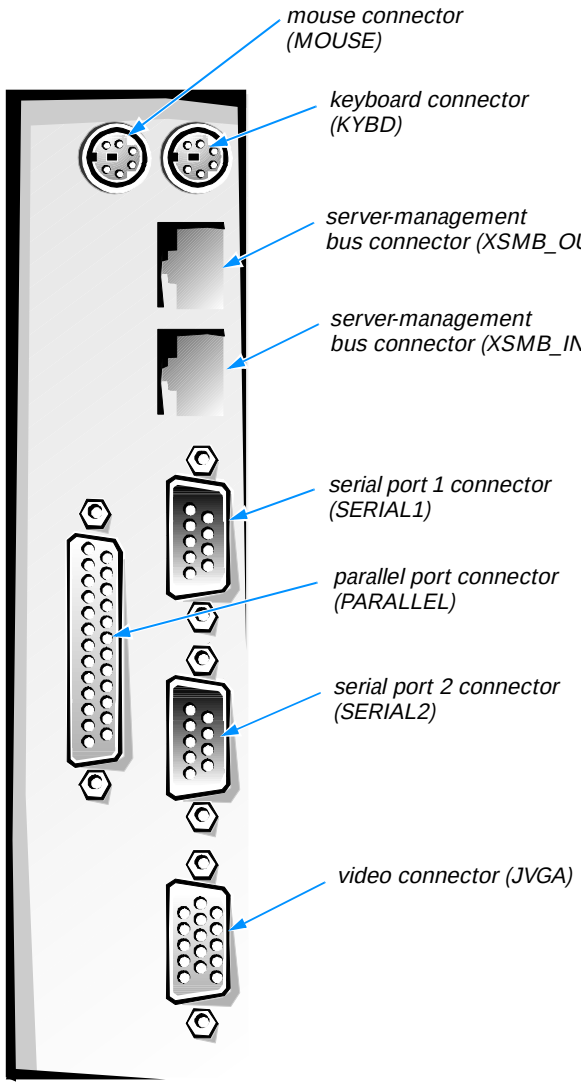


Figure B-1. I/O Ports and Connectors

Adding an Expansion Card Containing Serial or Parallel Ports

The computer 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 computer 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 computer 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 setting, 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.

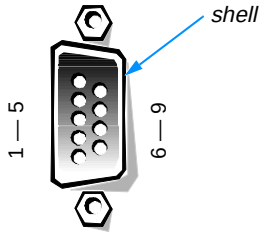


Figure B-2. Pin Numbers for the Serial Port Connectors

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.

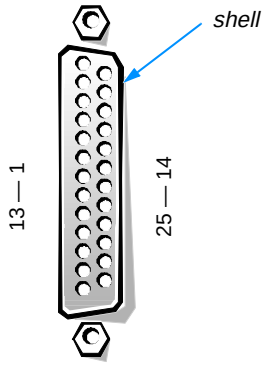


Figure B-3. Pin Numbers for the Parallel Port Connector

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 computer. 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 computer.

Mouse driver software can give the mouse priority with the microprocessor by issuing IRQ12 whenever a new mouse movement is detected. The driver software also passes along the mouse data to the application program 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.

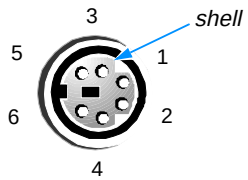


Figure B-4. Pin Numbers for the Keyboard Connector

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.

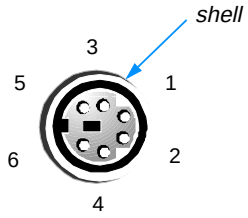


Figure B-5. Pin Numbers for the Mouse Connector

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 computer. 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.

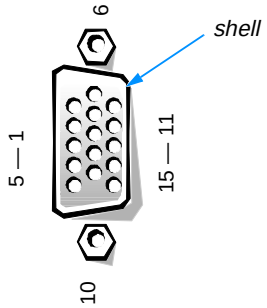


Figure B-6. Pin Numbers for the Video Connector

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

Server-Management Bus Connector

The Server-Management Bus (SMB) connectors (XSMB_IN and XSMB_OUT) are used to daisy-chain servers together so that server management information can be shared between the servers.

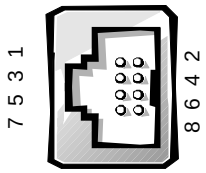


Figure B-7. Pin Numbers for the Server-Management Bus Connector

Table B-6. Pin Assignments for the Server-Management Bus Connector

Pin	Signal	I/O	Definition
1	RS-485 A	I/O	Noninverting receiver input and noninverting driver output
2	RS-485 B	I/O	Inverting receiver input and inverting driver output
3	NC	N/A	No connection
4	NC	N/A	No connection
5	NC	N/A	No connection
6	NC	N/A	No connection
7	NC	N/A	No connection
8	NC	N/A	No connection

APPENDIX 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 affordable devices that can back up data at rates of up to 1.6 megabytes per second (MB/sec) (sustained, with data compression) and can often run unattended. Dell offers tape drives with storage capacities in the range of 12 to 24 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 computer 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 computer by drawing air in through various openings in the computer and blowing it out the back. However, the fan also draws dust and other particles into the computer, 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 computer, thereby reducing the amount of contaminants drawn into the computer by the power supply fan. In particular, you should keep the exterior of your computer 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 computer:

- *A wrist grounding strap* — The proper use of a wrist grounding strap reduces the effect of electrostatic discharge (ESD), which can damage certain computer 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 computer, 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 computer 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 computer and keyboard.

Cleaning the Computer, 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 computer, monitor, and keyboard, follow these steps:

1. **Turn off the computer, 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 computer 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 computer or keyboard.
4. **Use the moistened cloth to wipe the computer 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 computer.

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 computer remain unobstructed, especially the fan vent on the back of the computer.
- 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 computer. 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 computer can result in electrical shorts, which can cause serious damage to the computer.

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 computer 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 computer 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 computer. This corrosion on computer 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 section.

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, which occurs when a person whose body contains such a charge touches a component in the computer. 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 computer, 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 computer.
- Use an antistatic floor mat when working inside the computer.
- 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 computer.
- 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 computer can adversely affect devices such as radio and television (TV) receivers operating near the computer. Radio frequencies emanating from a computer 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 computer 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 computer 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 computer.
- Always use shielded cables with metal connector shells for attaching peripherals to the computer.

To prevent the possibility of RFI from a computer affecting TV reception, follow these guidelines:

- Keep any TV set at least 6 ft away from the computer 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 computer 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 after withstanding a minimum of six consecutively executed shock pulses in the positive and negative x, y, and z axes. 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

Computer 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 computer 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.

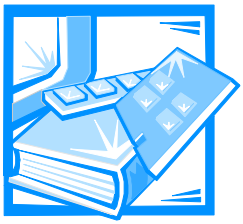
Line Conditioners

Line conditioners go beyond the overvoltage protection of surge protectors. Line conditioners keep a computer'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 Supply

An uninterruptible power supply (UPS) offers the most complete protection against variations in power because it uses 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.



APPENDIX 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.

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 2300*
- Model number: *SMM*
- 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 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 komputerowego, 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 ciasnym 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.

APPENDIX 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 *Diagnostics 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.

NOTE: Before you ship the product(s) to Dell, back up the data on the hard-disk drive(s) and any other storage device(s) in the product(s). Remove any removable media, such as diskettes, CDs, or PC Cards. Dell does not accept liability for lost data or software.

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 within 30 days after the date the replacement part was shipped by Dell and for parts used to repair systems not covered by this limited warranty. In these events, replacement parts will be priced at Dell's then-current standard prices. Payment for these parts is due within 30 days from the date of invoice.

NOTE: 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.

DELL DOES NOT ACCEPT LIABILITY BEYOND THE REMEDIES SET FORTH IN THIS WARRANTY STATEMENT OR LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL

DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR FOR LOST DATA OR SOFTWARE.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE PRECEDING EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

These provisions apply to Dell's U.S. limited three-year warranty only. For provisions of any service contract covering your system, refer to the separate service contract that you will receive.

NOTE: If you chose one of the available warranty and service options in place of the standard limited three-year warranty described in the preceding text, the option you chose will be listed on your invoice.

Limited Three-Year Warranty (Canada 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. This warranty is transferable with the warranted products.

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 *Diagnostics 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 Canada. Shipments to other locations will be made freight collect.

NOTE: Before you ship the product(s) to Dell, back up the data on the hard-disk drive(s) and any other storage device(s) in the product(s). Remove any removable media, such as diskettes, CDs, or PC Cards. Dell does not accept liability for lost data or software.

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, except as may be required by law.

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 Canada. 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 within 30 days after the date the replacement part was shipped by Dell and for parts used to repair systems not covered by this limited warranty. In these events, replacement parts will be priced at Dell's then-current standard prices. Payment for these parts is due within 30 days from the date of invoice.

NOTE: 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 JURISDICTIONS 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 ONE JURISDICTION TO ANOTHER.

DELL DOES NOT ACCEPT LIABILITY BEYOND THE REMEDIES SET FORTH IN THIS WARRANTY STATEMENT OR LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR FOR LOST DATA OR SOFTWARE.

SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE PRECEDING EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

These provisions apply to Dell's Canadian limited three-year warranty only. For provisions of any service contract covering your system, refer to the separate service contract that you will receive.

NOTE: If you chose one of the available warranty and service options in place of the standard limited three-year warranty described in the preceding text, the option you chose will be listed on your invoice.

"Total Satisfaction" Return Policy (U.S. and Canada Only)

If you are an end-user customer who bought products directly from a Dell company, you may return them to Dell up to 30 days from the date of invoice for a refund of the product purchase price if already paid. This refund will not include any shipping and handling charges shown on your invoice. If your organization bought the products from Dell under a written agreement with Dell, there may be different terms for the return of products under this policy, based on your agreement with Dell. To return products, you must call Dell Customer Service at the telephone number shown in the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide* to receive a Credit Return Authorization Number. You must ship the products to Dell in their original packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. You may return software for refund or credit only if the sealed package containing the diskette(s) or CD(s) is unopened. Returned products must be in as-new condition, and all of the manuals, diskette(s), CD(s), power cables, and other items included with a product must be returned with it.

This "Total Satisfaction" Return Policy does not apply to DellWare products, which may be returned under DellWare's current return policy.

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 program
Software designed to help you perform a specific task, such as a spreadsheet or word processor. Application programs 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.

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.

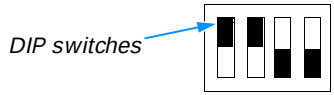
device driver
A device driver allows the operating system or a program to interface correctly with a peripheral, such as a printer or network card. Some device drivers—such as network drivers—must be loaded from the **config.sys** file (with a **device=** statement) or as memory-resident programs (usually, 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**.

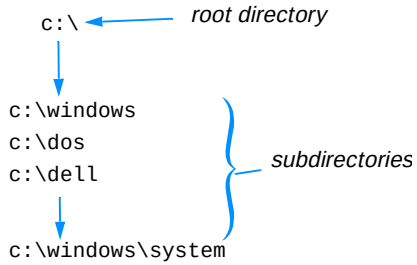
DIMM
Acronym for dual in-line memory module.

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.



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.

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 correction code.

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.

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**.

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.

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.

Kbit(s)
Abbreviation for kilobit(s), 1,024 bits.

Kbit(s)/sec
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.

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).

mm
Abbreviation for millimeter(s).

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.

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 recharged. 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.

SECC
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.

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.

Index

A

AC, v

alternating current. *See* AC

Asset Tag category, 4-11

asset tag number
  assigning, 2-10
  deleting, 2-10

Asset Tag utility, 2-10

assistance, technical, 1-6

autoconfiguration
  parallel port, B-3
  serial ports, 4-9, B-2

B

backup devices, C-1

BIOS
  revision number, 4-2

BIOS jumper, 6-8

boot device
  configuring, 7-8

Boot Sequence category, 4-7

booting the computer system, 4-7

built-in SCSI controller, 1-2, 1-3

C

cables
  ribbon, 6-5

cache
  secondary, 1-1

cautions, xi

CD-ROM drive, 1-3

cleaning
  accessories, C-3
  drives, C-4
  internal components, C-2
  solutions, C-3
  system exterior, C-3
  tools, C-3

COM port designations, 4-9, B-1

compact disc read-only memory. *See* CD-ROM

computer
  booting, 4-7
  cleaning, C-3
  covers, 6-2
  features, 1-1
  front-panel indicators, 1-5
  interior, illustrated, 6-6
  physical specifications, A-3
  system board features, 6-7

configuration utilities, running from CD, 2-3

connectors
back panel, B-2
location on system board, 6-7
controls and indicators
front panel, 1-4
covers
removing and replacing, 6-2
CPU Speed category, 4-6
CRDBIOS jumper, 6-8
creating diskettes, 2-2, 2-5

D

data
backups, C-1
loss and recovery, C-2
recovery tools, C-2
Date category, 4-5
Dell Server Assistant
using, 2-1
diagnosing problems, 1-6
diagnostics
diskette-based, 1-3
DIMMs
about, 1-2
sockets, 6-7
Diskette category, 4-10
Diskette Drive category, 4-5
diskette drives
cleaning, C-4
head-cleaning kit, C-3
turning off built-in controller, 4-10
types, sizes, and capacities, 4-5
Diskette First option, 4-7
diskette-based diagnostics, 1-3
diskettes, creating, 2-2, 2-5
documentation
viewing online, 2-5
drive access indicator, 1-4
drive activity indicator, 1-4
drive bays
about, 7-1
installing drives in, 7-2
drive failure indicator, 1-4
drive online indicator, 1-4
driver diskettes, creating, 2-2
drives
See also CD-ROM drives; diskette drives; hard-disk drives; SCSI hard-disk drives; tape drives
boot drive, 7-8
location inside chassis, 6-6
specifications, A-2
dual in-line memory modules. *See* DIMMs

E

ECC, 1-2
electromagnetic interference. *See* EMI
electrostatic discharge. *See* ESD
EMI, C-6
environmental specifications, A-3
error correction code. *See* ECC
error messages, 4-17
ESD, viii, C-6
expansion bus
specifications, A-1
expansion cards
about, 1-2
adding, 5-5
configuring, 5-1
conflict resolution, 5-12
locking and unlocking, 5-11
removing, 5-7
repositioning, 5-6
with diskette drive controller, 4-10
with ports, 4-9, B-2
exterior cleaning of system, C-3

EZ-SCSI
installing, 3-14

F

Fan Speed category, 4-6

features
system, 1-1

fixed disk. *See* hard-disk drives

floppy drives. *See* diskette drives

formatting
SCSI hard-disk drives, 7-4

front panel
controls and indicators, 1-4
illustrated, 1-5

G

getting help, 1-6

grounding procedure, 6-1

grounding strap, C-3

H

hard disk. *See* drives; SCSI devices

Hard Disk Only option, 4-7

hard drives. *See* hard-disk drives

hard-disk drives
See also drives; SCSI hard-disk drives; System Setup program
access indicator, 1-4
boot drive, 7-8
boot order, 7-8
cleaning, C-4
data recovery, C-1
drive bays, 7-2
drive carrier, illustrated, 7-6
failure indicator, 1-4

hard-disk drives *(continued)*
hot-plug installation and removal, 7-4
indicator codes, 7-4
indicator lights, 7-5
installing, 7-4
partitioning and formatting, 7-4
replacing with system running, 7-4
SCSI backplane indicator lights, 1-4

help tools, 1-6

hot-pluggable drives
removing and installing, 7-4

I

I/O ports and connectors, B-1

indicators
front-panel, 1-5
on front panel, 1-5
SCSI backplane board, 1-5, 7-5

Industry-Standard Architecture. *See ISA*

input/output. *See* I/O

installing
SCSI hard-disk drives, 7-1

interface connectors
location on system board, 6-7

interrupt request. *See* IRQ

IRQ line, B-3

ISA
expansion cards, configuring, 5-1
expansion slots, 1-2

ISA_CLR jumper, 6-8

J

jumpers
illustrated, 6-8
location on system board, 6-7, 6-8
PASSWD jumper, 4-16

K

key combinations
System Setup program, 4-3

keyboard
cleaning, C-3

keyboard connector
about, B-6
illustrated, B-2
pin assignments, B-6

Keyboard Errors category, 4-7

keylock
illustrated, 1-5

keys
<Ctrl><Alt><Enter>, 4-2
<F1>, 4-17
<F2>, 4-17
<Print Screen>, 4-1
System Setup program, 4-3

L

language support
for Server Assistant CD, 2-3

Level 2 Cache category, 4-10

line conditioners
preventing power source interruptions, C-9

LPT port designations, B-1

M

Manufacturing Test Report, 4-1

memory
about, 1-2
error messages after installing, 4-17
reserved memory, 4-5
specifications, A-1

messages
help messages on System Setup screens, 4-2
invalid configuration information, 4-1
prompt to enter the System Setup program, 4-1

microprocessor
features, 1-1
specifications, A-1
speeds, 1-1, 4-6
types supported, 1-1, A-1
upgrade kit, 1-2

monitor
cleaning, C-3

Mouse category, 4-9

mouse connector
about, B-6
illustrated, B-2
pin assignments, B-7

N

NetWare
approved drives, 3-20
creating 4.x driver diskettes, 2-6
error codes, 3-22
formatting media, 3-18
installation overview, 3-13
installing, 3-15
installing EZ-SCSI, 3-14
installing intraNetWare Support Pack 4, 3-17
mount status, 3-19
optimizing performance, 3-21
SCSI driver installation, 3-13
troubleshooting, 3-22
using a CD-ROM, 3-21
using removable media, 3-18
using SCSI devices, 3-18
using the tape backup utility, 3-20

notational conventions, xi

Num Lock category, 4-6

O

online documents, 2-5

operating systems, 1-3

P

Parallel Mode category, 4-10

parallel port
- about, B-1
- compatibility, 4-9
- configuring, B-3
- designations, B-1
- IRQ line, B-3
- pin assignments, B-5

Parallel Port category, 4-9

parallel port connector
- about, B-4
- illustrated, B-2
- pin assignments, B-5

partitioning and formatting
- SCSI hard-disk drives, 7-4

PASSWD jumper, 4-16, 6-8

Password Status category, 4-8

password. *See* setup password; system password

PCI expansion cards
- Resource Configuration Utility, 5-1

PCI expansion slots, 1-2

Peripheral Component Interconnect. *See* PCI

physical formatting, 7-4

physical specifications, A-3

Plug and Play expansion cards
- Resource Configuration Utility, 5-1

ports
- adding expansion cards with, 4-9, B-2
- autoconfiguration, 4-9
- designations, 4-9, B-1

ports *(continued)*
- illustrated, B-2
- specifications, A-2

power
- button, 1-4, 1-5
- indicator, 1-4, 1-5
- protection devices, C-9
- specifications, A-3
- surges and spikes, C-8

power source interruptions
- preventing, C-8

PowerEdge Expandable RAID Controller card
- hard-disk drive installation, 7-4

Primary SCSI and Secondary SCSI categories, 4-10

problem solving, 1-6

Processor 1 and Processor 2 categories, 4-6

R

radio frequency interference. *See* RFI

recovering data
- tools, C-2

regulatory notices, D-1

Reserved Memory category, 4-5

reset button, 1-4, 1-5

Reset Button category, 4-6

Resource Configuration Utility
- about, 5-1
- Advanced menu, 5-11
- exiting, 5-11
- ISA cards without configuration files, 5-2
- Main menu, 5-4
- making selections, 5-3
- online instructions, 5-3
- program diskettes, 5-2
- resolving resource conflicts, 5-12
- starting, 5-3

Resource Configuration Utility *(continued)*
Steps in Configuring Your Computer menu, 5-5
system board options, 5-7
System Board Options screen, 5-10
when to run, 5-2

resource conflicts
resolving, 5-12

return policy, E-5

RFI, C-6

ribbon cables, 6-5

S

safety instructions
for preventing ESD, viii
general, v
health considerations, vi

safety precautions
for preventing electrostatic discharge, 6-1

Scan Sequence category, 4-8

SCSI backplane board
about, 1-2
indicators, 1-5, 7-5

SCSI devices
See also drives; tape drives
CD-ROM drive, 1-3
hard-disk drives, 7-1
partitioning, 7-4
using, 3-18

SCSI disk utilities, 3-8

SCSI drivers
included with system, 3-1
installing for NetWare, 3-13
installing for Windows NT, 3-2, 3-9

SCSI hard-disk drives
bays, 7-2
configuring boot device, 7-8

SCSI hard-disk drives *(continued)*
hot-plug removal and installation, 7-4
ID numbering, 7-3
indicator codes, 7-5
installing, 7-1
partitioning and formatting, 7-4

SCSI host adapters
integrated Adaptec AIC-7860, 1-3

SCSISelect utility
advanced host adapter settings, 3-6
boot device settings, 3-5
default settings, 3-3
exiting, 3-9
host adapter settings, 3-4
installing for NetWare, 3-13
installing for Windows NT, 3-9
SCSI device/configuration settings, 3-5
starting, 3-8
using menus, 3-8
using the SCSI disk utilities, 3-8

security
See also setup password; system password
system, 1-6

security, System Setup program, 4-9

Serial Port 1 and Serial Port 2 categories, 4-9

serial port 1 connector
about, B-3
illustrated, B-2
pin assignments, B-4

serial port 2 connector
about, B-3
illustrated, B-2
pin assignments, B-4

serial ports
about, B-1
autoconfiguration, 4-9
configuring, B-3
designations, B-1
disabling and enabling, 4-9
IRQ lines, B-3
pin assignments, B-4

Server Assistant CD
about, 2-1
booting system from, 2-1
creating diskettes, 2-6
installing video drivers from, 2-9
main menu, 2-2
Resource Configuration Utility, 2-3
system diagnostics, 2-3
utility partition, 2-7
viewing online manuals, 2-5

server management features, 1-3

Server-Management Bus. *See* SMB connector

service, 1-6

Service Tag category, 4-11

setup password
assigning, 4-15
changing or deleting an existing password, 4-15
disabling a forgotten password, 4-16
using, 4-15
viewing current status, 4-9

Setup Password category, 4-9

small computer system interface. *See* SCSI

SMB connector
about, B-9
illustrated, B-2
pin assignments, B-9

Speaker category, 4-10

specifications
system, A-1

speed jumpers, 6-8

support, 1-6

surge protector
preventing power source interruptions, C-9

System Alert category, 4-7

system board
about, 6-5
connectors and sockets, 6-7
features, 1-2, 6-7

system board *(continued)*
illustrated, 6-7
options in Resource Configuration Utility, 5-7

system configuration information, 4-1, 5-1

system data categories, 4-10

system environment
altitude, C-5
corrosion, C-6
dust, C-5
EMI and RFI, C-6
ESD, C-6
humidity, C-5
magnetism, C-7
power source, C-8
shock and vibration, C-7
temperature, C-4

system fault indicator, 1-4

system features, 1-1

System Memory category, 4-10

system password
about, 4-11, 4-14
assigning, 4-11
changing or deleting an existing password, 4-14
disabling a forgotten password, 4-16
entering a wrong or incomplete password, 4-13
risk of not using password, 4-11
using to secure your system, 4-13
viewing current status, 4-8

System Password category, 4-8

system security, 1-6

System Setup program
about, 4-1
BIOS version, 4-2
categories, 4-5
copying or printing screen information, 4-1
disabling a forgotten password, 4-16
entering, 4-2
error messages, 4-17

System Setup program *(continued)*
help messages, 4-2
key functions, 4-3
navigation keys, 4-3
Resource Configuration Utility, 4-1, 5-1
screens, 4-4
setup password feature, 4-14
system configuration information, 4-1
system password feature, 4-11
using the program, 4-3
system specifications, A-1
system utilities, running from CD, 2-3

T

tape drives
backing up data, C-1
capacities supported, A-2
cleaning, C-4
technical assistance, 1-6
Time category, 4-5
tools
cleaning, C-3
troubleshooting
general, 1-6
NetWare, 3-22
Windows NT, 3-12

U

uninterruptible power supply. *See* UPS
UPS, C-9
utility partition, 2-7

V

video
connector pin assignments, B-8
drivers for Windows NT, 2-9
specifications, A-3
subsystem, 1-2
video connector
about, B-7
illustrated, B-2
pin assignments, B-8
Video Memory category, 4-11

W

warnings, xi
warranty information, x, E-1
Windows NT
creating 4.0 driver diskettes, 2-6
installing SCSI drivers, 3-2, 3-9
installing video drivers, 2-9
removing a host adapter, 3-11
swapping a host adapter, 3-12
troubleshooting, 3-12
updating drivers, 3-10
working inside the computer, safety precautions, 6-1