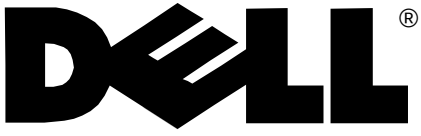
Dell® OptiPlex® GX*pro* Systems

# USER'S GUIDE



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# Safety Instructions

Use the following safety guidelines to help protect your computer's 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 five 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 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 *Diagnostics 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 bed, sofa, or rug.

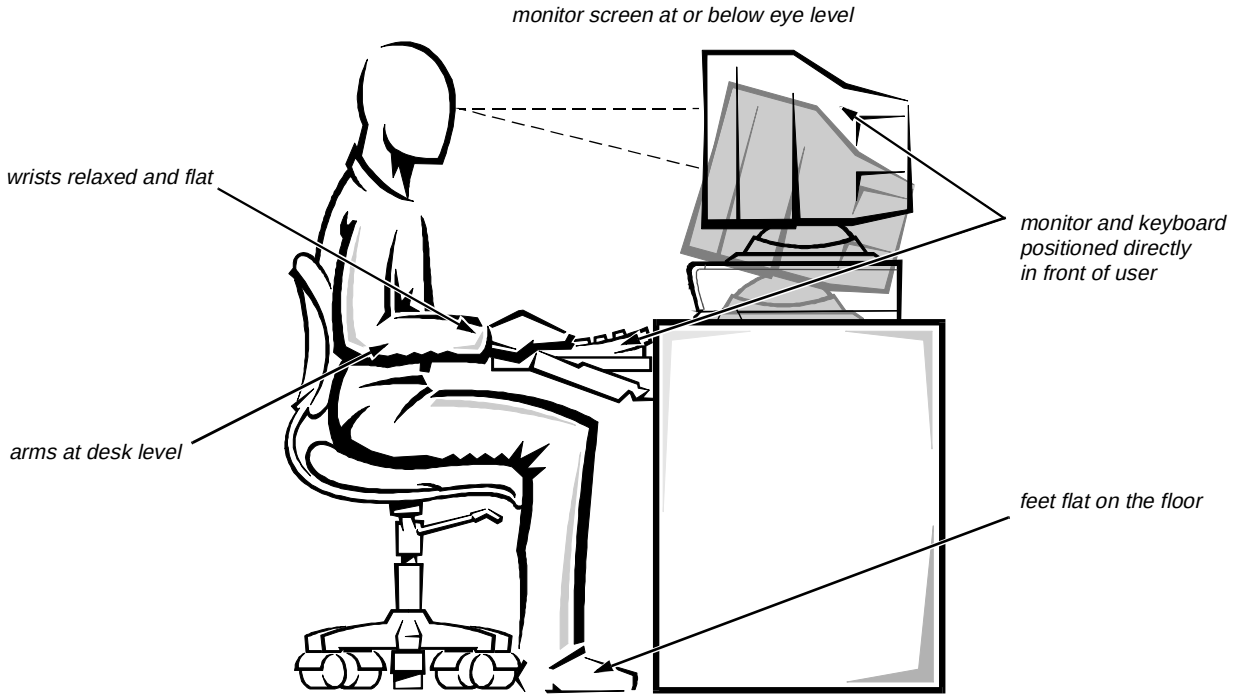
## Ergonomic Computing Habits

**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 servicing instructions closely.**

**To help avoid possible damage to the system board, wait five 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's 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 a Dell OptiPlex GX*pro* computer system. It 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.
- Everyone should read the first few sections of Chapter 2, "Using the Software Support Utilities," to find out which Dell utilities and bus-mastering integrated drive electronics (IDE) drivers have been included with the system. Only users who want to use one of the utilities or bus-mastering drivers need to read the rest of Chapter 2.
- Everyone should read the first several sections of Chapter 3, "Using the System Setup Program," to familiarize themselves 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 3.
- Users who add or remove an Industry-Standard Architecture (ISA) expansion card should read Chapter 4, "Using the ISA Configuration Utility."
- Users who want to connect their system to a network should read Chapter 5, "Using the Network Interface Controller." This chapter provides information on connecting the system to a network, configuring the network interface controller (NIC), installing drivers for the NIC, and running the NIC diagnostics.
- Users who need information on the integrated sound features of the computer system should read Chapter 6, "Using the Integrated Audio Controller." Chapter 6 provides information on connecting audio equipment to your computer, installing audio drivers, and reconfiguring the integrated audio controller.
- Chapter 7, "Working Inside Your Computer," Chapter 8, "Installing System Board Options," and Chapter 9, "Installing Drives," are intended for users who want to install or remove options inside the computer, such as dual in-line memory modules (DIMMs), expansion cards, or drives.
- Appendix A, "Technical Specifications," and Appendix B, "Hardware Configuration Features," are intended primarily as reference material for users interested in learning more about the details of the system. Users who add internal options may need to refer to Appendix B to change jumper or switch settings.
- Appendix C, "ISA Configuration Utility Messages," describes error messages generated by the ISA Configuration Utility (ICU), possible causes, and corrective actions.
- Appendix D, "Maintaining the System," describes preventive maintenance procedures that you should perform regularly to keep your computer system in top operating condition.
- Appendix E, "Regulatory Notices," is for users who are interested in which regulatory agencies have tested and approved the Dell OptiPlex GX*pro* systems.
- Appendix F, "Warranties and Return Policy," describes the warranty for your Dell system 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 F, "Warranties and Return Policy."

## Other Documents You May Need

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

- The *Getting Started* sheet provides step-by-step instructions for setting up your computer system.
- The *Frequently Asked Questions* cards provide detailed answers to questions that are often asked by Dell computer users. Be sure to read these cards before calling Dell for technical assistance.
- The *Diagnostics and Troubleshooting Guide* includes troubleshooting procedures and instructions for using the diskette-based diagnostics to test your computer system.
- The *Dell Integrated Audio User's Guide* provides instructions for using the application programs that take advantage of the computer's integrated sound feature. These programs are installed on your hard-disk drive.
- Video card documentation from the card manufacturer describes the video drivers included with the system. Only users who want to use or change a video driver need to read this documentation in detail.

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

*NOTE: Documentation updates are sometimes included with your system to describe changes to your system or software. Always read these updates* ***before*** *consulting any other documentation because the updates often contain the latest information.*

- Operating system documentation is included if you ordered your operating system software from Dell. This documentation describes how to install (if necessary), configure, and use your operating system software.
- Documentation is included with any options you purchase separately from your system. This documentation includes information that you need to configure and install these options in your Dell computer. Installation instructions for the options are included in this *User's Guide*.
- Technical information files—sometimes called "readme" files—may be installed on your hard-disk drive to provide last-minute updates about technical changes to your system or advanced technical reference material intended for experienced users or technicians.

## 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 presented in uppercase and 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><ENTER>

- All *items on a menu screen* are presented in the **HELVETICA** font and in uppercase bold.

  Example: **SETUP PASSWORD** category

- *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 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.

  Examples: **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 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 font.

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

  Example: The following message appears on your screen:

  No boot device available

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

  Example: DIMM *n* (where *n* represents the DIMM socket designation)

# Contents

***Figures***

## *Tables*

# Chapter 1
# Introduction

Dell® OptiPlex® G*Xpro* systems are high-speed, upgradable personal computers designed around Intel® Pentium® Pro microprocessors. Each system has an Industry-Standard Architecture (ISA) design that allows you to configure the computer system to your initial requirements and then upgrade it as necessary. These systems also support the high-performance Peripheral Component Interconnect (PCI) bus.

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

## System Features

Your system offers the following features:

- An Intel Pentium Pro microprocessor. The following microprocessor options are available:
  - — An Intel Pentium Pro microprocessor with an internal speed of 180 megahertz (MHz) and an external speed of 60 MHz
  - — An Intel Pentium Pro microprocessor with an internal speed of 200 MHz and an external speed of 66 MHz

  The Pentium Pro microprocessor includes an internal math coprocessor and other advanced internal logic.

  The microprocessor also incorporates both first- and second-level cache memory. First-level cache consists of an 8-kilobyte (KB) internal data cache and an 8-KB internal instruction cache. The integrated second-level cache, which eliminates the need for an add-in cache-memory chip or card, consists of a 256-KB (for the 180-MHz microprocessor) or a 256- or 512-KB (for the 200-MHz microprocessor) data/instruction cache.

  Cache memory enhances the speed of many microprocessor operations by storing the most recently accessed contents of system memory.
- Dual-processor capability. The system allows the installation of a microprocessor add-in card (operating at the same frequency and cache size as the installed microprocessor), which can be purchased from Dell. Dual processing improves performance under operating systems that support multiprocessing, such as Microsoft® Windows NT® 3.51 or 4.0.
- A 16-bit integrated audio controller that provides all the sound functions of the Sound Blaster expansion card. See Chapter 6, "Using the Integrated Audio Controller," for details.
- System memory that can be increased up to 512 megabytes (MB). Memory can be increased by installing 16-, 32-, 64-, or 128-MB extended-data out (EDO) and error correction code (ECC) dual in-line memory modules (DIMMs) in the four DIMM sockets on the system board. EDO DIMMs offer improved performance by using a shorter page-mode cycle time while accessing data within a single page of memory. See "Adding Memory" in Chapter 8 for details.
- The system's basic input/output system (BIOS), which resides in flash memory and can be upgraded by diskette if required.
- Plug and Play capability, which greatly simplifies the installation of expansion cards. Plug and Play support included in the system BIOS allows you to install Plug and Play expansion cards without setting jumpers or switches or performing other configuration tasks. The ISA Configuration Utility (ICU) allows you to configure existing ISA expansion cards for conflict-free operation. Also, because the system BIOS is

stored in flash memory, it can be updated to support future enhancements to the Plug and Play standard.

*NOTE: The Windows NT 4.0 operating system does not provide full ISA Plug and Play support. Therefore, some ISA Plug and Play cards (such as modem, sound, and network cards) may not work with your Windows NT operating system.*

- A modular computer chassis with a minimum number of screws for easy disassembly and improved serviceability.
- A chassis designed for both horizontal (desktop) and vertical (mini tower) use. Although optimized for horizontal positioning, the system is shipped with a floor stand that can be attached to make the system into a mini tower (for instructions on attaching the floor stand, see "Using the Floor Stand" found later in this chapter).
- A high-speed, high-resolution PCI video card. (Documentation from the video card manufacturer is included with your system.)

The system board includes the following built-in features:

- Three 32-bit PCI expansion slots and two shared PCI (32-bit)/ISA (16-bit) expansion slots on a riser board.
- Built-in support for two externally accessible devices (diskette drives and tape drives) connected to the computer's built-in diskette/tape drive interface.
- Enhanced integrated drive electronics (EIDE) support. The primary and secondary interface are both located on the PCI bus to provide faster data throughput. Each interface supports extremely high-capacity EIDE drives, as well as devices such as EIDE CD-ROM drives and EIDE tape drives.
- Two high-performance serial ports and one bi-directional parallel port for connecting external devices.
- A Personal System/2 (PS/2)-style keyboard port and a PS/2-compatible mouse port.
- An integrated Ethernet network interface controller (NIC). The NIC is configured using software described in Chapter 5, "Using the Network Interface Controller."

The following software is included with your Dell computer system:

- Utilities that safeguard your system and enhance the operation of its hardware features; for example, a thermal shutdown utility will perform an orderly shutdown if the system overheats. For more information on these utilities, see Chapter 2, "Using the Software Support Utilities."
- A standard set of video drivers for Microsoft Windows NT 4.0 and Windows 95 installed on your system, with the resolution set at 800 x 600 pixels. for Windows NT 3.51, Windows® 3.*x*, and Windows for Workgroups™ the resolution is set at 640 x 480 pixels. All video graphics array (VGA) monitors and most application programs support this resolution. To change the resolution, check the documentation that came with your monitor to determine the resolutions and refresh rates supported by the monitor. Then check the documentation that came with your PCI video card for instructions on changing the resolution.
- The System Setup program for quickly viewing and changing the system configuration information for your system. For more information on this program, see Chapter 3, "Using the System Setup Program."
- An Auto Power On utility that enables your system to perform routine tasks automatically in your absence. For more information on this utility, see Chapter 2, "Using the Software Support Utilities."
- Enhanced security features available through the System Setup program (a setup password, a system password, a system password lock option, a write-protect option for diskette drives, and automatic display of the system's service tag number). In addition, a customer-definable asset tag number can be assigned via a software support utility and viewed on the System Setup screens. For more information, see Chapter 2, "Using the Software Support Utilities," and Chapter 3, "Using the System Setup Program."
- Advanced power management options that can reduce the energy consumption of your system. For more information, see Chapter 3, "Using the System Setup Program."

- The ICU, which tells you how to configure ISA expansion cards manually. After resources have been assigned to these cards, the system BIOS can assign resources to PCI and Plug and Play expansion cards for a conflict-free configuration. For more information, see Chapter 4, "Using the ISA Configuration Utility."
- Dell diagnostics for evaluating the computer's components and devices. For information on using the diagnostics, see the chapter titled "Running the Diskette-Based Diagnostics" in the *Diagnostics and Troubleshooting Guide*.
- Network device drivers for several network operating systems. These drivers are supplied with systems with the NIC and are described in Chapter 5, "Using the Network Interface Controller."
- Desktop Management Interface (DMI) support, which enables the management of your computer system's software and hardware. DMI defines the software, interfaces, and data files that enable your system to determine and report information about its components.

  If your system has Dell-installed Microsoft Windows (except for Windows NT 4.0), DMI is already installed on your system's hard-disk drive. You can enable DMI support by double-clicking the DMI icon in the Windows Control Panel (located in the Main program group). For instructions on enabling DMI support or for information about DMI, refer to the DMI online help. You can access the online help by double-clicking the DMI icon in the Control Panel. The DMI online help is also provided in the Dell Accessories program group.
- The Dell Inspector utility, which uses DMI support to display detailed information about the hardware and software configuration for your system. The Dell Inspector utility provides you with the information you may need if you call Dell for technical assistance. It also provides you with the information you may need when you install hardware or software in your system. The Dell Inspector utility is located in the Dell Accessories program group.

If you ordered Dell-installed software with your system, such as Microsoft Windows, Windows NT, Windows 95, or other programs, Dell provides a menu that allows you to make program diskette sets of your Dell-installed software. A *program diskette set* is an uninstalled version of a software package that you can use to reinstall or reconfigure the software. You can use this same menu to remove *diskette image files* (individual files that correspond to each diskette in a program diskette set) to reclaim space on the computer's hard-disk drive. For more information on making program diskette sets, see the online help provided in the Dell DiskMaker program, which is available in the Dell Accessories program group.

## Important Note to Windows 95 Users

For the Microsoft Windows 95 operating system to work correctly on your computer system, you *must* use the version of Windows 95 that Dell installed on your computer.

*Should you need to reinstall Windows 95 on an OptiPlex GX*pro *system* for any reason, you must be sure to reinstall the correct version. Dell recommends performing a periodic tape backup of the system's entire hard-disk drive, so that if necessary the operating system, drivers, and other software can be reinstalled as originally configured, with a minimum of downtime.

If you are unable to reinstall from a tape backup of the hard-disk drive, you can reinstall Windows 95 from the system's Windows 95 backup media (CD or diskettes) that you received from Dell or created from the Dell-installed software on your system. *However, if you reinstall Windows 95 in this manner, the bus-mastering functionality of the Windows 95 integrated drive electronics (IDE) driver, which was operative in your original configuration, will be disabled*. (Your system will operate without the bus-mastering functionality, with only a small degradation in performance. For information on the advantages of using bus-mastering drivers, see "Bus-Mastering IDE Drivers" in Chapter 2.)

*NOTE to network system administrators: If you must download Windows 95 from a server to client systems, make sure that you have the Windows 95 backup media for the OptiPlex GX*pro *system on your server before downloading.*

## Using the Floor Stand

Included with your system is a floor stand that you can easily attach to give the computer a mini tower (vertical)

orientation. Although you can attach (and remove) the floor stand at any time with a minimum of system disruption, it is easiest to attach before you set up your computer and connect the back panel cables.

Attach the floor stand as follows:

1. **Turn the computer onto its right side so that the drive bays are at the bottom.**
2. **Fit the floor stand onto what *was* the left side of the computer.**

   Position the floor stand as shown in Figure 1-1. Align the large round hole in the floor stand with the securing button on the side of the cover, and align the captive thumbscrew in the stand with the screw hole in the cover.

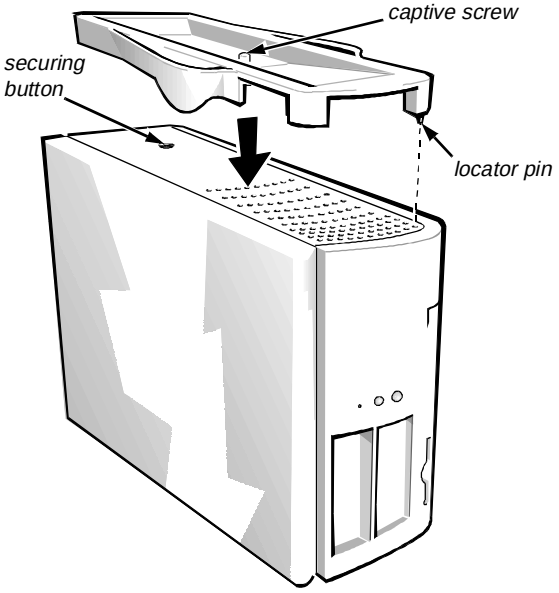



***Figure 1-1. Attaching the Floor Stand***

   As you lower the stand into place, make sure the locator pin (see Figure 1-1) heads into the corner hole of the hole pattern as shown. When the stand is in place, tighten the thumbscrew.

3. **Rotate the computer so that the floor stand is at the bottom and the drives are at the top.**

To remove the floor stand, turn the computer over so the floor stand is at the top, loosen the screw and lift the floor stand away, and place the computer in a horizontal position.

# Front Panel

Your computer's front panel contains the following indicators and controls (see Figure 1-2):

- The *power button* provides control of the system's alternating current (AC) input power. The push-button switch operates as follows:
  - — When the computer is turned off, pressing the button turns the computer on.
  - — When the computer is turned on, pressing the button turns the computer off. However, a low-voltage (standby) current is maintained from the power supply to the switch. To completely remove all power from the system, unplug the AC power cable from its source.

    For systems running Microsoft Windows 95 or Windows NT with the Dell AutoShutdown service operational, pressing the power button causes the system to perform an orderly operating system shutdown before turning off. (For more information, see "Dell AutoShutdown Service" in Chapter 2.)

  *NOTE: A Display Power Management Signaling (DPMS) monitor does not begin warming up until the computer to which it is attached is turned on. Thus, some DPMS monitors may not display a video image until several seconds after you turn on your computer.*
- The green *power indicator* lights up when the computer is receiving power.
- The *hard-disk drive access indicator* lights up when a hard-disk drive is in use. (Drive access indicators for diskette drives and tape drives are located on the front of the drives.)
- The *reset button* reboots (restarts) your system without your having to turn the power off and then on again. Rebooting the system in this manner reduces stress on system components.

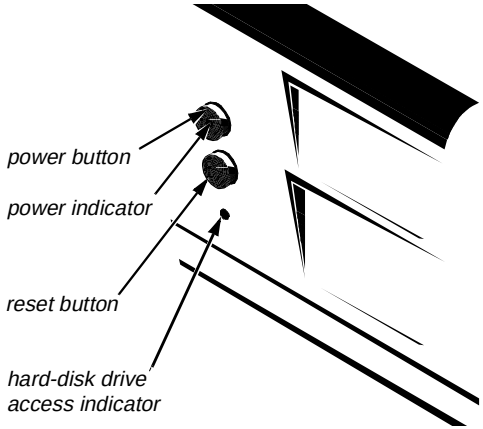



***Figure 1-2. Front Panel***

# Back Panel

Your computer's back panel contains various ports and connectors for attaching external devices and includes a security cable slot. These features are described in the following subsections.

## Connecting External Devices

You can connect various external devices, such as a mouse and printer, to the input/output (I/O) ports and connectors on the computer's back panel. The system BIOS detects the presence of most 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 system memory before they will work. These software drivers help the computer recognize the external device and direct its operation.

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

  **CAUTION: When disconnecting external devices from the back of the computer, wait five seconds after turning off the computer before you disconnect the device to avoid possible damage to the system board.**

For information about enabling, disabling, or configuring I/O ports and connectors, see Chapter 3, "Using the System Setup Program." For detailed descriptions and illustrations of each port and connector on the back panel, see "I/O Ports and Connectors" in Appendix B.

## Security Cable Slot

To the right of the fan vent on the back of the computer is a security cable slot (see Figure 1-3) for attaching a commercially available antitheft device. Antitheft devices for personal computers usually include a segment of galvanized cable with an attached locking device and associated key. To prevent unauthorized removal of your computer, loop the cable around an immovable object, insert the locking device into the security cable slot on the back of your computer, and lock the device with its associated key. Complete instructions for installing this kind of antitheft device are usually included with the device.

*NOTE: Antitheft devices are of differing designs. Before purchasing such a device, make sure it will work with the cable slot on your computer.*

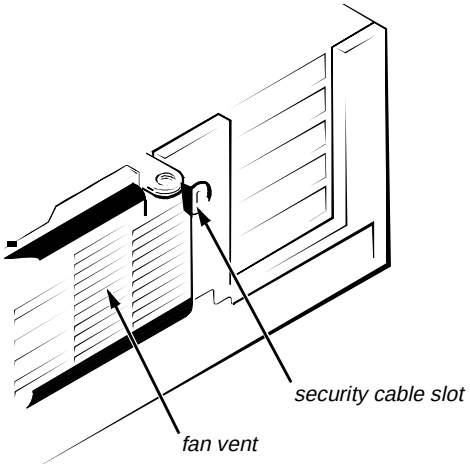



***Figure 1-3. Security Cable Slot***

## 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 the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide.*

# Chapter 2
# Using the Software Support Utilities

Your Dell system comes with software support utilities on diskette or on your computer's hard-disk drive. These software support utilities include system utilities, system services, and bus-mastering integrated drive electronics (IDE) drivers, all of which are documented in this chapter.

*NOTE: For information on the additional software support utilities you receive with your system, refer to the following places:*

- Video drivers—see the documentation from the video card manufacturer. (Video drivers support the video graphics requirements of a variety of monitors and application programs running Microsoft Windows NT 3.51 or 4.0, Microsoft Windows 95, Microsoft Windows 3.*x*, or MS-DOS® operating systems.)
- Audio drivers—see Chapter 6, "Using the Integrated Audio Controller," of this guide.
- Network interface drivers—see Chapter 5, "Using the Network Interface Controller," of this guide.

*System utilities and services* can be used to safeguard your system and to explicitly control certain hardware features. Refer to "System Utilities and Services" found later in this chapter for information about these utilities.

*Bus-mastering IDE drivers* are provided for the Microsoft Windows 95, Windows NT 3.51, and OS/2® operating systems.

*NOTE: Bus-Mastering IDE drivers are* not *yet available for use with the Windows NT 4.0 operating system.*

These drivers can off-load certain functions from the system microprocessor, providing a performance improvement during multithreaded operations (instances where several application programs are running simultaneously). Refer to "Bus-Mastering IDE Drivers" found later in this chapter for information about these utilities.

*NOTE: On each software support diskette set you receive, a* **readme.txt** *file may be included (on diskette 1 of the set) along with the software utilities or drivers. If included, the* **readme.txt** *file contains the latest updates to the information in this manual. Use the editor included with your operating system to view and/or print the contents of* **readme.txt** *files.*

## Software Support Utilities on Diskette

If software support diskettes are included with your Dell system, the Dell system utilities and bus-mastering IDE drivers are provided on these diskettes. To use one of these utilities or drivers, you must install the utility or driver as described later in this chapter.

## Dell-Installed Software Support Utilities

If no software support diskettes were shipped to you, the system utilities and bus-mastering IDE drivers are already installed on your hard-disk drive in two different forms: as working utilities, operative immediately, and as diskette images.

In case you later need to reinstall the files for any reason, you need to copy the diskette images to a backup diskette (see the next section, "Backing Up the Software Support Utilities"). From the backup diskette, you can install the desired file(s) to a directory on your hard-disk drive. Further instructions for installing the utilities and services are provided later in this chapter.

# Backing Up the Software Support Utilities

Dell recommends that you create original diskette copies, or *program diskette sets*, of your Dell-installed software. You will need these diskettes if you ever want to reconfigure or reinstall your Dell-installed software. To create program diskettes, use the Dell DiskMaker program to create program diskette sets (available through the Dell Accessories program group or folder).

# System Utilities and Services

The following utilities and services are included on your *Dell System Utilities* diskette**:**

- The *Asset Tag* utility lets you enter a system asset tag number into nonvolatile random-access memory (NVRAM). Thereafter, you can display this number using the Asset Tag utility or the System Setup program.
- The *Auto Power On* utility enables you to create a batch file to carry out a series of commands when your system is powered on by the Auto Power On feature or by the power button.
- The *Dell AutoShutdown* service enhances the operation of the power button by providing for an orderly operating system shutdown when the computer system is turned off.
- The *Dell Thermal Shutdown* service provides mechanisms for protecting the microprocessor against overheating.

## Asset Tag Utility

The Asset Tag utility allows you to enter an asset tag number for your computer. The default System Setup screens (see Figure 3-1) do 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 and Windows 95.*

### Installing the Asset Tag Utility

The Asset Tag Utility is already installed on your hard-disk drive. If you need to reinstall the Asset Tag Utility, perform the following steps:

1. **If you have not already done so, use the Dell DiskMaker to make a diskette copy of the *Dell System Utilities* diskette image on your hard-disk drive.**

   The Dell DiskMaker is available through the Dell Accessories program group. For more information, refer to the online help provided in the Dell DiskMaker program.

2. **With the backup diskette in drive A, copy the** asset.com **file from the diskette to the directory of your choice on your hard-disk drive.**

If the **path** statement in your **autoexec.bat** file does not already contain the directory in which you reinstalled the Asset Tag utility, modify the **path** statement to include that directory. (See your MS-DOS reference documentation for information on modifying the **autoexec.bat** file.)

### Using the Asset Tag Utility

After you reinstall the Asset Tag utility, you can use it to enter an asset tag number that you or your company assign to your computer; you can also use it to reenter the computer's service tag number if that becomes necessary.

Use the **asset** command from the system prompt. To view existing asset tag and service tag numbers, type asset and press <ENTER>. (You can also view the asset tag number using the System Setup program described in Chapter 3.)

#### 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 2-1 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 2-1. Asset Tag Command-Line Options***

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

## Auto Power On Utility

The Auto Power On utility enables your system to automatically perform routine tasks in your absence. For example, you might want your system to turn on at night and perform a backup procedure. To use the utility, you need to create a batch file containing the command(s) or program(s) that you want performed in your absence. The Auto Power On utility determines whether system power was turned on by the power button or by the **AUTO POWER ON** option in the System Setup program and passes this information on to your batch file, initiating the appropriate commands at system start-up. See "Auto Power On" in Chapter 3 for information on using the **AUTO POWER ON** option.

The following example shows the contents of a possible batch file.

*NOTE: The first three lines of your batch file **must** match the first three lines in the following example.*

```
autopowr
if errorlevel 2 goto alarm
if errorlevel 1 goto button

:alarm
call alarm.bat
autopowr /off

:button
call button.bat
goto end
```

The **autopowr/off** command shuts off your computer.

### Installing the Auto Power On Utility

The Auto Power On utility is already installed on your hard-disk drive. If you need to reinstall the Auto Power On utility, perform the following steps:

1. **If you have not already done so, use the Dell DiskMaker to make a diskette copy of the *Dell System Utilities* diskette image on your hard-disk drive.**

   The Dell DiskMaker is available through the Dell Accessories program group. For more information, refer to the online help provided in the Dell DiskMaker program.

2. **With the backup diskette in drive A, copy the** autopowr.com **file from the diskette to the directory of your choice on your hard-disk drive.**

If the **path** statement in your **autoexec.bat** file does not already contain the directory in which you reinstalled the Asset Tag utility, modify the **path** statement to include that directory. (See your MS-DOS reference documentation for information on modifying the **autoexec.bat** file.)

## Dell AutoShutdown Service

The Dell AutoShutdown service (available with the Windows NT and Windows 95 operating systems) lets you perform an orderly system shutdown and turn your system off with a single touch of the power button.

This service is already installed and operative on your hard-disk drive. If you need to reinstall it, see "Installing the Dell AutoShutdown and Thermal Shutdown Services" found later in this chapter.

### How AutoShutdown Works

The power button operates in two modes, immediate and AutoShutdown mode.

When the system is off, the power button always acts in immediate mode—that is, when the button is pressed, the system powers up immediately.

When the system is on and the AutoShutdown service is installed, the power button operates in AutoShutdown mode. Pressing the power button signals the service to perform an orderly operating system shutdown (reducing the possibility of data loss and file corruption) before removing power from the system. During the shutdown

sequence, the power indicator on the front panel of the computer flashes.

*NOTE: The presence of the AutoShutdown service does not affect the operation of the system reset button.*

### *If Your Operating System Locks Up*

If, when you press the power button, the power indicator begins to flash but the system does not turn off, your operating system may have locked up. (A locked-up operating system does not sense when the power button is pressed.)

To ensure that the system can be turned off under these circumstances, a manual intervention mechanism has been included in the software. To turn off a locked-up system, either press the power button a second time or press the reset button.

*NOTE: This scenario (a locked-up system with the AutoShutdown service active) is the only situation in which pressing the reset button will turn off the system without rebooting it.*

## *Dell Thermal Shutdown Service*

The Dell Thermal Shutdown service helps protect the system microprocessor from damage due to overheating. It can also protect your system data from loss or corruption resulting from a thermal-related system shutdown.

For the Windows NT and Windows 95 operating systems, this service should already be installed and operative on your hard-disk drive. Should you need to reinstall it for any reason, see "Installing the Dell AutoShutdown and Thermal Shutdown Services" found later in this chapter.

### *How Thermal Shutdown Works*

When installed, the service uses sensors located beneath the microprocessor to monitor the microprocessor's temperature. If the processor begins to overheat and reaches the preset primary (lower) threshold temperature, the system first performs an orderly operating system shutdown and then turns itself off. During the shutdown phase, the power indicator flashes and a screen message notifies the user that the system is shutting down.

If the processor reaches the preset secondary (higher) threshold value during the shutdown process, the system abandons the shutdown process and turns itself off immediately.

**CAUTION: Whether or not the Thermal Shutdown service is installed, the temperature sensors are always installed and operational. If the service is *not* installed and the processor overheats to the primary (lower) threshold value, the system turns off immediately—with no attempt to perform an orderly operating system shutdown.**

## *Installing the Dell AutoShutdown and Thermal Shutdown Services*

For systems running the Windows NT and Windows 95 operating systems, Dell installed the AutoShutdown and Thermal Shutdown services on the hard-disk drive both as working utilities and as diskette images.

If you need to reinstall one or both of these services, perform the following steps:

1. **If you have not already done so, make a diskette copy of the *Dell System Utilities* diskette image on your hard-disk drive.**

   Use the Dell DiskMaker (available through the Dell Accessories program group) to create a program diskette from the diskette image. For more information, refer to the online help provided in the Dell DiskMaker program.

2. **With the backup diskette in drive A, run the** setup.exe **program from the diskette.**
3. **At the Welcome screen, click NEXT.**
4. **Select the service(s) you want to install and then click NEXT.**
5. **Click YES and then OK to reboot Windows and activate the new service(s).**

### *Removing a Service*

To remove a service, perform the following steps:

1. **Insert the backup diskette into drive A.**
2. **Run** remove.exe **from the diskette.**

3. **Select the service(s) you want to remove and click NEXT.**

4. **When prompted to restart Windows, first click OK, and then EXIT and restart Windows.**

# Dell Energy Manager

The Dell Energy Manager, a utility available only on systems running the Windows 3.1 operating system, allows you to control your computer's energy conservation features. If your system has Dell-installed Windows 3.1, the Dell Energy Manager is already installed and operational on your system's hard-disk drive.

To access the Dell Energy Manager utility, double-click the Power icon in the Windows Control Panel (located in the Main program group), and then click the Options button. For instructions on using this utility, click the Help button to access the Dell Energy Manager online help.

*NOTE: You can use this utility to custom-set the time-out periods for your monitor and hard-disk drive. If you deviate from the standard* **MAXIMUM**, **REGULAR**, *and* **MINIMUM** *settings available through the* **POWER MANAGEMENT** *category in the System Setup program, the* **POWER MANAGEMENT** *category displays the* **CUSTOM** *setting.*

## Installing the Dell Energy Manager

For systems running the Windows 3.1 operating system, Dell has installed the Dell Energy Manager utility as both a working utility and as a diskette image.

If you need to reinstall the utility, perform the following steps:

1. **If you have not already done so, make a diskette copy of the *Dell Energy Manager* diskette image on your hard-disk drive.**

   Use the Dell DiskMaker (available through the Dell Accessories program group) to create a program diskette from the diskette image. For more information, refer to the online help provided in the Dell DiskMaker program.

2. **With the backup diskette in drive A, run the** setup.exe **program from the diskette.**

3. **At the Dell Energy Manager Setup screen, click CONTINUE to automatically copy the diskette files to a default directory.**

# Bus-Mastering IDE Drivers

Bus-mastering IDE drivers (provided for Windows 95, Windows NT 3.5*x*, and OS/2) bring about a performance improvement by off-loading certain functions from the system microprocessor during multithreaded operation (several application programs running simultaneously). The bus-mastering driver for your operating system has been preloaded at the factory and is operative when you receive your computer.

The drivers for Windows NT 3.5*x* and OS/2 have also been copied to your hard-disk drive in diskette-image form. If you need to reinstall either of these drivers, you can do so as described in the following subsections.

*NOTE: Bus-Mastering IDE drivers are* not *yet available for use with the Windows NT 4.0 operating system.*

## Windows NT 3.5x

To reinstall the bus-mastering IDE drivers for Windows NT 3.5*x*, perform the following steps:

1. **If you have not already done so, use the Dell DiskMaker to make a diskette copy of the *Dell Bus Mastering IDE Drivers* diskette image on your hard-disk drive.**

   The Dell DiskMaker is available through the Dell Accessories program group. For more information, refer to the online help provided in the Dell DiskMaker program.

2. **Boot your system and log onto Windows NT. If you are already running Windows NT, close any open documents or application programs.**

3. **Insert the *Dell Bus Mastering IDE Drivers* diskette into drive A.**

4. **From the File menu, select RUN.**

5. **In the Command Line box in the Run window, type** `a:\nt\setup.exe` **to start the installation procedure.**

6. **To read and then to agree to the license agreement, click YES twice.**

7. **To accept the default directory in which to install the drivers (**c:\piixide**), click OK.**
8. **When the system asks if you want to view the** readme.txt **file, click NO and continue following the steps in this procedure.**
9. **When the license agreement and Program Manager reappear on the screen, return to the Program Manager.**
10. **From the Program Manager, double-click the Windows NT Setup icon in the Main program group.**
11. **From the menu bar, select OPTIONS|ADD/REMOVE SCSI ADAPTERS.**
12. **In the SCSI Adapter Setup dialog box, click ADD....**
13. **When a message explaining how to recover from a bad installation is displayed, click OK.**
14. **In the Select SCSI Adapter Option dialog box, select OTHER (REQUIRES A DISK FROM A HARDWARE MANUFACTURER) from the Adapter menu.**
15. **In the Insert Diskette dialog box, type** `c:\piixide` **to specify the driver installation directory.**
16. **In the Select OEM Option dialog box, select INTEL PIIX PCI SCSI BUS MASTER IDE CONTROLLER and click OK.**

    The Select SCSI Adapter Option dialog box reappears, now listing **INTEL PIIX PCI SCSI BUS MASTER IDE CONTROLLER** in the Adapter menu.
17. **Click INSTALL.**
18. **If the Windows NT Setup dialog box does not list the correct driver installation directory, type** `c:\piixide`**. Click CONTINUE.**

    To signal a successful installation, the SCSI Adapter Setup dialog box reappears, with **INTEL PIIX PCI BUS MASTER IDE CONTROLLER** listed in the Adapter menu.
19. **Click CLOSE to exit the dialog box, select EXIT from the NT Setup Options menu, and click OK on the message about rebooting.**
20. **Select SHUTDOWN from the Program Manager File menu.**
21. **From the Shutdown Computer dialog box, select SHUTDOWN AND RESTART, and then click OK.**

## *OS/2*

To install the bus-mastering IDE drivers for OS/2, perform the following procedure:

1. **If you have not already done so, use the Dell DiskMaker to make a diskette copy of the *Dell Bus Mastering IDE Drivers* diskette image on your hard-disk drive.**

   The Dell DiskMaker is available through the Dell Accessories program group. For more information, refer to the online help provided in the Dell DiskMaker program.
2. **Boot your system under OS/2. If you are already running OS/2, close any open documents or application programs.**
3. **Insert the *Dell Bus Mastering IDE Drivers* diskette into drive A.**
4. **Open an OS/2 command line window. At the prompt, type** `a:\os2\setup.exe` **to start the installation procedure.**
5. **Follow the on-screen instructions to copy the driver files to the hard-disk drive.**

   At the conclusion of this process, you can find further installation instructions in the **readme.txt** file in the **c:\piixide** directory.
6. **Print the** readme.txt **file and use it to complete the installation procedure.**

# Chapter 3
# 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.

*NOTE: Do not use the System Setup instructions on the card titled* Frequently Asked Questions About Your Dell System*—these instructions are incorrect for your system.*

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

You can *view* the current settings at any time. When you *change* a setting, in many cases you must reboot the system before the change takes 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 out the System Setup screens (by pressing the <PRINT SCRN> 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 from the Dell Accessories folder or program group.

## Entering the System Setup Program

To enter the System Setup program, press the System Setup key combination during the system's power-on self test (POST), as follows:

1. **Turn on (or reboot) your system.**
2. **During the boot routine, the message** `Press <CTRL><ALT><ENTER> for System Setup` **appears on the screen. When the message appears, *immediately* hold down the <CTRL> and <ALT> keys and press the <ENTER> key.**

   The message `Entering System Setup ..... Please wait` appears and is soon replaced by Page 1 of the System Setup screens.

If you wait too long to press the <CTRL><ALT><ENTER> key combination, the `Press <CTRL><ALT><ENTER> for System Setup` message disappears and your operating system begins to load into memory. If this situation occurs, *let the system complete the load operation*; then shut it down 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 3-1.) 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 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. You can change those that appear bright on the screen. 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**

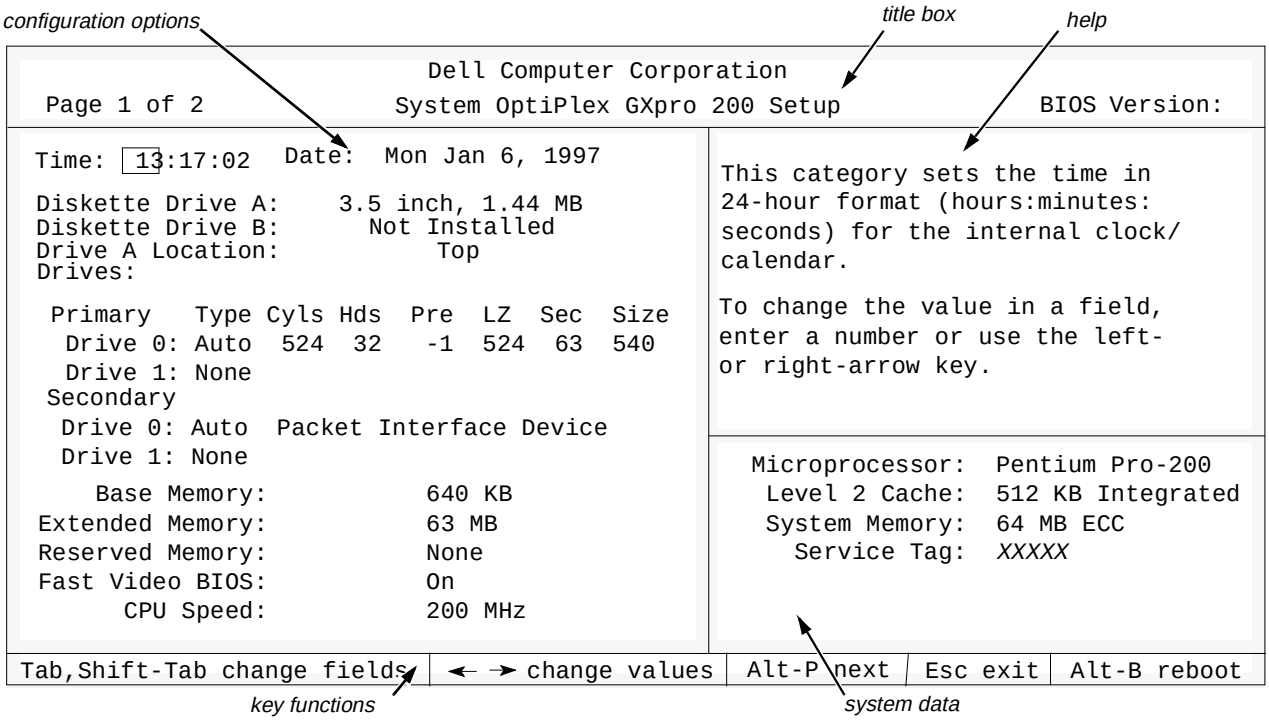
  The line of boxes across the bottom of both screens lists keys and their functions within the System Setup program.

# Using the System Setup Program

Table 3-1 lists the keys you use to view or change information on the System Setup screens and to exit the program.

***Table 3-1. 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 in 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 without rebooting the system and returns the system to its previous state—the boot routine or operating system prompt.<br><br>For most of the categories, any changes you made 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 made.<br><br>**CAUTION: Any unsaved data in open application programs will be lost when you use this key combination.** |



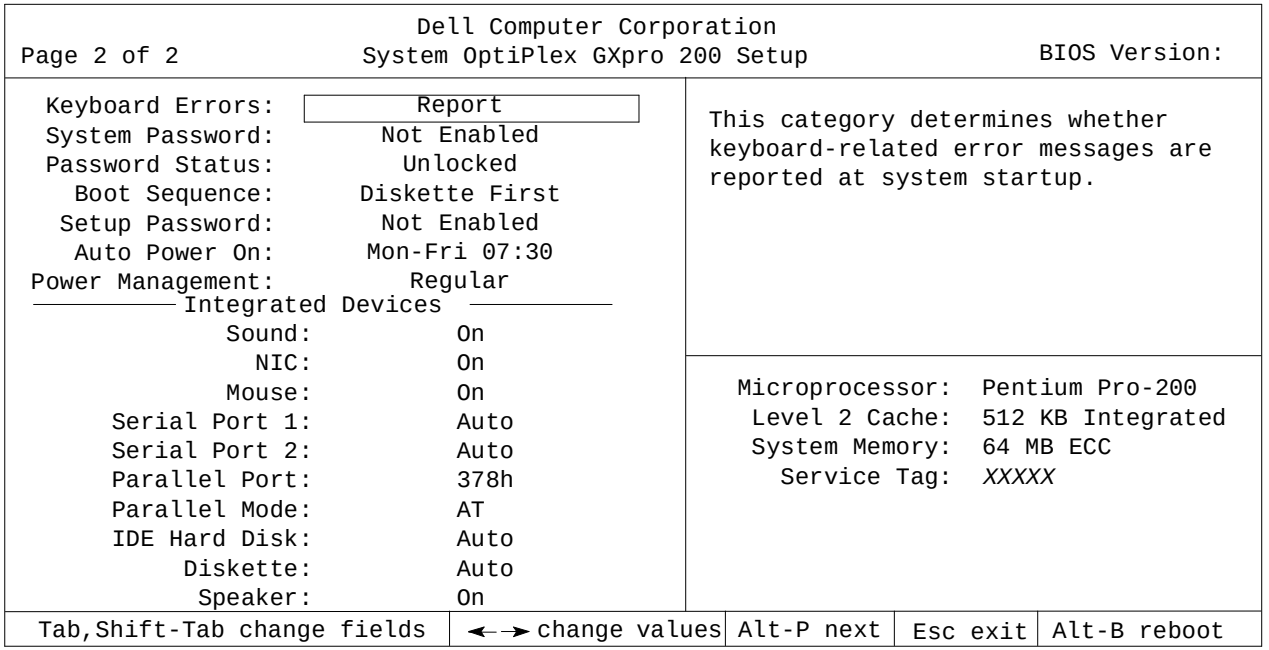




***Figure 3-1. System Setup Screens***

# 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 in 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 in 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(s) of diskette drive(s) installed in your computer. The standard configuration for this system is one 3.5-inch diskette drive installed at the top of the drive cage. This drive is designated **DISKETTE DRIVE A** and is normally the only diskette drive in the computer.

If you install a second diskette drive, it must be a 5.25-inch drive located in one of the two lower bays of the drive cage. A second drive is normally designated as **DISKETTE DRIVE B**. To reverse the drive designations, see the next subsection, "Drive A Location."

The relative positions of the two drive options always match the physical locations of the drives in your computer—the drive listed on top is the top drive in your computer.

The options are:

- **5.25 INCH, 360 KB**
- **5.25 INCH, 1.2 MB**
- **3.5 INCH, 720 KB**
- **3.5 INCH, 1.44 MB**
- **NOT INSTALLED**

*NOTE: Tape drives are* ***not*** *reflected in the* **DISKETTE DRIVE A** *and* **DISKETTE DRIVE B** *categories. For example, if you have a single diskette drive and a tape drive attached to the diskette/tape drive interface cable, set the* **DISKETTE DRIVE A** *category to match the characteristics of the diskette drive and set the* **DISKETTE DRIVE B** *category to* **NOT INSTALLED.**

## Drive A Location

**DRIVE A LOCATION** controls which diskette drive—**TOP** (the default option) or **BOTTOM** (if existing)—is used as drive A, the boot drive.

The letters *A* and *B* in the categories **DISKETTE DRIVE A** and **DISKETTE DRIVE B** switch places automatically when **DRIVE A LOCATION** is changed to reflect the new configuration.

If an external diskette drive controller is being used, **DRIVE A LOCATION** becomes a nonselectable category.

## Drives: Primary and Secondary

**PRIMARY** identifies drives attached to the primary enhanced integrated drive electronics (EIDE) interface connector (labeled "IDE1") on the system board; **SECONDARY** identifies drives connected to the secondary EIDE interface connector (labeled "IDE2").

For both the **PRIMARY** and the **SECONDARY** drive sections, the **DRIVE 0** and **DRIVE 1** categories identify the type of EIDE hard-disk drives installed in the computer. For each drive, seven parameters can be chosen as a group by drive-type number, entered individually from the keyboard or set automatically. A *drive-type number* specifies the parameters of a hard-disk drive based on a table recorded in the system's BIOS.

To choose a setting for these categories, type characters from the keyboard or use the left- or right-arrow key to cycle through the choices.

The options are:

- **AUTO**
- **NONE**
- **USR1** or **USR2**
- A specific drive-type number

*NOTE: Operating systems that bypass the system BIOS may not obtain optimum hard-disk drive performance.*

## *EIDE Devices Other Than Hard-Disk Drives*

For EIDE CD-ROM and EIDE tape drives that use the built-in EIDE controller, it is recommended that you use the secondary EIDE interface connector.

For all EIDE devices that are not hard-disk drives, set the appropriate **DRIVE** category to **AUTO**.

## *EIDE Hard-Disk Drives*

For EIDE hard-disk drives, the system provides an automatic drive-type detect feature. To use this feature for **DRIVE 0,** highlight the **DRIVE 0** category and type a (for *automatic*). To use it for **DRIVE 1**, type a at the **DRIVE 1** category. In each case, the category setting changes to **AUTO**. After you reboot the system, the System Setup program automatically sets the correct drive-type number and parameters for each drive.

Before installing a new EIDE hard-disk drive, also check the documentation that came with the drive to verify that all jumper settings on the drive are appropriate for your configuration.

## *If You Have a Problem*

If the system generates a drive error message the first time you boot your system after installing an EIDE drive, it may mean that your particular drive does not work with the automatic drive-type detect feature. If you suspect that your problem is related to drive type, try entering your drive-type information in one of the following ways.

### If You Know the Drive-Type Number

Use the drive-type number you found in the documentation that came with the drive or, if the drive was installed by Dell when you purchased your system, on the manufacturing test report that was shipped with your system.

To set the drive-type number in the System Setup program, highlight the appropriate drive category (**DRIVE 0** or **DRIVE 1**) and type in the correct drive-type number. If you prefer, you can press the right- or left-arrow key to increase or decrease, respectively, the drive-type number until the correct one is displayed.

### If You Do Not Know the Drive-Type Number

The **DRIVE 0** and **DRIVE 1** categories display the following seven parameters for each drive type:

- **TYPE** is the drive-type number for the selected hard-disk drive.
- **CYLS** is the number of logical cylinders.
- **HDS** indicates the number of logical heads in the drive.
- **PRE** (*precompensation cylinder*) is the cylinder number at which the electrical current for the drive head changes to compensate for differences in data density across the disk surface (this parameter has no effect for EIDE drives).
- **LZ** is the cylinder number that is used as the drive's landing zone for the heads when the drive is not in use.
- **SEC** is the number of logical sectors per track.
- **SIZE** (automatically calculated by the system) indicates the number of millions of bytes of storage provided by the drive.

If none of the supported drive types match the parameters of your new drive, you can enter your own parameters. To do so, highlight the appropriate drive category (**DRIVE 0** or **DRIVE 1**) and type u to display **USR1**. You can then use the right- or left-arrow key to switch between the **USR1** and **USR2** settings. Then press the <TAB> key to highlight each of the parameter fields in succession, and enter the appropriate number for each field. You can have only two user-defined drive types.

*NOTE: The* **USR1** and **USR2** *drive types can be used for both the* **PRIMARY** *and* **SECONDARY DRIVE 0** *and* **DRIVE 1** *categories. However, if you select the* **USR1** or **USR2** *drive type, you may not obtain optimum hard-disk drive performance. Also, the* **USR1** *and* **USR2** *drive types cannot be used for hard-disk drives greater than 528 megabytes (MB) in capacity.*

## *Base Memory*

**BASE MEMORY** displays the amount of memory available to MS-DOS programs that do not use extended or expanded memory. This category has no user-selectable options.

The default value for the **BASE MEMORY** category is **640 KB**, which includes 1 kilobyte (KB) reserved for system use.

## Extended Memory

**EXTENDED MEMORY**, which has no user-selectable options, indicates the amount of memory available as extended memory. The value given is in megabytes rather than kilobytes. To convert megabytes to kilobytes, multiply the megabyte total by 1024.

## 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 only part of the base memory comes from the dual in-line memory modules (DIMMs) on the system board, whereas the base memory from 15 MB to 16 MB comes from the memory expansion card.

The **RESERVED MEMORY** category has the following options:

- **NONE** (the default option)
- **15M - 16M**
- **512K - 640K**

## Fast Video BIOS

**FAST VIDEO BIOS** offers the option of shadowing and caching the BIOS for an Industry-Standard Architecture (ISA) video graphics array (VGA) card installed in an expansion slot.

*NOTE: Peripheral Component Interconnect (PCI) video cards are always shadowed and cached.*

The **FAST VIDEO BIOS** category has the following options:

- **ON** (the default option)
- **OFF**

If you choose the **ON** option, when your system boots it immediately copies the video card's BIOS code into write-protected memory locations in fast random-access memory (RAM). (This process is known as *shadowing*.) The **ON** option also allows the BIOS code to be cached. *Caching* speeds system performance by retaining the most recently accessed data and instructions in an intermediate storage area of static RAM (SRAM), which is faster than system RAM.

Although **FAST VIDEO BIOS** should normally be set to **ON**, some video cards are not designed to be shadowed or cached. If this category is set to **ON** and you experience video problems, try setting **FAST VIDEO BIOS** to **OFF**.

## 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, each key provides the cursor-control function (if any) indicated at the bottom of the key.

## Keyboard Errors

**KEYBOARD ERRORS** enables or disables reporting of keyboard errors during the 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 one is attached to the computer.

## 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**

*NOTE: Read "Using the System Password Feature" found later in this chapter for detailed 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

**PASSWORD STATUS** provides an extra measure of system security by letting you set the system password to **LOCKED** or **UNLOCKED**.

### Using With a System Password Enabled

When this category is **UNLOCKED**, any user who already knows the system password can disable the password at system start-up by using the <CTRL><ENTER> option displayed on the screen—thus (inadvertently or not) leaving the system without password protection.

When this category is **LOCKED** and a user tries to disable the password at system start-up, the following message is displayed:

```
Password locked, not disabled
```

To provide maximum security for your system, operate the system with **SYSTEM PASSWORD ENABLED**, **SETUP PASSWORD ENABLED**, and **PASSWORD STATUS LOCKED**. Then, if you want to let selected individuals use your system, give them the system password *but not the setup password*. In this way, even those who know the system password cannot disable it at system start-up and will not be able to unlock it in the System Setup program in order to change or disable it.

### Using Without a System Password Enabled

In situations where the system administrator does not want to use a system password, this category can be used to guard against a user assigning a password. With **PASSWORD STATUS LOCKED** and **SETUP PASSWORD ENABLED**, a user who does not know the setup password cannot enter the System Setup program and unlock the system password in order to assign one.

## Boot Sequence

**BOOT SEQUENCE** can be set to **DISKETTE FIRST** (the default option) or **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.

Selecting **DISKETTE FIRST** causes the system to try booting from drive A first. If it finds a diskette that is not bootable in the drive or finds a problem with the drive itself, the system displays an error message. If it does not find a diskette in the drive, the system then tries to boot from the hard-disk drive (drive 0).

Selecting **HARD DISK ONLY** causes the system to boot *only* from the hard-disk drive, even if there is a bootable diskette in drive A.

## 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**

*NOTE: Read "Using the Setup Password Feature" found later in this chapter for detailed 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.*

## Auto Power On

**AUTO POWER ON** allows you to use the Auto Power On feature (included with your software utilities) to turn your computer system on automatically on certain days of the week at a preset time. You can set **AUTO POWER ON** to turn on the system either every day or every Monday through Friday.

*NOTE: This feature will not work if you shut off your system using a power strip or surge protector.*

Select a daily schedule (**EVERYDAY** or **MON-FRI**) and then use the down-arrow key to highlight first the hours field and then the minutes field. Time is kept in a 24-hour format (*hours*:*minutes*). To change the start-up 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 in numbers in both of the appropriate fields.

The default for **AUTO POWER ON** is **DISABLED**.

## Power Management

For certain types of monitors and most EIDE hard-disk drives, you can reduce system power consumption by enabling the power management feature. With **POWER MANAGEMENT** enabled, these monitors and drives automatically switch into low-power mode during periods of system inactivity.

**POWER MANAGEMENT** can be implemented at three levels—options are **MAXIMUM**, **REGULAR**, and **MINIMUM.** (The different levels apply to the monitor only; hard-disk drive operation is the same for all three.) The feature can also be set to **DISABLED**.

*NOTE: The Dell Energy Manager utility (available only on systems running the Windows 3.1 operating system) lets you assign time-out settings that deviate from the predefined* **MAXIMUM**, **REGULAR**, and **MINIMUM** *settings available through the* **POWER MANAGEMENT** *category. If you have used the Dell Energy Manager to customize your time-out periods, the* **POWER MANAGEMENT** *category may display* **CUSTOM** *as its setting. (For more information on the Dell Energy Manager, see "Dell Energy Manager" in Chapter 2.)*

### Saving Monitor Power

If you have a Video Electronics Standards Association (VESA®) Display Power Management Signaling (DPMS)-compliant monitor, enabling the **POWER MANAGEMENT** category reduces monitor power consumption during periods of keyboard and mouse inactivity.

*NOTE: The power management feature monitors activity of a mouse connected to the Personal System/2 (PS/2)-compatible mouse port.*

**CAUTION: Check your monitor documentation to make sure you have a DPMS-compliant monitor before you enable this feature. Otherwise, you risk damaging the monitor.**

By setting **POWER MANAGEMENT** to **MAXIMUM**, **REGULAR**, or **MINIMUM**, you can set predefined time-out periods (see Table 3-2) for the two successive monitor shutdown stages, *standby* and *off.*

*NOTE: Each monitor manufacturer defines the details of the shutdown stages for its own monitors. But in all cases, power consumption decreases with each stage from "on" (full power) to "standby" (reduced power; the display image usually disappears) to "off" (where power consumption is minimal). To define these stages for your monitor, see the documentation that came with the monitor.*

From any of these shutdown stages, you can return full power to the monitor in one of the following ways:

- For most DPMS-compliant monitors, any subsequent activity—including moving the mouse—should return full power to the monitor.
- A few DPMS-compliant monitors require that you turn monitor power off and then on again to return to full power.

Check your monitor documentation for information on how your monitor is designed to operate.

### Saving EIDE Hard-Disk Drive Power

For most systems, enabling **POWER MANAGEMENT** at any level causes EIDE hard-disk drives to switch to low-power mode after about 20 minutes of system inactivity.

*NOTE: Not all EIDE hard-disk drives support this feature. Enabling this feature for drives that do not support it may cause the EIDE drive to become inoperable until the computer is restarted and the* **POWER MANAGEMENT** *category is disabled.*

In low-power mode, the disks inside the drive stop spinning. They remain idle until the next drive access, which causes them to start spinning again. (Because the disks take a few seconds to regain full speed, you may notice a slight delay when you next access the hard-disk drive.)

When **POWER MANAGEMENT** is **DISABLED** (the default), the disks spin constantly as long as the system is turned on.

***Table 3-2. Power Time-Out Periods***

| Power Management Setting | EIDE Drive Spindown Time-Outs | Monitor Standby Time-Outs | Monitor Off Time-Outs |
|---|---|---|---|
| Disabled | Never | Never | Never |
| Maximum | 20 minutes | 10 minutes | 1 hour |
| Regular | 20 minutes | 20 minutes | 1 hour |
| Minimum | 20 minutes | 1 hour | Never |

## Sound

**SOUND** determines whether the integrated audio controller is **ON** (the default) or **OFF**. Set this category to **OFF** if you want to use a sound expansion card instead of the integrated audio controller or if you need the resources used by the controller. You must reboot your system before a change takes effect.

## NIC

**NIC** determines whether the network interface controller (NIC) is **ON** or **OFF**. You must reboot your system before a change takes effect.

## Mouse

**MOUSE** enables or disables the system's built-in PS/2-compatible mouse port. Disabling the mouse allows an expansion card to use interrupt request (IRQ) 12.

## 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:

- 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 that 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.

For more information about built-in ports, port designations, IRQs, and the remapping of ports, see "I/O Ports and Connectors" in Appendix B.

## 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.

The default setting is **378H**; you should leave it at that setting unless an expansion card needs to use that address.

## 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.

Your system also supports Extended Capabilities Port (ECP) mode, which can be used by Windows 95. Windows 95 uses ECP protocol automatically if it detects an

ECP-capable device, removing the necessity for an ECP option in this category.

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.

### IDE Hard Disk

**IDE HARD DISK** enables or disables the system's built-in EIDE hard-disk drive interface.

With **AUTO** selected (the default option), the system turns off the built-in EIDE interface as necessary to accommodate a controller card installed in an expansion slot.

As part of the boot routine, the system first checks for a *primary* hard-disk drive controller card installed in an expansion slot. If no card is found, the built-in EIDE interface is enabled and the controller on the master EIDE drive is designated as the primary controller, using IRQ14. If any EIDE drives are attached to the secondary EIDE channel, IRQ15 is also used.

If a primary controller is detected on the expansion bus, the built-in EIDE interface is disabled.

Selecting **OFF** disables the built-in EIDE interface.

### Diskette

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

With **AUTO** selected (the default option), the system turns off the built-in diskette drive controller as 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 is also in effect (the system turns off the built-in diskette drive controller as necessary).

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

### Speaker

**SPEAKER** determines whether the on-board speaker is **ON** (the default) or **OFF**. A change to this category takes effect immediately (rebooting the system is not required).

### System Data Categories

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

- **MICROPROCESSOR** displays the type of microprocessor installed in the computer.
- **LEVEL 2 CACHE** displays the amount of integrated level-2 cache memory in the microprocessor.
- **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.
- **SERVICE TAG** displays the system's five-character service tag number, which was programmed into NVRAM by Dell during the manufacturing process. Reference 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. For information on using the utility, see "Using the Asset Tag Utility" in Chapter 2.

## 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 either know the password or have a key to the computer (see "Deleting or Changing an Existing System Password" found later in this section).

If you assign and later *forget* a system password, you need your computer key to get inside the chassis, where you can change a jumper setting to disable 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 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.

With a system password assigned, the status shown in the **SYSTEM PASSWORD** category is **ENABLED**. With the system password feature disabled by a jumper setting on the system board, the status shown is **DISABLED BY JUMPER**. *You cannot change or enter a new system password if either of these options is displayed.*

With no system password assigned and with the password jumper on the system board in the enabled position (its default setting), the status 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. **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 in your new system password.**

   You can use up to seven characters in your password.

   As you press each character key (or the <SPACEBAR> 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 the highlight 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 in 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 your system on, press the reset button, or reboot the system by pressing the <CTRL><ALT><DEL> key combination, the following prompt appears on the screen:

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

After entering the correct system password and pressing <ENTER>, your system boots and you can use the keyboard 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 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 in 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.**

   *NOTE: If the* **PASSWORD STATUS** *category is set to* **LOCKED***, you will receive a message to that effect, and you will not be able to disable the system password. For more information, see "Password Status" found earlier in this chapter.*

5. **Reboot the system and enter the System Setup program as described in "Entering the System Setup Program" found earlier in this chapter.**

6. **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, go to step 7.

   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 2 through 6.

7. **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 your computer key to get inside the chassis, where you can change a jumper setting to disable the 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 in 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* **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, respectively, until you open the computer, 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 Cover" in Chapter 7.**

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

2. **Refer to "Jumpers" in Appendix B for jumper information and to Figure B-1 for the location of the password jumper (labeled "PSWD") on the system board.**
3. **Remove the jumper plug from the PSWD jumper (the *disable* setting).**
4. **Replace the computer cover.**
5. **Reconnect your computer to its power source, and turn it on.**

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

   *NOTE: Before you assign a new system and/or setup password, you must replace the PSWD jumper plug.*
6. **Repeat step 1.**
7. **Replace the PSWD jumper plug (the *enable* setting).**
8. **Replace the computer cover, reconnect the computer and peripherals to their power sources, and turn them on.**

   Booting with the PSWD 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.
9. **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 your *Diagnostics and Troubleshooting Guide* for an explanation of the message and suggestions for correcting any errors. (An exception to this routine occurs after you install a memory upgrade; it is normal to receive an error message the first time you boot the system after a memory upgrade. In that case, you do not need to refer to the *Diagnostics and Troubleshooting Guide*—follow the instructions in "Performing a Memory Upgrade" in Chapter 8 of this 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 4
# Using the ISA Configuration Utility

The ISA Configuration Utility (ICU) is used by the system to track what expansion cards are installed and what resources are used. 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. Plug and Play and PCI expansion cards do not contain jumpers and switches; they are configured only through software.

**CAUTION: The ICU is intended only for configuring non-Plug and Play ISA expansion cards. It should not be used for assigning resources to Plug and Play expansion cards and PCI expansion cards. These cards should be configured automatically by the basic input/output system (BIOS).**

*NOTES: The Windows NT operating system does not provide full Plug and Play support. Therefore, some Plug and Play cards (such as modem, sound, and network cards) may not work with Windows NT. If your system is running a Dell-installed Windows NT operating system and you want to use Plug and Play cards, Dell recommends that you use the card manufacturer's utility to set the card to legacy mode, enter the card's resources through the manufacturer's utility, and then use the ICU to add the Plug and Play card now in legacy mode to your system configuration. On systems with a Dell-installed Windows NT operating system, the ICU is installed on the hard-disk drive as a diskette image. Use the Dell DiskMaker (located in the Dell Accessories program group or folder) to make an ICU diskette from this diskette image.*

*If you are using the Windows 95 operating system, the functions provided by the ICU are handled by the Device Manager, which can be accessed by double-clicking the System icon in the Control Panel. See your Windows 95 documentation for instructions on using the Device Manager to manage resources and resolve conflicts.*

The remainder of this chapter describes the various features of, and the various ways to use, the ICU.

## Quick Start

To quickly get started using this utility, follow these steps:

1. **Determine whether you need to run the ICU.**

   See "When to Run the ICU" found later in this chapter for detailed instructions.

2. **Perform any required preparatory steps before starting the utility.**

   Preparatory steps include making a program diskette, copying your mouse driver to this diskette, and making a backup copy of this diskette. See "Preparing to Use the ICU" found later in this chapter for detailed instructions.

3. **Start the ICU.**

   Insert the backup copy of the program diskette into drive A, and turn on your computer or press the reset button.

   *NOTE: The ICU takes a few minutes to load. During this time, the cursor may appear as a pointer rather than an hourglass.*

   When the utility has finished loading, the ICU window is displayed (see Figure 4-1).

4. **Add, modify, or remove a card, or view resources for a card or other device.**

   Depending on what you need to accomplish with the ICU, you may need to perform one or more of these tasks:

   - If you are adding an ISA expansion card, see "Adding a Listed Card" found later in this chapter for detailed instructions. If the card you are adding does not have a configuration file, see "Adding an Unlisted Card" found later in this chapter for detailed instructions.
   - If you are modifying a card that is already installed, see "Modifying a Card" found later in this chapter for detailed instructions.
   - If you are removing a card, see "Removing a Card" found later in this chapter for detailed instructions.
   - If you want to examine the resources already assigned in the system, see "Viewing Resources" found later in this chapter for detailed instructions.

5. **Save your configuration, and exit the utility.**

   See "Saving the System Configuration" and "Exiting From the ICU" found later in this chapter for detailed instructions.

# About the ICU

Before your system was shipped from Dell, a technician used the ICU to enter the correct information for the expansion cards initially installed in your computer.

If your system was shipped with Dell-installed software, the ICU diskette image (from which you can make a program diskette) is installed on your hard-disk drive. (Your system may also be accompanied by an *ISA Configuration Utility Diskette*.)

The ICU is also available through online services such as Dell's TechConnect bulletin board service (BBS). See your *Diagnostics and Troubleshooting Guide* for information on accessing the BBS.

Whenever you add or remove an ISA expansion card, use the ICU 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. After the resources identified in these configuration files are assigned to all ISA expansion cards, the system assigns resources to all Plug and Play expansion cards, as well as PCI expansion cards, thereby creating a conflict-free configuration.

## ISA Database

The ICU provides a database of configuration files for a large variety of ISA expansion cards. The database is located in the **\db** subdirectory. *Listed cards* are ISA expansion cards that have configuration files stored in this database.

*Unlisted cards* are ISA expansion cards that do not have configuration files stored in the ICU database. Unlisted cards are not displayed in the list of cards provided for the various card categories. The unlisted cards may be cards for which no configuration file exists or new cards that include a manufacturer-supplied configuration file on diskette.

When you supply a configuration file and the ICU is running from the hard-disk drive, the configuration file is copied to the directory that contains the rest of the ICU database.

See "Adding a Listed Card" found later in this chapter for directions on how to add a listed ISA expansion card. See "Adding an Unlisted Card" found later in the chapter for instructions on how to add an unlisted ISA expansion card.

# When to Run the ICU

Whenever you add or remove ISA expansion cards, you must run the ICU 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 ISA expansion cards. The ICU can identify and resolve any resource conflicts, as well as 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 the ISA expansion card before you install it in your computer.

*NOTE: Before you add a Plug and Play card under a Dell-installed Windows NT operating system, use the Dell DiskMaker program to create an ICU diskette. Then use the card manufacturer's utility to set the card to legacy mode, enter the card's resources through the manufacturer's utility, and use the ICU to add the Plug and Play card to your system configuration.*

After you have run the ICU for your 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.

# Preparing to Use the ICU

Before using the ICU for the first time, you must complete the following steps:

1. **If the utility was shipped as a diskette image on your hard-disk drive, make a program diskette from the diskette image.**

   For instructions on how to create a program diskette from the diskette image, see the online help provided in the Dell DiskMaker program, which is available in the Dell Accessories program group.

2. **Make a backup copy of your program diskette, as described in the next subsection, "Backing Up the ISA Configuration Utility Diskette."**

   Use the backup copy whenever you run the utility; store the original program diskette in a safe place.

3. **Copy your mouse driver file (**mouse.exe**) to your program diskette (which is either the *ISA Configuration Utility Diskette*—if you received one with your system—or the program diskette you made from the diskette image on your hard-disk drive). Then add the mouse statement to the** autoexec.bat **file on the program diskette.**

   For instructions, refer to your MS-DOS reference documentation.

## Backing Up the ISA Configuration Utility Diskette

Before using the ICU, make a backup copy of the *ISA Configuration Utility Diskette*, just as you would with any other software. Before performing the following procedure, make sure you have a high-density 3.5-inch diskette. Then perform the following steps.

*NOTE: If you received an* ISA Configuration Utility Diskette *with your system, you should use this procedure to create a backup of that diskette.*

1. **At the MS-DOS prompt, type the following command line and press <ENTER>:**

   ```
   diskcopy a: a:
   ```

   *NOTE: For operating systems other than MS-DOS, see the documentation that came with the operating system for instructions on making backup copies of diskettes.*

2. **Follow the instructions on the screen for inserting the *source* diskette (the original copy) and the *target* diskette (the backup copy).**

   You may be prompted to swap diskettes several times during the duplication process. When **diskcopy** has finished copying the source diskette, a message appears asking if you want to copy another diskette. Type n to end the **diskcopy** command.

3. **Store your original program diskette in a safe place.**

   Use only the backup diskette when running or installing the ICU from your diskette drive.

# Starting the ICU

You must run the MS-DOS version of the ICU from a diskette. To do so, you must first follow the instructions provided in "Preparing to Use the ICU" found earlier in this chapter.

Insert the backup copy of the *ISA Configuration Utility Diskette* into drive A. Then either turn on your computer or reboot it by pressing the reset button.

## Accessing Help

You can access online help in the ICU in four ways:

- You can select **CONTENTS** from the Help menu. The table of contents of topics is displayed. Select a topic and click Help. Help text on that topic appears in a dialog box.
- For most dialog boxes, you can click Help to display information on the action you are performing.
- From the ICU window, you can press the <F1> key to display the table of contents for the available help topics.
- To redisplay the last message you received from the ICU, you can select **PREVIOUS MESSAGE** from the Help menu.

## Making Selections in the ICU

The ICU window is the main window of the utility and the starting point for making any changes to your expansion-card configuration. This window displays a list of all ISA, Plug and Play, and PCI expansion cards currently installed in the computer. The ICU window contains menus and a tool bar, as shown in Figure 4-1. When you choose a course of action, the ICU displays dialog boxes to guide you through the various steps.

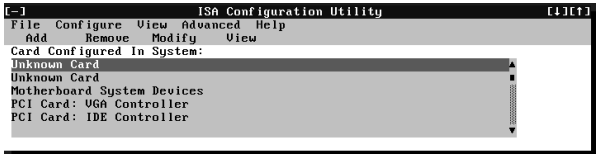



***Figure 4-1. ICU Window***

You can maneuver through each menu and dialog box using a mouse. If a mouse is not available, you can use the keys shown in Table 4-1. Each menu and menu option has an underlined character in its name. When you press the key for that character in conjunction with the <ALT> key, that menu or menu option is selected

***Table 4-1. ICU Keys***

| Keys | Action |
|---|---|
| <ALT><*x*><*y*> | Displays the menu containing the underlined letter *x* and performs the operation indicated by the menu item containing the underlined letter *y*. For example, to save a file (that is, to display the File menu and select the **SAVE** menu option), press <ALT><f> and <s>. |
| <TAB> | Moves from one control button or list to another. |
| Up- and down-arrow keys | Moves up and down through items in a list. |
| <SPACEBAR> | Highlights an item in a list. |
| <ENTER> | Selects the highlighted button or item in a list. |

# Adding a Listed Card

*NOTE: If you want to add a configuration file that you received on diskette with a new expansion card, you must copy the configuration file to the* **\db** *subdirectory on the backup copy of the* ISA Configuration Utility Diskette. *You should then reboot your system and perform the following procedure to add the expansion card.*

Use the following procedure to add a listed card with the ICU:

1. **Start the ICU as described in "Starting the ICU" found earlier in this chapter.**
2. **From the ICU window, click ADD or select ADD CARD from the Configure menu.**

3. **Click the name of the category of card that you want to add. If you clicked ADD in step 2, click OK.**

   A dialog box like the one in Figure 4-2 appears listing the names of all available cards of that type.

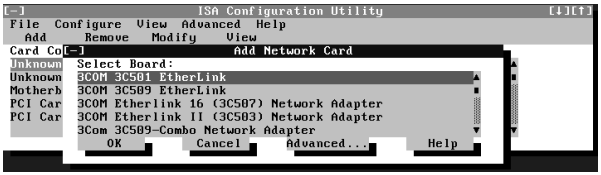



***Figure 4-2. Add Network Card Dialog Box***

4. **Select the name of the card you want to add.**

   If the name of the card that you want to add is not on the list, see "Adding an Unlisted Card" found later in this chapter for instructions on how to add the card.

5. **If you want the ICU to select the resources for the card, click OK. Otherwise, proceed to step 6.**

   The ICU uses the default resources set by the card manufacturer whenever possible. If the ICU cannot find a resource that is valid for the card and available in the system, the utility generates an error message. See Appendix C, "ISA Configuration Utility Messages," for an explanation of the message and a possible solution to the conflict.

   If you are satisfied with the default resources assigned to the card, you can skip the remainder of this procedure.

6. **To select the resources yourself, click ADVANCED.**

   The Card Configuration dialog box (see Figure 4-3) displays all resources used by the card. Some cards have multiple functions, each having one or more resources associated with it. For example, a communications card can have fax, modem, and scanner functions, each of which may have one or more associated resources.

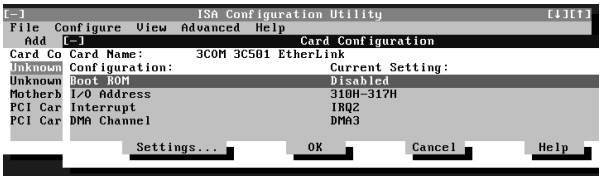



***Figure 4-3. Card Configuration Dialog Box***

7. **To change any of the resource settings for the card, select the resource setting and then click SETTINGS.**

   The Configuration Settings dialog box (see Figure 4-4) displays the name of the resource that you selected in the upper-left corner of the box. The resource values currently associated with the selected function are displayed in the Resources for Choice box. The resource values displayed are **INTERRUPT (IRQ)**, **DMA**, **MEMORY (HEX)**, and **I/O PORT (HEX)**.

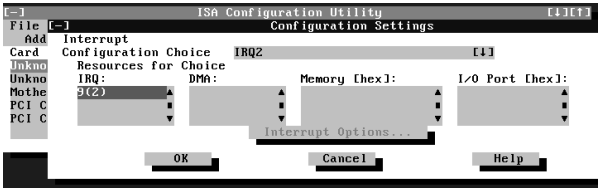



***Figure 4-4. Configuration Settings Dialog Box***

8. **To change the resource settings, click the down arrow next to the Configuration Choice box. Then click the new resource setting from the list of available settings (see Figure 4-5).**

   You cannot manually enter a value; you must choose a setting from the list. If there is only one setting listed, no other settings are available.

The setting that you select may affect the resources available. For example, if you are offered the **DISABLED** option and select it, all resource values are blank, indicating that a disabled setting uses no resources.Available Settings List Box

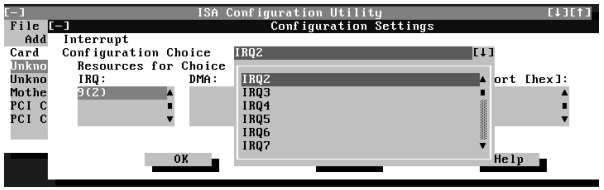



***Figure 4-5. Available Settings List Box***

**9. To change individual resource values for the current configuration setting, select the resource value that you want to change and click OPTIONS located below the resource values (see Figure 4-6).**

For example, when you click the value under **DMA**, **OPTIONS** changes to DMA Options. When you click this button, a smaller dialog box appears. By clicking the down arrow next to the current resource value, you can display a list of the available values for the resource.

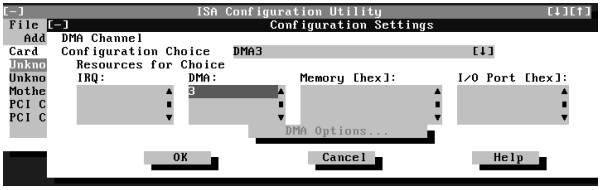



***Figure 4-6. Configuration Settings Dialog Box***

Choose the desired value and click **OK**. The value you selected is displayed under the resource heading in the Configuration Settings dialog box.

**OPTIONS** is disabled if no alternative values are available for the selected resource.

*NOTE: If you change one or more resource values using* ***OPTIONS*** *and later change the setting in the Configuration Choice box, the changes that you made to the resource values are overwritten by the default values for the new configuration choice.*

**10. Click OK in the Configuration Settings dialog box when you have finished selecting resources for the function.**

*NOTE: After modifying the system configuration, you must turn off the system to install, remove, or change jumper settings on the ISA expansion cards to match the settings you selected in the ICU.*

# Adding an Unlisted Card

Unlisted cards are ISA expansion cards that do not have configuration files stored in the ICU database.

*NOTE: If you want to add a configuration file that you received on diskette with a new expansion card, see "Adding a Listed Card" found earlier in this chapter.*

To add an unlisted card with the ICU, perform the following steps:

1. **Start the ICU as described in "Starting the ICU" found earlier in this chapter.**
2. **From the ICU window, click ADD or select ADD CARD from the Configure menu.**
3. **Click the name of the category of card that you want to add. If you clicked ADD in step 2, click OK.**

   A dialog box appears listing the names of all available cards of that type.
4. **Select UNLISTED CARD from the bottom of the list of cards displayed in the dialog box that appears. Then click OK.**
5. **Click NO when the ICU asks if you have a configuration file for the card.**

   The Configure Unlisted Card dialog box appears with blank fields.
6. **Enter the name of the card that you want to add in the CARD NAME field.**
7. **For each resource you want to assign to the card, click the box beneath the name of the resource to be assigned and then click ADD.**

   For example, if you click the box beneath **INTERRUPT (IRQ)**, the button changes to **ADD INTERRUPT**. When you click this button, a Specify dialog box (in this case, Specify

Interrupt) appears. Figure 4-7 shows the Configure Unlisted Card dialog box with the Specify Interrupt dialog box opened.

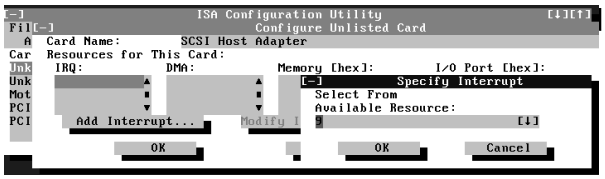



***Figure 4-7. Specify Interrupt Dialog Box***

If you are providing a value for the IRQ or direct memory access (DMA) resource, click the down arrow beneath **AVAILABLE RESOURCES**. A smaller Specify list box appears (see Figure 4-8). Click the value you want to assign to the resource. Then click **OK**.

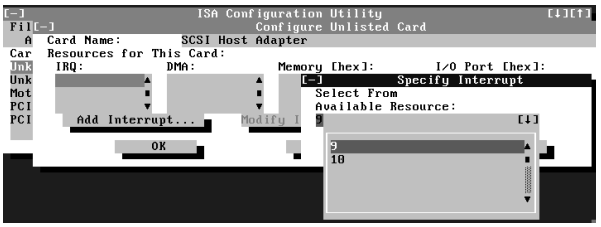



***Figure 4-8. Specify Interrupt List Box***

If none of the values for the DMA or IRQ resources match the allowable values for your unlisted card (as indicated in the card's documentation), select one of the available values offered by the utility and click **OK**.

If you are providing values for the input/output (I/O) port or memory resources, you must enter the starting and ending addresses in hexadecimal format using the two fields provided by the Specify Memory or Specify I/O Port dialog box. Click each box in succession to enter the beginning and ending addresses, and then click **OK** to complete the selection. Figure 4-9 shows the two fields.

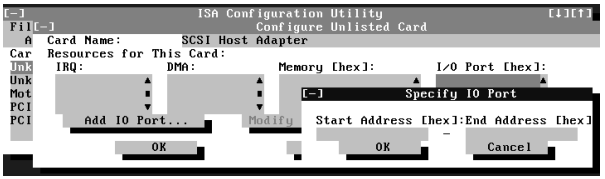



***Figure 4-9. Specify Memory Dialog Box***

8. **When you have finished selecting resources for the unlisted card, click OK in the Configure Unlisted Card dialog box.**

   A message box appears, notifying you either that the card is using its default settings or that it cannot use its default settings and must be reconfigured.

9. **Click OK. If the card must be reconfigured, record the resource settings recommended by the ICU. Click CLOSE to accept the resource settings currently displayed.**

10. **If you had to assign a disallowed resource value to the card in steps 7, 8, and 9, click each of the other cards, and then click VIEW until you find another card using a resource value that is allowed for the unlisted card. Reassign the resource setting for this other card using the procedure in the next section, "Modifying a Card." Then modify the resource settings for the unlisted card so that it uses an allowable value.**

*NOTE: After modifying the system configuration, you must turn the system off to install, remove, or change jumper settings on the ISA expansion cards to match the settings you selected in the ICU.*

# Modifying a Card

Modifying a card allows you to change the system resources used by a card. This feature is helpful when you want to add a card that requires resources already in use by other cards or devices in your computer. You can allocate different resources to the cards currently in your computer to free the resources necessary for the card you want to install.

You can also use this feature to force Plug and Play or PCI expansion cards to use specific resource values. This procedure is called *locking* a card. You should lock a card *only* if it uses static device drivers. See "Locking and Unlocking Cards" found later in this chapter for information.

*NOTE: You cannot modify the resources of a Plug and Play or PCI expansion card. You can only view the resources currently assigned and lock or unlock them.*

To modify the resource settings for a listed or unlisted card, complete the following steps:

1. **Start the ICU as described in "Starting the ICU" found earlier in this chapter.**
2. **Select the card from the list of installed cards in the ICU window, and choose MODIFY CARD from the Configure menu or click MODIFY.**

   If the Card Configuration dialog box appears, the selected card is listed (it has a configuration file in the ICU database). Continue with step 3.

   If the Configure Unlisted Card dialog box appears, the card is unlisted (it does not have a configuration file). Proceed to step 5.

   *NOTE: When you modify an unlisted card, the ICU cannot show you the valid resources for the card. Therefore, you must have documentation from the card manufacturer that describes the resources and resource settings that the card can use.*
3. **Follow steps 7 through 9 in "Adding a Listed Card" found earlier in this chapter. Then continue with step 4 of this procedure.**
4. **Click OK to complete the card modifications and return to the ICU window.**

   You have completed this procedure.
5. **To add, modify, or remove a resource value, select the box beneath the resource to be assigned, and then click ADD, MODIFY, and REMOVE, respectively.**

   For example, if you click the box beneath **INTERRUPT (IRQ)**, **ADD**, **MODIFY**, and **REMOVE** change the Add Interrupt, Modify Interrupt, and Remove Interrupt. When you click one of these buttons, a smaller Specify list box (in this case, **SPECIFY INTERRUPT**) appears.

   If you are providing a value for the IRQ or DMA resource, click the down arrow beneath **AVAILABLE RESOURCES**. Click the value you want to assign to the resource. If the resource can be shared with another card or device, click **SHARABLE**. Then click **OK**.

   If none of the values for the DMA or IRQ resource match the allowable values for your unlisted card (as indicated in the card's documentation), select one of the available values offered by the utility and click **OK**.

   If you are providing values for the I/O port or memory resource, you must enter the starting and ending addresses in hexadecimal format using the two fields provided by the Specify Memory or Specify I/O Port dialog box.
6. **When you have finished selecting resources for the unlisted card, click OK in the Configure Unlisted Card dialog box.**

   A message box appears, notifying you either that the card is using its default settings or that it cannot use its default settings and must be reconfigured.
7. **Click OK. If the card must be reconfigured, record the resource settings recommended by the ICU. Click CLOSE to accept the resource settings currently displayed.**
8. **If you had to assign a disallowed resource value to the card in steps 5, 6, and 7, click each of the other cards, and then click VIEW until you find another card using a resource value that is allowed for the unlisted card. Reassign the resource setting for this other card. Then modify the resource settings for the unlisted card so that it uses an allowable value.**

*NOTE: After modifying the system configuration, you must turn off the system to install, remove, or change jumper settings on the ISA expansion cards to match the settings you selected in the ICU.*

## Removing a Card

Before you remove an ISA expansion card from your computer, you must use the ICU to remove the card from the system configuration.

*NOTE: When you remove a Plug and Play or PCI expansion card from your computer, you do not need to run the ICU. To remove a Plug and Play or PCI expansion card, complete steps 2 through 7 in "Removing an Expansion Card" in Chapter 8.*

Use the following procedure to remove an ISA expansion card from your computer:

1. **Start the ICU as described in "Starting the ICU" found earlier in this chapter.**
2. **Select the card from the current system configuration list in the ICU window.**
3. **Select REMOVE CARD from the Configuration menu, or click REMOVE.**

   The ICU requests verification that you want to remove the card.
4. **Click YES to free the resources allocated to the card and remove its name from the list of active cards, or click NO to cancel the operation.**

   The ICU returns to the ICU window.

   **CAUTION: After removing a card from the system configuration using the ICU, you must turn off the system and physically remove the card. Failure to do so can damage your system.**
5. **Remove the ISA expansion card from the computer.**

   See "Removing an Expansion Card" in Chapter 8 for instructions.

# Viewing Resources

The ICU displays all resources currently used by your system.

To view all system resources, select **SYSTEM RESOURCES** from the View menu or click **VIEW**. The System Resource Usage dialog box (see Figure 4-10) displays all resources currently used by the system.

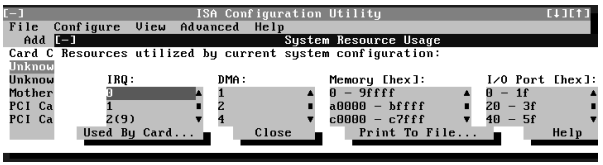



***Figure 4-10. System Resource Usage Dialog Box***

To determine which card uses a particular resource shown in the System Resource Usage dialog box, select the resource in question and then click **USED BY CARD**. The Card Resource Usage dialog box appears with the information.

To view the resources that a particular card is using, select the card from the list displayed in the ICU window, and then select **CARD RESOURCES** from the View menu or click **VIEW**. The Card Resource Usage dialog box displays the resources assigned to that card. Figure 4-11 shows resources that might be assigned to a network adapter card.

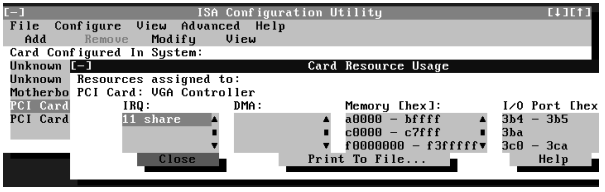



***Figure 4-11. Card Resource Usage Dialog Box***

You can save the information displayed in the resource usage dialog box by clicking **PRINT TO FILE**. The ICU then prompts you for a filename.

# Saving the System Configuration

You can save the system configuration to nonvolatile random-access memory (NVRAM) as you configure each card's resources. To do so, select **SAVE** from the File menu and continue with your operation.

# Exiting From the ICU

At the ICU window, select **EXIT** from the File menu to exit the utility. If you have made any changes to the system configuration, you are asked whether you want to save the changes.

If you click **YES**, the ICU saves the updated system configuration information into NVRAM and in the **system.img** file. If you click **NO**, you exit the ICU without saving any of your configuration changes. If you click **CANCEL**, nothing is saved and the utility continues to operate.

# Advanced Features of the ICU

The ICU provides the following advanced features:

- Locking cards and resources, which allows you to force specific resource assignments every time the system boots rather than allowing certain resources to be assigned dynamically
- Modifying the Configuration Manager, which allows you to reduce the amount of memory used by the ICU

Each of these advanced features is described in more detail in the following subsections.

**CAUTION: The ICU also contains an advanced feature called an image file, which allows you to save a particular configuration and then replicate the configuration on multiple systems. However, configuration information stored in an image file is actually saved to the system's RAM drive, which is erased the next time the system is restarted. For this reason, Dell does not recommend using image files.**

## Locking and Unlocking Cards

The ICU includes a locking mechanism that enables you to allocate the system resources for all or for some functions of a Plug and Play expansion card. Plug and Play expansion cards are dynamic, meaning that they are allocated resources at system boot. Some device drivers support this dynamic card configuration, but some do not. Device drivers that do not support dynamic card configuration are referred to as *static device drivers.*

To determine whether your expansion card has static device drivers, check the documentation that came with your device driver. If you are using a static device driver, you need to permanently associate resources with a Plug and Play expansion card instead of relying on the default Plug and Play behavior. Otherwise, the device driver might not be able to find the card the next time the system boots. This procedure is referred to as *locking* a card.

*NOTE: The locking feature of the ICU is valid only for Plug and Play and PCI expansion cards.*

To lock the card resources or particular functions of the card, you must first enable the locking feature. You must also select a Plug and Play or PCI expansion card from the list of cards installed.

### Locking and Unlocking All Resources

To lock or unlock all the resources and configurations for a Plug and Play or PCI expansion card, perform the following steps:

1. **If it is not already installed, install the Plug and Play or PCI expansion card. Then turn on the system.**

   Complete steps 2 through 9 in "Installing an Expansion Card" in Chapter 8. The Plug and Play expansion card should be configured automatically by the system.

2. **Start the ICU.**

   See "Starting the ICU" found earlier in this chapter.

3. **Select LOCKING ENABLED from the Advanced menu in the ICU window.**

   A check mark next to **LOCKING ENABLED** signifies that the feature is active; a Lock button appears on the tool bar.

4. **Select the Plug and Play expansion card that you want to lock or unlock from the Cards Configured in System list.**

5. **Click LOCK or select LOCK/UNLOCK CARD from the Advanced menu.**

   Both options toggle the lock state of the selected card.

### *Locking and Unlocking Configuration Resources*

You can also lock and unlock individual resources for a card. To do so, perform the following steps:

1. **If it is not already installed, install the Plug and Play expansion card. Then turn on the system.**

   Complete steps 2 through 8 in "Installing an Expansion Card" in Chapter 8. The Plug and Play expansion card is configured automatically by the system.

2. **Start the ICU.**

   See "Starting the ICU" found earlier in this chapter.

3. **Select LOCKING ENABLED from the Advanced menu in the ICU window.**

   A check mark next to **LOCKING ENABLED** signifies that the feature is active; a Lock button appears on the tool bar.

4. **Select the Plug and Play expansion card that you want to lock or unlock from the Cards Configured in System list.**

5. **Click MODIFY or select MODIFY CARD from the Configure menu.**

6. **From the Card Configuration dialog box, select the function you want to lock or unlock.**

7. **Click SETTINGS.**

8. **Modify the resource setting and/or resources offered on the Configuration Settings dialog box, if necessary.**

   See "Modifying a Card" found earlier in this chapter for more information.

9. **Select LOCK RESOURCES.**

   The Lock Resources box toggles the lock state of the selected configuration setting.

10. **Repeat steps 6 through 9 for any other configuration settings that you want to lock or unlock.**

11. **Click OK in the Card Configuration dialog box when you have finished making your selections.**

## *Modifying the Configuration Manager*

PCI and Plug and Play expansion cards are automatically assigned resources when you start up your system. The Configuration Manager makes this resource information available to the ICU.

You can modify the Configuration Manager in two ways to conserve system memory. One option for conserving memory is to set the **/nolock** parameter in the **config.sys** file. The **/nolock** parameter disables the Lock Resources box in the Configuration Settings dialog box and saves 30 kilobytes (KB) of memory.

*NOTE: The* **/nolock** *parameter does not affect the Lock button or the* **LOCK/UNLOCK CARD** *option in the Advanced menu of the ICU.*

You can specify the **/nolock** parameter in the **config.sys** file by modifying the file to include the following command line:

```
device=c:\directory\config\dwcfgmg.sys /nolock
```

*NOTE: See your MS-DOS reference documentation for instructions on how to modify the* **config.sys** *file.*

Be sure to replace *directory* with the name of the directory in which you loaded the Configuration Manager. The default location for the Configuration Manager is in the **c:\plugplay** directory.

A second method for conserving memory is to load the Configuration Manager driver, **dwcfgmg.sys**, into high memory using a memory manager, such as EMM386. To do so, you must modify the **config.sys** file to include the following command lines:

```
device=c:\windows\emm386.exe noems
devicehigh /size=a700 c:\plugplay\con-
fig\dwcfgmg.sys  /nolock
```

If you want to take advantage of both options for conserving system memory by setting the **/nolock** parameter as well as loading the Configuration Manager into high memory, modify the **config.sys** file to contain the following command lines:

```
device=c:\windows\emm386.exe noems
devicehigh /size=32e0 c:\plugplay\con-
fig\dwcfgmg.sys /nolock
```

## *Using Image Files*

An image file contains a representation of the system configuration. The Plug and Play support software looks at NVRAM for the system configuration. If NVRAM becomes corrupted, you can load an image file to boot the

system with a valid system configuration and save the configuration back to NVRAM.

Saving and loading complete system configuration information provides a way to restore a working configuration should something happen to the NVRAM. For instance, your hard-disk drive might become corrupted or unusable, or you might want to discard recent changes to your system configuration and restore a previous configuration.

Another advantage of saving complete system configuration information is that you can use the image file to load identical configurations on several systems.

*NOTE: To load identical configurations on multiple systems, you must copy both the* **system.img** *and* **icu.ndx** *files onto each system.*

## Loading an Image File

You can load system configuration information from a previously saved configuration image file, replacing the information in the ICU's working memory with information from the specified file. To do so, select **LOAD IMAGE** from the Advanced menu. When you exit the ICU, you can save the information to NVRAM or exit without saving changes to the configuration information.

## Saving an Image to a File

After you have configured your system, you can save the image of the ICU's currently saved configuration information to a new configuration image file or resave the image back into the previously specified file. To save the information into a new file, select the **SAVE IMAGE AS** option from the Advanced menu. To save the information back into the previously specified image file, select **SAVE IMAGE** from the Advanced menu. The system configuration information is not saved to NVRAM until you exit the ICU and save the changes. The ICU also saves the current image to a file named **system.img** in the current directory when you save to NVRAM.

*NOTE: You should keep a backup copy of a working configuration in an* **.img** *file on diskette in case you ever need to restore the configuration.*

# Chapter 5
# Using the Network Interface Controller

This chapter describes how to connect your computer system to an Ethernet network using the built-in peripheral component interconnect (PCI) network interface controller (NIC). The NIC, installed on your computer's system board, provides all the functions normally provided by a separate network expansion card. To connect your system to and configure it for use on an Ethernet network, you must complete the following steps:

1. **Connect the network cable to the back of your computer.**

   See the next section, "Connecting to a Network," for detailed instructions.

2. **Verify that the NIC is enabled in the System Setup program.**

   See "NIC" in Chapter 3 for instructions.

3. **Configure the NIC, and install the network drivers by running the 3Com® Install program.**

   See "Configuring the NIC" found later in this chapter for detailed instructions.

4. **Run the NIC diagnostics to verify that the NIC is operating properly.**

   See "Running the NIC Diagnostics" found later in this chapter for detailed instructions.

## Connecting to a Network

Your computer's NIC connector (an RJ45 connector located on the back panel; see Figure 5-1) is designed for attaching an unshielded twisted pair (UTP) Ethernet cable (used in 10Base-T networks). Press one end of the UTP cable into the NIC connector until the cable snaps securely into place.

Connect the other end of the cable to an RJ45 jack wall plate or to an RJ45 port on a UTP concentrator or hub, depending on your network configuration. Observe the following cabling restrictions for 10Base-T networks:

- 10Base-T networks allow the use of 22-, 24-, and 26-gauge cable (24-gauge cable is the most common). Voice and data lines should be in separate sheaths.
- The maximum cable run length (from a workstation to a concentrator) is 328 feet (ft) (100 meters [m]).
- The maximum number of workstations (not counting concentrators) on a network is 1024.
- The maximum number of daisy-chained concentrators on one network segment is four.

The RJ45 connector on the computer's back panel incorporates the following indicators:

- The yellow *activity indicator* flashes when the system is transmitting or receiving network data. (A high volume of network traffic may make this indicator appear to be in a steady "on" state.)
- The green *link integrity indicator* lights up when there is a good 10Base-T connection between the network and the adapter. When the green indicator is off, the computer is not detecting a physical connection to the network.

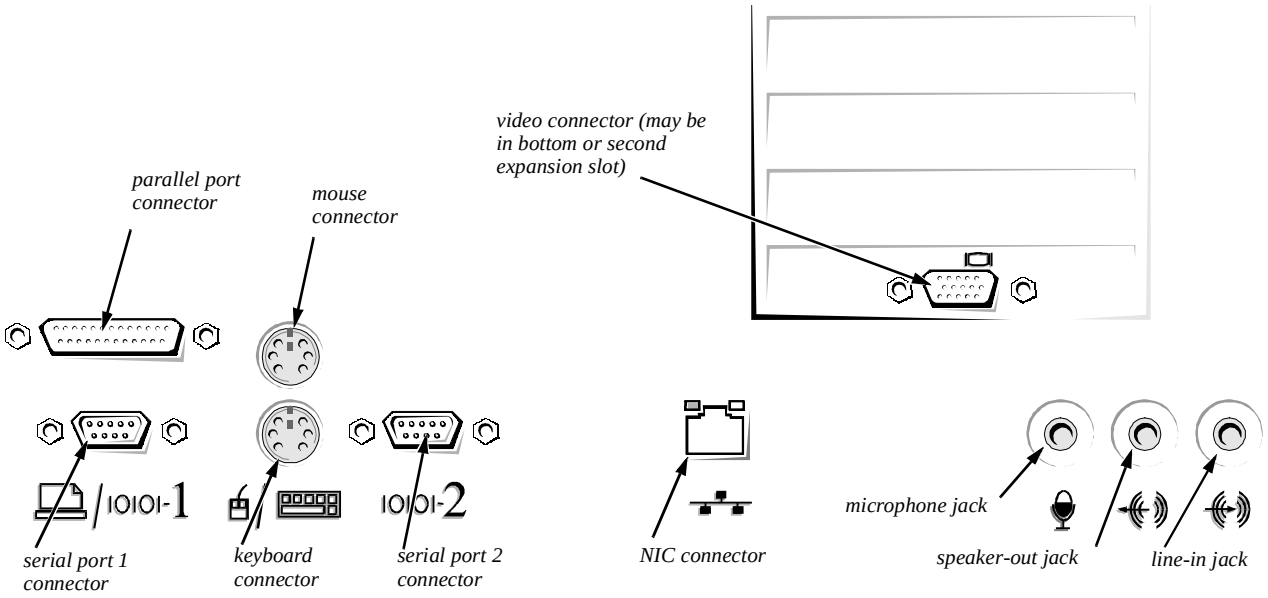



***Figure 5-1. I/O Ports and Connectors***

# Configuring the NIC

If your system is running a Dell-Installed Microsoft Windows NT 4.0 or Windows 95 operating system, the network drivers are automatically detected. If you need to change your network configuration, double-click on the Network icon in the Control Panel and select the Adapter tab. Enter the necessary information about the network card when prompted.

If your system is running the Windows NT 3.51 operating system, see "Installing Network Drivers," found later in this chapter.

If your system is running the MS-DOS operating system, use the 3Com Install program to configure the system's built-in Ethernet NIC.

To run the Install program, follow these steps:

1. **Boot the system to MS-DOS.**

   For instructions, see your MS-DOS reference documentation.

2. **Change to the** c:\dell\network **directory.**

   For example, type cd c:\dell\network.

3. **Type** install **and press <ENTER>.**

   The first time you run the Install program, a license agreement screen appears. To accept the terms and conditions of the license agreement, type y and press <ENTER>. The Install information screen is then displayed.

4. **Read the Install information screen and press <ENTER>.**

   The Main Menu of the Install program appears.

5. **Proceed to the applicable subsection in "Installing Network Drivers" found later in this chapter.**

### Using Install to Change Configuration Settings

In addition to automatically configuring and installing software for your Ethernet NIC, the Install program can be used to change the NIC's configuration settings manually. Except for the following situations, you should not need to change any configuration settings:

- You have a modem faster than 9600 baud.
- You want to optimize a driver for OS/2 or Windows or for operation on a server.

To use Install to change configuration settings, follow these steps:

1. **Follow steps 1 through 4 in "Configuring the NIC" found earlier in this chapter.**
2. **At the Main Menu, select CONFIGURATION/ DIAGNOSTIC/TROUBLESHOOTING... and press <ENTER>.**
3. **At the Configuration and Diagnostic screen, select CONFIGURATION AND DIAGNOSTIC PROGRAM and press <ENTER>.**
4. **Select CONFIGURE ADAPTER and press <ENTER>.**
5. **Press <TAB> until you highlight the first option in the main dialog box. Then use the arrow keys to highlight the category for the configuration setting you want to change, and press <ENTER>.**

   A second dialog box appears.
6. **Use the arrow keys to scroll through the list of options for that configuration setting. Select an option and press <ENTER>.**
7. **Repeat steps 5 and 6 for any other configuration settings you want to change.**
8. **When you have made all your changes, press <TAB> until OK is highlighted. Then press <ENTER>.**
9. **To exit Install, select QUIT from the menu bar.**

## Installing Network Drivers

This section contains information on installing the network drivers available for your system.

### Novell® NetWare® Drivers and Client Software

The following subsections describe how to install drivers and client software in a Novell NetWare environment.

#### Determining an Adapter's Port Address

In order to install multiple clients or one or more server drivers in a multiple-adapter NetWare environment, you must first obtain the port address of each adapter. To determine the adapter's port address, perform the following steps:

1. **Perform steps 1 through 4 of "Configuring the NIC" found earlier in this chapter.**
2. **At the Main Menu, select the CONFIGURATION/ DIAGNOSTIC/TROUBLESHOOTING... option and press <ENTER>.**
3. **From the Configuration and Diagnostic screen, select CONFIGURATION AND DIAGNOSTIC PROGRAM and press <ENTER>.**
4. **From the list of installed adapters that appears, select the adapter whose port address you want.**
5. **Select VIEW from the menu bar.**

   The adapter's port address is displayed as a four-digit hexadecimal number.

The following subsections describe how to install NetWare drivers on client workstations and servers with single or multiple 3Com PCI network adapters.

#### Client Workstation With Built-In 3Com PCI Network Adapter Only

If your Dell OptiPlex GX*pro* network environment fits certain criteria, you can use 3Com's AutoLink installation program on the *Dell Network Drivers* diskette to install your NetWare DOS ODI driver on the client. As part of the driver installation, Autolink will automatically install all necessary NetWare DOS ODI client software, modify the system's **config.sys** and **autoexec.bat** files, log on to the server, and (if a 3Install account has already been configured on the server) update the client software.

The following are system requirements for using the Autolink program:

- Novell NetWare 2.*x*, 3.1*x*, or 4.*x* operating system installed
- Computer is using the built-in 3Com PCI network adapter only, with no additional network adapters installed
- Computer is intended for use as a NetWare DOS ODI client

To use the AutoLink installation program to configure a single NIC on an MS-DOS client workstation in a NetWare environment, follow these steps:

1. **Connect the workstation to a NetWare network, and turn on the system.**

   For instructions on connecting the workstation to a network, see "Connecting to a Network" found earlier in this chapter.

2. **Follow steps 1 through 4 in "Configuring the NIC" found earlier in this chapter.**

3. **When the Main Menu is displayed, select NETWARE DOS ODI CLIENT and press <ENTER>.**

   The Install program then automatically configures the NIC and installs the required software drivers. Several messages appear during the installation process. When the installation process is complete, a message indicates that the NIC has been successfully configured.

4. **When the configuration and installation process has completed successfully, reboot the system.**

   When the system reboots, a DOS ODI client session starts automatically.

*NOTE: Network administrators can edit the* **autolink.cfg** *file to control the NETWARE DOS ODI CLIENT automated installation process. Instructions are contained in the file. To ensure that the computer is configured with the latest client software, the network administrator can set up a 3Install account on the server. Instructions for configuring a 3Install account are contained in the* **readme.txt** *file located in the* **\qinstall\server** *subdirectory of the* **c:\dell\network** *directory, or on the 3Com network drivers diskette.*

## *Client Workstation With Multiple 3Com PCI Network Adapters*

If your NetWare system uses one or more 3Com network adapter cards in addition to the built-in adapter, use the following procedure to install the network drivers and configure the additional adapter cards.

*NOTE: Before starting the following procedure, make sure you know the adapter port address for each adapter. (To determine the port address, see "Determining an Adapter's Port Address" found earlier in this section.)*

1. **Connect the workstation to a NetWare network, and turn on the system.**

   For instructions on connecting the workstation to a network, see "Connecting to a Network" found earlier in this chapter.

2. **Follow steps 1 through 4 in "Configuring the NIC" found earlier in this chapter.**

3. **When the Main Menu is displayed, select NETWORK DRIVERS and press <ENTER>.**

4. **At the Network Drivers screen, select INSTALL NOVELL NETWARE DRIVERS and press <ENTER>.**

5. **At the Novell NetWare Drivers screen, select COPY DOS ODI CLIENT DRIVER and press <ENTER>.**

   After displaying a message about PCI adapter backward compatibility, the program prompts you to specify a target directory. (The default directory is **c:nwclient**.)

   If you are running an ODI driver with multiple adapters already installed, specify which adapter you want the driver to recognize. To do so, use the `pcislot=`*address* parameter to add the adapter's input/output (I/O) base address to the **net.cfg** file. The *Dell Network Drivers* diskette contains a sample **net.cfg** file in the **\netware\client** directory.

6. **When the installation process has completed successfully, reboot the system.**

## *Server With Built-In 3Com PCI Network Adapter Only*

To configure a single built-in 3Com PCI adapter on a computer that is running NetWare and functioning as a server, follow the steps in the appropriate subsection for

NetWare 3.11 or NetWare 3.12, depending on your operating system.

*NOTE: Before starting the following procedures, make sure you know the adapter port address for each installed adapter. (To determine the port address, see "Determining an Adapter's Port Address" found earlier in this section.)*

The *Dell Network Drivers* diskette contains a NetWare 4.*x* server driver (**3c59x.lan**) and the NetWare Loadable Modules (NLMs) that enable the NetWare 4.*x* driver to be used with NetWare 3.11 or 3.12 software. These files are located in the **\netware\server** subdirectory on the diskette.

### NetWare 3.11

To install the 4.*x* server driver on a single-adapter server running NetWare 3.11, follow these steps:

1. **Copy the contents of the NetWare subdirectory to the boot partition on the server's hard-disk drive.**
2. **Reboot the server, then type the following command lines in sequence at the NetWare console, pressing <ENTER> after each one.**

   *NOTE: To ensure correct system operation, the load sequence must be followed exactly.*

   ```
   load c:lslenh.nlm
   load c:3c59x.lan port=xxxx
   ```

   where *xxxx* is the adapter's port address.
3. **When loading has completed, bind the protocol to the driver in the usual manner.**

   For binding information, see your Novell NetWare documentation.

   *NOTE: To run the* **3c59x.lan** *driver with NetWare 3.11, you need to update the* **monitor.nlm** *file that accompanies NetWare 3.11 with a new* **monitor.nlm** *file from Novell. For the latest* **nlm** *files, contact Novell, Inc.*

### NetWare 3.12

To install the 4.*x* server driver on a single-adapter server running NetWare 3.12, follow these steps:

1. **Copy the contents of the NetWare subdirectory to the boot partition on the server's hard-disk drive.**
2. **Reboot the server, then type the following command line at the NetWare console and press <ENTER>.**

   ```
   load c:3c59x.lan port=xxxx
   ```

   where *xxxx* is the adapter's port address.
3. **When loading is complete, bind the protocol to the driver in the usual manner.**

   For binding information, see your Novell NetWare documentation.

## *Server With Multiple 3Com PCI Network Adapters*

If your NetWare server uses one or more 3Com network adapter cards in addition to the built-in adapter, use one of the following procedures to install the drivers and configure the additional adapter cards for NetWare 3.11 or NetWare 3.12, depending on your operating system.

*NOTE: Before starting the following procedures, make sure you know the adapter port address for each installed adapter. (To determine the port address, see "Determining an Adapter's Port Address" found earlier in this section.)*

### NetWare 3.11

To install the 4.*x* server driver on a multiple-adapter server running NetWare 3.11, follow these steps:

1. **Copy the contents of the NetWare subdirectory to the boot partition on the server's hard-disk drive.**
2. **Reboot the server, then type the following command lines in sequence at the NetWare console, pressing <ENTER> after each one.**

   *NOTE: To ensure correct system operation, the load sequence must be followed exactly.*

   ```
   load c:lslenh.nlm
   load c:3c59x.lan port=xxxx name=x
   load c:3c59x.lan port=xxxx name=y
   ```

   where *xxxx* is the adapter's port address and *x* and *y* are one-character parameters you assign to give each adapter a unique name. Enter as many `load c:3c59x.lan...` statements as necessary to load each adapter's address and name.

3. **When loading has completed, bind the protocol to the user-assigned names.**

   For binding information, see your Novell NetWare documentation.

   *NOTE: To run the* **3c59x.lan** *driver with NetWare 3.11, you will need to update the* **monitor.nlm** *file that accompanies NetWare 3.11 with a new* **monitor.nlm** *file from Novell. For the latest* **nlm** *files, contact Novell, Inc.*

### NetWare 3.12

To install the 4.*x* server driver on a multiple-adapter server running NetWare 3.12, follow these steps:

1. **Copy the contents of the NetWare subdirectory to the boot partition on the server's hard-disk drive.**
2. **Reboot the server, then type the following command lines in sequence at the NetWare console, pressing <ENTER> after each one.**

   *NOTE: To ensure correct system operation, the load sequence must be followed exactly.*

   `load c:3c59x.lan port=`*xxxx* `name=`*x*

   `load c:3c59x.lan port=`*xxxx* `name=`*y*

   *xxxx* is the adapter's port address and *x* and *y* are one-character parameters you assign to give each adapter a unique name. Enter as many `load c:3c59x.lan...` statements as necessary to load each adapter's address and name.

3. **When loading has completed, bind the protocol to the user-assigned names.**

   For binding information, see your Novell NetWare documentation.

## *Windows NT 3.51 Drivers*

This subsection describes how to install the Windows NT 3.51 drivers either during or after the installation of the Windows NT 3.51 operating system.

### *Installing Drivers During Operating System Installation*

At some point during installation of the Windows NT 3.51 operating system, you are prompted to configure the network adapter. When this occurs, follow these steps:

1. **At the Network Adapter Card Detection window, click CONTINUE; click CONTINUE again at the second occurrence of this screen.**
2. **At the Add Network Adapter window, scroll down and highlight <OTHER> REQUIRES DISK FROM MANUFACTURER. Then click CONTINUE.**
3. **At the Insert Disk window, insert the *Dell Network Drivers* diskette into drive A, type `a:\ndis\winnt35` at the path prompt, and then click OK.**
4. **From the list of adapters displayed, highlight 3COM ETHERLINK III PCI BUS-MASTER ADAPTER (3C590) and click OK.**

   Wait while the setup program copies a series of setup files. The Windows NT Setup window then presents you with the following three network protocol options:

   - NWLINK IPX/SPX COMPATIBLE TRANSPORT
   - TCP/IP TRANSPORT
   - NETBEUI TRANSPORT

5. **Highlight your choice and click CONTINUE.**

   For more information on which protocol is required for your system, refer to your Windows NT documentation and/or your system administrator.

6. **Continue through the remainder of the Windows NT installation, making sure to restart the system when prompted.**

### *Installing Drivers Subsequent to Operating System Installation*

To install a Windows NT 3.51 driver in an existing Windows NT system, follow these steps:

1. **In the Main program group, double-click first the Control Panel icon and then the Network icon.**

2. **At the Network settings menu, click ADD ADAPTER, scroll down and highlight <OTHER> REQUIRES DISK FROM MANUFACTURER, and click CONTINUE.**
3. **Follow steps 3 through 5 of the previous procedure, "Installing Drivers During Operating System Installation."**
4. **Restart the system when prompted.**

### Installing Other Drivers

This subsection provides general information on installing drivers for the following additional network operating systems:

- IBM® LAN Server 4.0 for OS/2
- IBM LAN Server 4.0 for DOS
- Banyan VINES 6.0
- Microsoft LAN Manager 2.0, 2.1, and 2.2
- Artisoft LANtastic 6.0
- DEC Pathworks for DOS/Windows 4.1, 5.1

For these additional network operating systems, you must install the appropriate network driver by following these steps:

1. **Follow steps 1 through 4 in "Configuring the NIC" found earlier in this chapter.**
2. **At the Main Menu, select NETWORK DRIVERS and press <ENTER>.**
3. **Select the appropriate driver for your network operating system, and specify the drive and directory where you want it installed.**
4. **Instructions for configuring the drivers are contained in text (**.txt**) files in the** c:\dell\3com **directory and its subdirectories. For a list of files, type** dir/s *.txt **and press <ENTER>. Most of these files can be displayed from within the Install program by selecting the menu option to which they pertain. For additional instructions, see the documentation that accompanied your network operating system.**

## Running the NIC Diagnostics

The NIC diagnostics contains three groups of tests:

- Group 1 tests the NIC hardware components, connector, and circuitry and includes the following individual tests:
  - — Register Access Test
  - — EEPROM Vital Data Test
  - — EEPROM Configurable Data Test
  - — FIFO Loopback Test
  - — Interrupt Test
  - — Ethernet Core Loopback Test
  - — Encoder/Decoder Loopback Test

  For more information on any of these tests, press the <F1> key while running the NIC diagnostic program.
- Group 2 does not apply to UTP NICs and thus should not be used on your system.
- Group 3 consists of the Echo Exchange Test, which tests the NIC's ability to send and receive data while connected to the network. To run the Group 3 test, you need a second computer system set up as an echo server. For instructions, see "Setting Up an Echo Server" found later in this section.

The remainder of this section discusses how to run the Group 1 and Group 3 tests, how to change the test parameters, and how to examine the results of the diagnostic tests.

### Running the Group 1 Tests

The Group 1 tests are run ten times by default. To change the number of times the tests run, see "Changing the Test Parameters" found later in this section.

To run the Group 1 tests, follow these steps:

1. **Follow steps 1 through 5 in "Configuring the NIC" found earlier in this chapter.**
2. **From the Main Menu, select CONFIGURATION/ DIAGNOSTIC/TROUBLESHOOTING... and press <ENTER>.**

3. **From the Configuration and Diagnostic screen, select CONFIGURATION AND DIAGNOSTIC PROGRAM and press <ENTER>.**
4. **From the Test menu, select RUN TESTS and press <ENTER>.**

   The Run Tests dialog box appears with the **START** option highlighted.
5. **Press <ENTER> to start the tests.**

   After the tests have run ten times, the results are displayed in the Results column.

## *Running the Group 3 Test*

Before running the Group 3 test, you must set up another system as an echo server. This system must have a 3Com network adapter (such as the built-in NIC in your computer) for the test to work properly. The echo server receives packets from the network adapter being tested and echoes these packets back to the network adapter.

**CAUTION: Do *not* run the Group 3 test on an active network.**

### *Setting Up an Echo Server*

To set up a system as an echo server, follow these steps:

1. **Follow steps 1 through 5 in "Configuring the NIC" found earlier in this chapter.**
2. **From the Main Menu, select CONFIGURATION/ DIAGNOSTIC/TROUBLESHOOTING... and press <ENTER>.**
3. **From the Configuration and Diagnostic screen, select CONFIGURATION AND DIAGNOSTIC PROGRAM and press <ENTER>.**
4. **From the Test menu, select ECHO SERVER and press <ENTER>.**
5. **Click START to make the system an echo server.**

### *Running the Diagnostic Tests*

To run the diagnostic tests, follow these steps:

1. **Follow steps 1 through 5 in "Configuring the NIC" found earlier in this chapter.**
2. **From the Main Menu, select CONFIGURATION/ DIAGNOSTIC/TROUBLESHOOTING... and press <ENTER>.**
3. **From the Configuration and Diagnostic screen, select CONFIGURATION AND DIAGNOSTIC PROGRAM and press <ENTER>.**
4. **From the Test menu, select TEST SETUP and press <ENTER>.**
5. **Enable the Group 3 test. Then select OK and press <ENTER>.**
6. **From the Test menu, select RUN TESTS and press <ENTER>.**

   The Run Tests dialog box appears with the **START** option highlighted.
7. **Press <ENTER> to start the tests.**
8. **When the tests have finished, select QUIT from the Configuration and Diagnostic screen. Then exit the echo server program on the echo server system.**

## *Changing the Test Parameters*

To change the default test parameters for a diagnostic test, follow these steps:

1. **Follow steps 1 through 5 in "Configuring the NIC" found earlier in this chapter.**
2. **From the Main Menu, select CONFIGURATION/ DIAGNOSTIC/TROUBLESHOOTING... and press <ENTER>.**
3. **From the Configuration and Diagnostic screen, select CONFIGURATION AND DIAGNOSTIC PROGRAM and press <ENTER>.**
4. **From the Test menu, select TEST SETUP and press <ENTER>.**
5. **Press <TAB> until you select the field containing the test parameter you want to change. Then, depending on the field you chose, do one of the following:**
   - In the Group Select box, use the arrow keys to select a test group.
   - In the Group 1 Tests box, use the arrow keys to highlight a test. Then press <SPACEBAR> to enable or disable a particular test.

- In the Repetitions box, type the number of test iterations you want or use the arrow keys to select **CONTINUOUS**.
- In the Errors box, press <SPACEBAR> to enable or disable the **HALT ON ERROR** parameter.

6. **When you have finished making changes to the test parameters, select OK and press <ENTER>.**
7. **To run the diagnostic tests with the new test parameters, select RUN TESTS from the Test menu and press <ENTER>.**

## What to Do If a Test Fails

To examine the results of a failed diagnostic test, follow these steps:

1. **Highlight the test that failed and press <ENTER>.**
2. **Select ZOOM and press <ENTER>.**

If a diagnostic test has failed, follow these steps to test the NIC further:

1. **Inspect all cables and connections.**
2. **Make sure that you booted your system to MS-DOS version 3.1 or later and that no device drivers or memory managers are loaded.**
3. **If you are running the Group 3 test, make sure the NIC is connected to a properly cabled and inactive network and that an echo server is set up on the network.**
4. **Make sure the settings for the adapter's options are not the same settings being used by any other adapter cards installed in the computer.**
5. **If you experience problems that occur only when using the NETWARE DOS ODI CLIENT option (described in step 3 of "Client Workstation With Built-In 3Com PCI Network Adapter Only" found earlier in this chapter), display or print the** autolink.log **file located in the root directory of drive C.**

The **autolink.log** file contains a log of all events that occurred during the automatic installation and configuration process. To display this file, at the MS-DOS prompt type the following command line:

```
type c:\autolink.log |more
```

# Chapter 6
# Using the Integrated Audio Controller

This chapter describes how to connect your computer system to external audio devices that use the 16-bit integrated audio controller on your computer's system board. The controller provides all the sound functions found on the Sound Blaster expansion card from Creative Laboratories Inc. This chapter also describes the audio application programs that Dell has installed on your hard-disk drive, and it tells you how to configure the integrated audio controller to avoid resource conflicts with other devices.

*NOTE: The instructions in this chapter apply to systems using the integrated audio controller. If you are using a sound card, use the connection instructions in the documentation that came with your sound card.*

## Using System Software

**CAUTION: If you choose not to use the versions of system software shipped with your computer (the system basic input/output system [BIOS], ISA Configuration Utility [ICU], and audio drivers), sound functions may not work in some application programs.**

To ensure that the sound functions work in all application programs, verify the following:

- The system BIOS version number (displayed in the upper right corner of each System Setup program screen) is A01 or later.
- The ICU version number (displayed in the **version.txt** file on the *ISA Configuration Utility Diskette*) is A04 or later.
- The title line in the **version.txt** file (located in the directory containing your audio drivers) contains the letters "PnP."

If, for some reason, you cannot use all the previously listed versions of these programs and the sound functions do not work in certain application programs, you have the following alternatives:

- If you are using the new audio drivers, run the **diagnose** program located in the directory where the audio drivers are installed (the default is **c:\vibra16**).
- Use the new system BIOS, an older version of the audio drivers, and version A02 of the ICU.
- Use older versions of all the previously listed system software.

### Reverting to an Earlier BIOS Version

If you update your system to the A01 version (or later) of the system BIOS but then decide you need to revert to an earlier version, follow these steps:

1. **Restart the system to the MS-DOS prompt only.**
2. **Enter the System Setup program by pressing <CTRL><ALT><ENTER>.**
3. **Write down or print out any configuration settings that are different from the defaults.**

   Examples of such settings include the hard-disk drive settings and password settings.
4. **Restart the system using a clean, bootable diskette containing the flash BIOS program. Then run the flash BIOS program from the diskette.**

   The flash BIOS program is available from the Dell World Wide Web page at **http://www.dell.com** and from the Dell Bulletin Board Service (BBS). Instructions for running the flash BIOS program are

provided in the **flash.txt** file. For the BBS contact number in your location, see your *Diagnostics and Troubleshooting Guide*.

5. **Restart the system to the MS-DOS prompt, and enter the System Setup program. Then press <ALT><F> to reset all categories to their defaults.**
6. **Reenter all settings you noted in step 3. Also update the TIME and DATE categories.**
7. **Press <ALT><B> to restart the system and save the changes you made to the System Setup program.**

# Connecting Audio Devices

You can connect a variety of audio devices to your computer. Use Figure 6-1 to locate the audio connectors on the input/output (I/O) panel on the back of your computer.

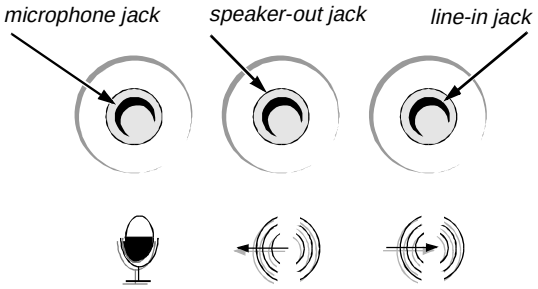



***Figure 6-1. Audio Connectors***

Before using any audio device, be sure that the **SOUND** category in the System Setup program is set to **ON** (the default). For instructions, see Chapter 3, "Using the System Setup Program."

*NOTE: Dell recommends that you turn off your computer before connecting any peripheral device.*

## Speakers

Your computer system supports most standard speakers that have integrated amplifiers. You can purchase speakers separately from Dell.

Connect the audio cable from the speakers to the speaker-out jack (see Figure 6-1).

*NOTE: When speakers are attached to the speaker-out jack and the* **SOUND** *category in the System Setup program is set to* **ON***, sounds generated by the computer, such as beep codes, are heard through the external speakers and the computer's built-in speaker. If the* **SPEAKER** *category in the System Setup program is set to* **OFF***, the external speakers do not transmit sounds generated by the computer.*

## Microphones

Your computer system supports most standard personal computer microphones. You can purchase a microphone separately from Dell.

Connect the audio cable from the microphone to the microphone jack (see Figure 6-1).

## Record/Playback Devices

Your computer system supports a variety of record/playback devices such as cassette players, CD players, radios, stereo systems, video cassette recorders (VCRs), and tape players.

Connect the line-out cable from any one of these devices to the line-in jack on the back of your computer (see Figure 6-1).

## CD-ROM Drives

Use the following procedure to use an internal CD-ROM drive with the integrated audio controller:

1. **Install the CD-ROM drive in your computer.**

   For instructions on installing a CD-ROM drive that uses the computer's enhanced integrated drive electronics (EIDE) interface, see "Installing a Drive That Uses a Built-In Drive Interface in a 5.25-Inch Drive Bay" in Chapter 9.

   For instructions on installing a small computer system interface (SCSI) CD-ROM drive, see "Installing SCSI Devices" in Chapter 9.

2. **Connect the audio cable from the CD-ROM drive to the CD-ROM drive interface connector (labeled "CD_IN") on the system board.**

   See Figure 8-1 for the location of the CD_IN connector on the system board.

*NOTES: The integrated audio controller allows you to manipulate musical instrument digital interface (MIDI) files on your computer and to hear output from those files on external speakers. However, to communicate with an external MIDI device, such as a synthesizer or other musical instrument, you must install a MIDI-compatible expansion card. (For instructions, see "Installing an Expansion Card" in Chapter 8.) If you use a MIDI card, set the* **SOUND** *category in the System Setup program to* **OFF**. *(See Chapter 3, "Using the System Setup Program," for information on changing System Setup categories.)*

*To use a joystick, install a joystick-compatible expansion card in your computer. (For instructions, see "Installing an Expansion Card" in Chapter 8.) If you use a joystick card with sound capabilities, set the* **SOUND** *category in the System Setup program to* **OFF**. *(See Chapter 3, "Using the System Setup Program," for information on changing System Setup categories.)*

# Adjusting Volume

Use the instructions in one of the following subsections to adjust the volume and speaker balance of an audio source that uses the integrated audio controller in your Dell computer.

## Adjusting Volume in Microsoft Windows NT 4.0 and Windows 95

Use the following procedure to access the volume control and speaker balance utility (Sound Blaster Mixer) in Microsoft Windows NT 4.0 and Windows 95:

1. **Double-click the Volume Control in the taskbar to access the Volume Control window.**
2. **Use the taskbar to adjust the volume control.**

For detailed instructions on adjusting the volume, see your Windows documentation.

## Adjusting Volume in Microsoft Windows NT 3.51

Use the following procedure to access the volume control and speaker balance utility (Media Player) in Microsoft Windows NT 3.51:

1. **In the Windows Accessories group, double-click the Media Player icon.**
2. **Click the Select Device menu and select VOLUME CONTROL.**
3. **Use the taskbar to adjust the volume setting.**

For detailed instructions on using the Media Player utility, see your Windows 3.51 documentation.

## Adjusting Volume in Microsoft Windows

Use the following procedure to access the volume control and speaker balance utility (Creative Mixer) in Microsoft Windows:

1. **In the Windows Program Manager, double-click the Audio program group.**
2. **Double-click the Creative Mixer icon.**

For detailed instructions on using Creative Mixer, see Chapter 4, "Creative Mixer," in the *Dell Integrated Audio User's Guide* that accompanied your Dell system.

## Adjusting Volume in MS-DOS

Use the following procedure to access the volume control and speaker balance utility (Mixerset) in MS-DOS:

1. **At the MS-DOS prompt, type** cd vibra16 **and press <ENTER>.**
2. **Type** mixerset **and press <ENTER>.**

For detailed instructions on using the Mixerset utility, see Chapter 8, "Mixerset Utility," in the *Dell Integrated Audio User's Guide* that accompanied your Dell system.

## Using the Dell-Installed Audio Application Programs

Dell has installed several application programs that let you take advantage of the computer's integrated sound. For instructions on using these application programs, see the *Dell Integrated Audio User's Guide* that came with your system.

The following Windows application programs are installed on your hard-disk drive:

- Creative WaveStudio, which allows you to record, play, and edit 8-bit (tape quality) and 16-bit (CD quality) data.
- Creative EnsembleAV, which lets you play audio through different players independently or concurrently.
- Creative Soundo'LE, which can be used to play and record **.wav** data. Soundo'LE supports object linking and embedding (OLE), which means you can insert sound into other application programs by linking or embedding the **.wav** files.
- Creative Mixer, an audio mixer that lets you combine and manipulate sound from several audio sources.
- Creative Mosaic, a board game.

The *Dell Integrated Audio User's Guide* also describes several MS-DOS utilities and application programs that are available on your hard-disk drive.

*NOTE: These application programs are not installed on systems running the Windows NT 3.51 or 4.0 operating systems. Windows NT 3.51 and 4.0 allow you to take advantage of the system's integrated sound through the Multimedia application program. To access this application program, double click the Multimedia icon in the Windows NT Control Panel.*

## Configuring the Integrated Audio Controller

The integrated audio controller is configured to avoid resource conflicts with other devices that Dell installed in your computer. To check the resource configuration of the audio controller, open the Audio program group in the Program Manager and double-click the Check Resources icon.

*NOTE: If you are running MS-DOS or another non-Windows operating system, use the ISA Configuration Utility (ICU) to check the resources of the integrated audio controller. For instructions, see "Viewing Resources" in Chapter 4.*

If you change the configuration of your system—for instance, if you add an expansion card—you may need to reconfigure the resources of the audio controller or the new device.

Whenever possible, change the resources of the new device, not those of the audio controller. See the documentation that accompanied the device for instructions on changing its resource configuration.

If you must change the resource configuration of your computer's integrated audio controller, use the ICU as described in the following procedure. This utility automatically configures the audio controller to work with any other device installed in your computer.

**CAUTION: Do not use any other configuration utility to change the resources of the integrated audio controller in your computer. Using another utility causes resource problems and could keep you from using the integrated audio feature on your computer.**

*NOTE: In Windows 95, the functions provided by the ICU are handled by the Device Manager, which can be accessed by double-clicking the System icon in the Control Panel. See your Windows 95 documentation for instructions on using the Device Manager to manage resources and resolve conflicts.*

Use the following procedure to change the resources of the integrated audio controller through the ICU:

1. **Start the ICU.**

   Use the instructions in Chapter 4, "Using the ISA Configuration Utility." In particular, read the sections titled "Quick Start," "Preparing to Use the ICU," and "Starting the ICU."

2. **At the ICU window, highlight MOTHERBOARD SYSTEM DEVICES and press <ENTER> (see Figure 6-2).**

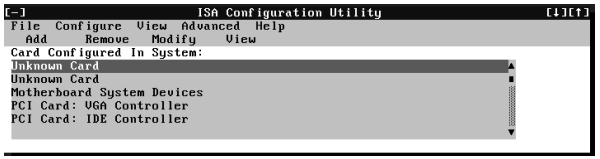



*Figure 6-2. ICU Window*

3. **Select MODIFY CARD from the Configure menu to display a list of all system board devices.**

4. **Highlight MULTI-MEDIA AUDIO CONTROLLER, and press <ENTER>.**

   The Configuration Settings screen appears, listing the default IRQ number, DMA channels, and I/O addresses in separate boxes.

5. **Select the IRQ.**

   Highlight the IRQ box heading and double-click the default IRQ to display the Select Interrupt screen. Click the down arrow to display a list of available IRQs; highlight your choice and then click **OK**.

6. **Select the DMA channels.**

   You must select (or accept) both an 8-bit low DMA channel (the top option) and a 16-bit high DMA channel (the bottom option). For each channel, make a new selection by double-clicking the default DMA to display the Select DMA screen and then proceeding as you did to select the IRQ.

7. **Select the I/O port addresses.**

   You must select (or accept) three separate I/O addresses—the base I/O address, the MPU-401 MIDI port address, and the FM music synthesizer address.

   For each address, double-click the default I/O address to display the Select IO Port screen. Click the down arrow to display the list of available choices; highlight your choice and click **OK**.

   *NOTE: The FM music synthesizer address offers only one option.*

8. **When you are satisfied with your selections, save the configuration and exit the ICU.**

   Click **OK** at the Configuration Settings screen and then at the Card Configuration screen. At the ICU screen, save the file and exit.

   Your operating system's start-up files (**autoexec.bat** and **config.sys**) are automatically updated.

   The Configuration Choice menu lists all of the allowable configurations for the integrated audio controller.

9. **Highlight a configuration that does not conflict with the resources of your new device, and press <ENTER>.**

10. **Save the configuration, exit the ICU, and restart your system.**

    Your operating system's start-up files (**autoexec.bat** and **config.sys**) are automatically updated.

## Installing Audio Drivers

Your system's Plug and Play audio drivers were installed at Dell and are operative when you receive the system—no further installation or configuration is needed to use them. However, should you need to reinstall them on your system for any reason, you can do so as described in the following subsection titled "MS-DOS, Windows 3.1*x*, and Windows for Workgroups."

If your system is running the Windows 95 operating system or a Dell-installed Windows NT 3.51 or 4.0 operating system, audio drivers are automatically detected and configured at system start-up. If you need to reinstall Windows NT 3.51 or 4.0 drivers, see the subsection titled "Windows NT 3.51 and 4.0."

## MS-DOS, Windows 3.1x, and Windows for Workgroups

To reinstall audio drivers on systems running the MS-DOS, Windows 3.1x, and Windows for Workgroups operating systems, perform the following steps:

1. **If you have not already done so, use the Dell DiskMaker to make diskette copies of the four audio driver diskette images on your hard-disk drive.**

   The Dell DiskMaker is available through the Dell Accessories program group. For more information, refer to the online help provided in the Dell DiskMaker program.

2. **If you are in Windows, exit to the MS-DOS prompt.**
3. **Insert diskette 1 of 4 (the Configuration Manager diskette) into drive A, and then type** `a:` **at the MS-DOS prompt.**
4. **Type** `install` **to run the installation program.**
5. **At the Configuration Manager Welcome... screen, press <ENTER>.**
6. **To accept the default install locations, press <ENTER>. (To change the locations, follow the on-screen instructions.)**

   The program copies files to the designated locations and notifies you that it is making changes to your **config.sys** and **autoexec.bat** files.

7. **When prompted, press <ENTER> to continue.**

   The program scans your files and makes the necessary modifications.

8. **When prompted, press any key to continue.**
9. **At the Software Installation Completed screen, remove diskette 1 and then press <F10> to reboot the system.**
10. **After the system has restarted, insert diskette 2 of 4 (the install diskette) and type** `a:` **at the MS-DOS prompt.**
11. **Type** `install` **to run the installation program.**
12. **At the Audio Software Welcome... screen, press <ENTER>.**
13. **At the next screen, press <ENTER> to select the FULL INSTALLATION option.**
14. **To accept the default install locations, press <ENTER>. (To change the locations, follow the on-screen instructions.)**

    The program displays your audio device configuration settings (these are not changeable options).

15. **Press <ENTER> to install the driver files.**
16. **When prompted, remove diskette 2, insert diskette 3 of 4 (the applications diskette), and press <ENTER>.**

    The program continues with the installation process.

17. **When prompted, remove diskette 3, insert diskette 4 of 4 (the accessories diskette), and press <ENTER>.**

    The program continues with the installation process.

    The program copies files to the designated locations and notifies you that it is making changes to your **config.sys** and **autoexec.bat** files.

18. **When prompted, press <ENTER> to continue.**
19. **If prompted to replace a file, highlight BACKUP and press <ENTER>.**
20. **At the Software Installation Completed screen, remove the diskette and press <F10> to reboot the system.**

    When you next start Windows, the new Audio group appears in your Program Manager.

*NOTE: If, after completing this procedure, you have problems with any MS-DOS programs, move the line containing* set blaster= *below the line containing* ctcu *in your* **autoexec.bat file**. *This change is required when running Quake by id Software, Inc. For instructions on modifying your* **autoexec.bat** *file, see your MS-DOS documentation.*

## Windows NT 3.51 and 4.0

To reinstall audio drivers on systems running a Dell-installed Windows NT 3.51 or 4.0 operating system, perform the following steps:

1. **Double-click the Multimedia icon from the Control Panel.**
2. **Click the Device tab in the Multimedia Properties window.**

3. **Click Audio Devices from the Multimedia Devices list and click ADD.**
4. **Select CREATIVE LABS SOUND BLASTER 1.X, PRO16 and click OK.**
5. **Click CONTINUE in the Sound Blaster I/O Address window.**
6. **Change the MPU401 I/O address setting to DISABLED in the Sound Configuration Window, and then click OK.**
7. **Restart the system when prompted.**

# Chapter 7
# Working Inside Your Computer

Your Dell computer system supports a variety of internal options that expand system capabilities. This chapter prepares you to install options inside the computer. It describes how to remove and replace the computer cover and expansion-card cage; it shows how to rotate the power supply out of the way to expose the system board features beneath; and it familiarizes you with the internal components you may handle if you install Dell hardware options.

## Before You Begin

To make working inside your computer easier, make sure you have adequate lighting and a clean work space. If you temporarily disconnect cables or remove expansion cards, note the position of the connectors and slots 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 in detail elsewhere in this guide.

### Safety First—For You and Your Computer

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

**WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF YOUR EQUIPMENT**

**Before starting to work on your computer, perform the following steps in the sequence indicated:**

1. **Turn off your computer and all 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. **If you are disconnecting a peripheral from the computer or are removing a component from the system board, wait 5 seconds after turning off the computer before disconnecting the peripheral or removing the component to avoid possible damage to the system board.**
4. **Touch an unpainted metal surface on the computer chassis, such as the power supply, 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, Dell recommends that you periodically review the safety instructions at the front of this guide.

## Removing the Computer Cover

Use the following procedure to remove the computer cover:

1. **Observe the *Warning for Your Personal Safety and Protection of Your Equipment* described earlier in this chapter. Also observe the safety instructions at the front of this guide.**
2. **If you have installed a padlock (optional; see Figure 7-1) through the two rings on the cover and the back panel, remove the padlock.**

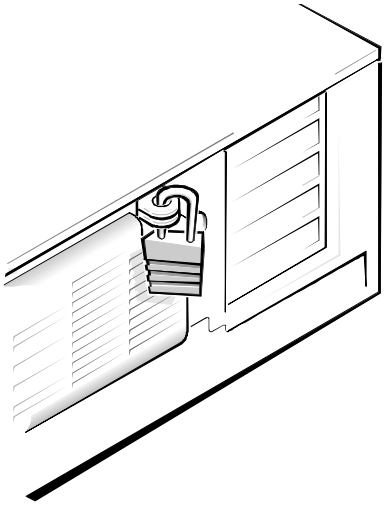


***Figure 7-1. Padlock Installed***

3. **Remove the cover.**

   From the front of the computer, press in the two securing buttons (located on the sides of the cover toward the back). With the buttons depressed, lift the cover at the back, allowing it to pivot up toward you (see Figure 7-2).

   Disengage the plastic hooks that secure the cover to the front of the chassis, and lift the cover away.

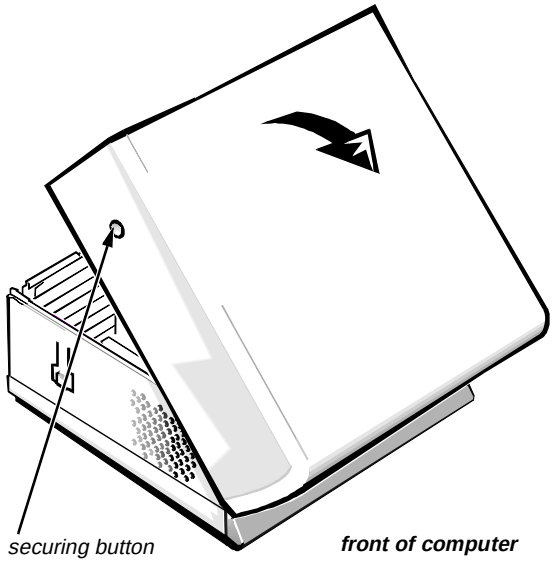



***Figure 7-2. Removing the Computer Cover***

## Replacing the Computer Cover

Use the following procedure to replace the 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. Make sure cables are not routed over the drive cage—they will prevent the cover from closing properly.**
2. **Check to see that no tools or extra parts (including screws) are left inside the computer's chassis.**
3. **Replace the cover.**

   From the front of the computer, hold the cover at about a 45-degree angle as shown in Figure 7-3 (with the top tilted away from you). Set the bottom front of the cover on top of the plastic "ledge" that runs along the bottom front of the chassis, and fit the four hooks along the bottom of the cover into the rectangular slots along the bottom front of the chassis. (It may be helpful to look down into the chassis to verify that the hooks are in place.)

Pivot the cover down toward the back and into position (make sure the securing buttons click into place).

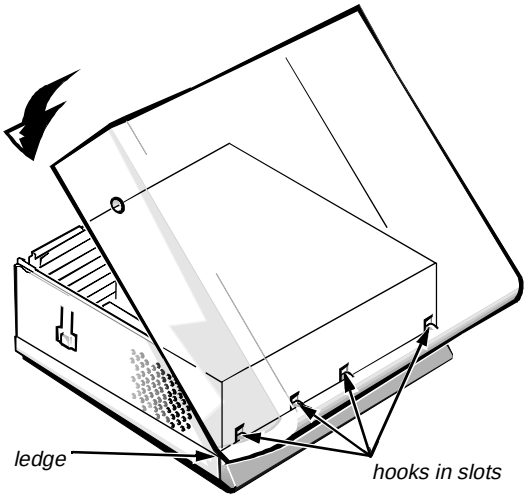



***Figure 7-3. Replacing the Computer Cover***

4. **If you are using a padlock to secure your system, reinstall the padlock.**

## *Unpacking Your Hardware Option*

When you remove an option from its shipping carton, you may find it wrapped in antistatic packing material designed to protect it from electrostatic damage. Do not remove the packing material until you are ready to install the option.

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

# *Inside Your Computer*

Figure 7-4 shows an overhead view of your computer to help you orient yourself when installing hardware options. Unless otherwise specified, locations or directions relative to the computer are as shown.

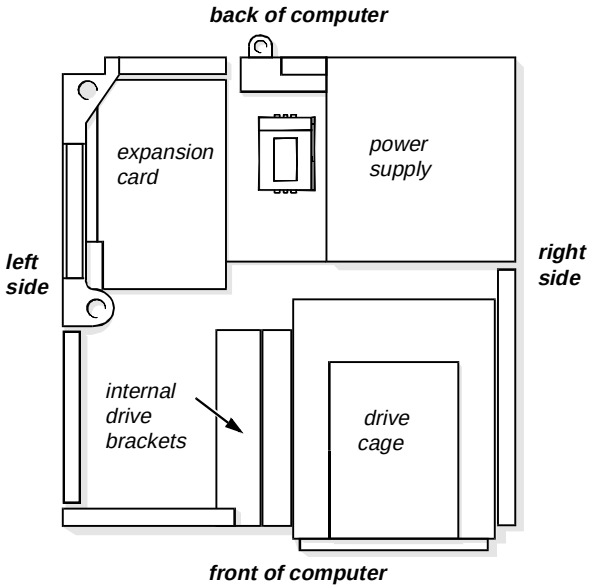



***Figure 7-4. Computer Orientation View***

Figure 7-5 shows your computer with its cover removed. Refer to this illustration to locate interior features and components discussed in this guide.

When you look inside your computer, note the *direct current (DC) power cables* coming from the power supply (only one power cable is illustrated in Figure 7-5). These cables supply power to the system board; to internal diskette drives, hard-disk drives, and tape drives; and to certain expansion cards that connect to external peripherals.

The flat ribbon cable in Figure 7-5 is typical of the *interface cables* for internal drives. An interface cable connects a drive to a connector on the system board or on an expansion card.

The *system board*—the large printed circuit board at the bottom of the chassis—holds the computer's control circuitry and other electronic components. Some hardware options are installed directly onto the system board.

During an installation procedure, you may be required to change a *jumper* setting on the system board, and/or a jumper or *switch* setting on an expansion card or on a drive. (See "Jumpers and Switches—A General Explanation" in Appendix B.)

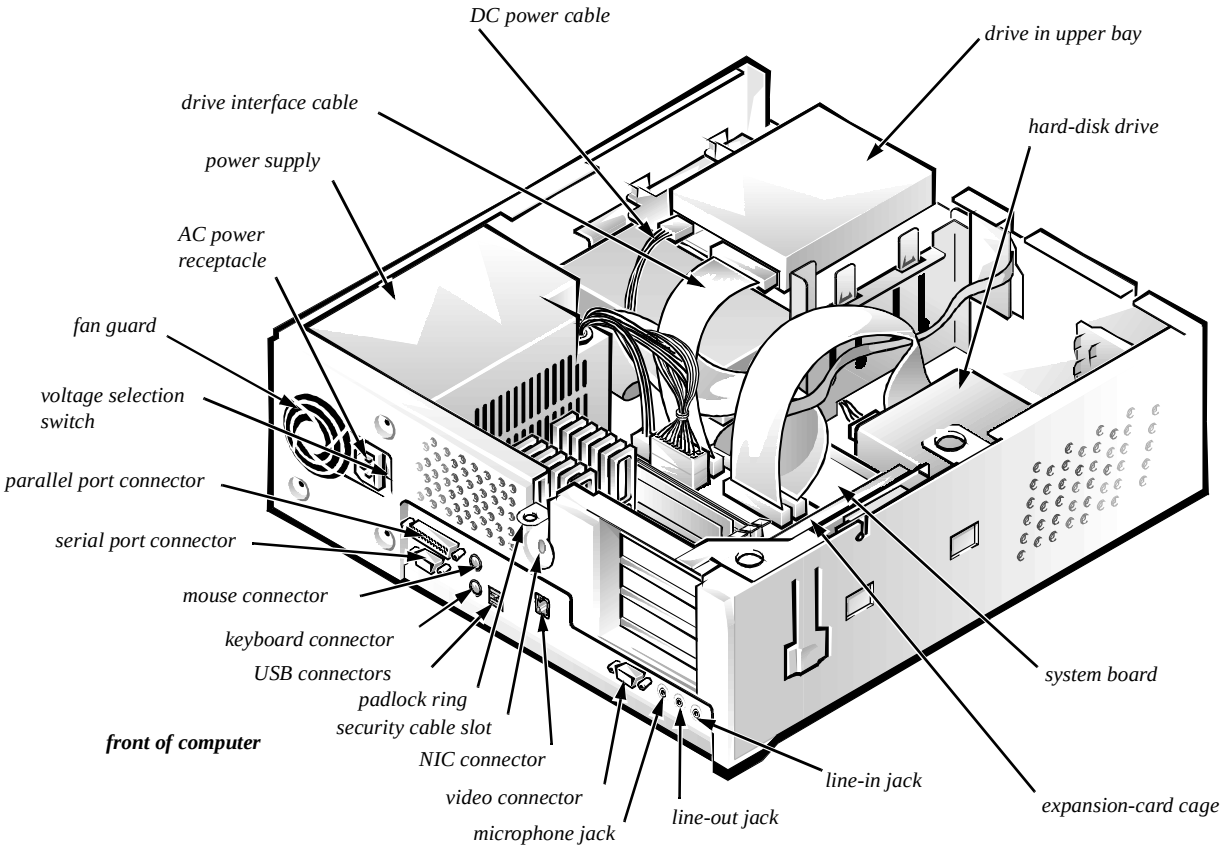



***Figure 7-5. Inside the Chassis***

# Removing and Replacing the Expansion-Card Cage

Your Dell computer has a removable expansion-card cage, which greatly simplifies many installation procedures by allowing you to remove the riser board and all installed expansion cards in a single step.

## Removing the Expansion-Card Cage

Use the following procedure to remove the expansion-card cage:

1. **Remove the computer cover as instructed in "Removing the Computer Cover" found earlier in this chapter.**
2. **Check any cables connected to expansion cards through the back-panel openings. Disconnect any cables that will not reach to where the cage must be placed while removed from the chassis.**
3. **Locate the card-cage securing lever (see Figure 7-6). Rotate the lever toward the back of the computer until it stops in an upright position.**

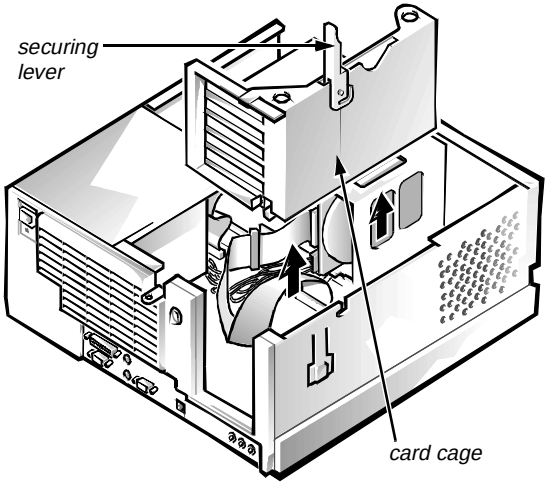



***Figure 7-6. Removing the Expansion-Card Cage***

4. **Lift the expansion-card cage up and away from the chassis.**

## Replacing the Expansion-Card Cage

Use the following procedure to replace the expansion-card cage:

1. **With the securing lever in the upright position, fit the expansion-card cage flush against the left wall of the chassis and lower it into place.**
2. **Rotate the securing lever toward the front of the chassis, all the way down. Make sure the riser board is fully seated in the RISER connector on the system board.**
3. **Reconnect any cables you removed in step 2 of the previous procedure, "Removing the Expansion-Card Cage."**

## Rotating the Power Supply Away From the System Board

The memory, power, and battery sockets lie beneath the power supply. To access any of these features, you can easily rotate the power supply up and out of the way, as follows:

1. **Remove the computer cover as instructed in "Removing the Computer Cover" found earlier in this chapter.**
2. **Unplug the main alternating current (AC) power cable from the AC power receptacle on the back of the computer (see Figure 7-5).**
3. **Facing the front of the computer, locate the securing tab at the back-left corner of the power supply (see Figure 7-7). Push the tab to the left to disengage the power supply, and rotate the power supply to the right until it stops.**

   The power supply can remain in this vertical position while you work on the system board.

To replace the power supply, rotate it back into position, making sure that the securing tab snaps into place.

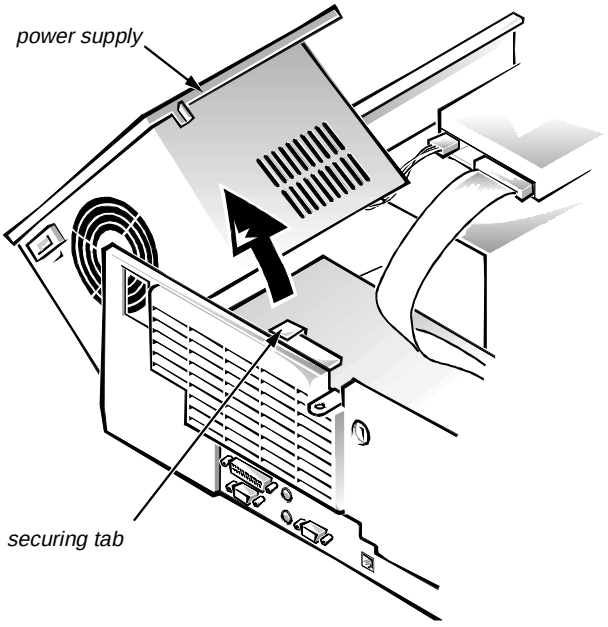



***Figure 7-7. Rotating the Power Supply***

# Chapter 8
# Installing System Board Options

This chapter describes how to install the following options:

- Industry-Standard Architecture (ISA) and Peripheral Component Interconnect (PCI) expansion cards
- System memory
- Microprocessor
- Microprocessor card (for dual-processor systems)

This chapter also includes instructions for replacing the system battery, if necessary.

Use Figure 8-1 to locate the system board features.

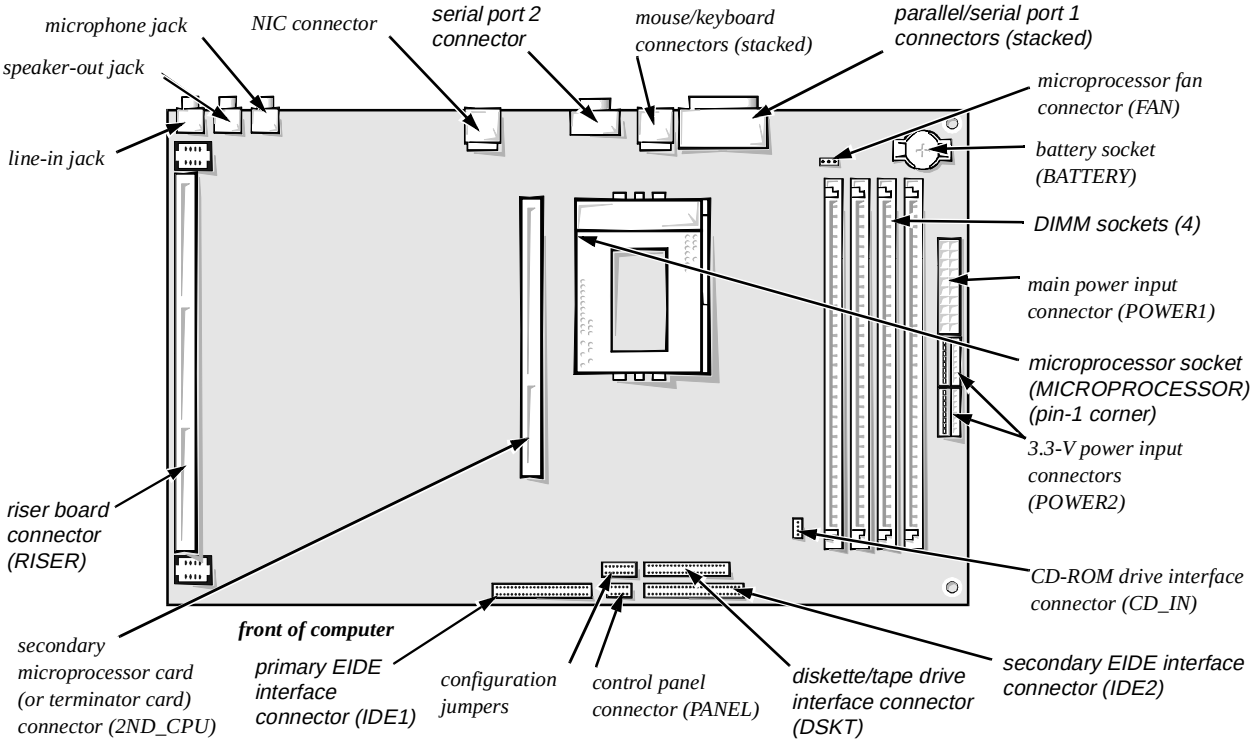



***Figure 8-1. System Board Features***

# Expansion Cards

Expansion cards can be installed on the computer's *riser board* (see Figure 8-3). The vertical riser board plugs into the RISER connector on the system board (see Figure 8-1) and is considered an extension of the system board.

The system accommodates a mix of up to five 32-bit PCI expansion cards and up to two 8- and/or 16-bit ISA expansion cards, not to exceed a total of five cards. (See Figure 8-2 for examples of ISA and PCI expansion cards.)

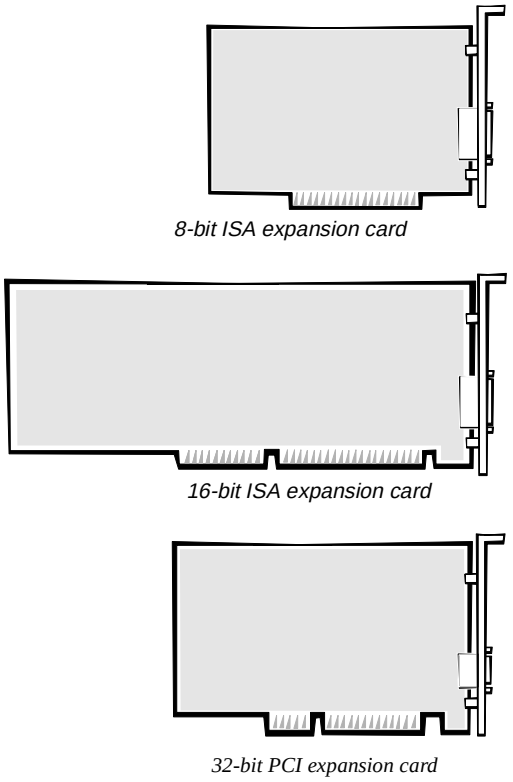



***Figure 8-2. Expansion Cards***

## Expansion Slots

Of the seven expansion-card connectors on the riser board, five (the shorter connectors) are for PCI cards and two (the longer connectors) are for ISA cards. Because both ISA connectors share expansion-slot space with the adjacent PCI connectors, a maximum of five expansion cards can be installed.

- Expansion-card connectors PCI1 (at the bottom of the riser board) through PCI5 support 32-bit PCI expansion cards. Note that connector PCI5 shares expansion-slot space with connector ISA2 and that connector PCI4 shares expansion-slot space with connector ISA1, so that only one card of either type can be installed in the common slots.

  **CAUTION: Your system's video card must be installed in one of the two bottom-most PCI connectors (PCI1 or PCI2).**

- Expansion-card connectors ISA2 (at the top of the card) and ISA1 can accommodate 8- or 16-bit ISA expansion cards. Note that connector ISA2 shares expansion-slot space with connector PCI5 and that connector ISA1 shares expansion-slot space with connector PCI4, so that only one card of either type can be installed in the common slots.

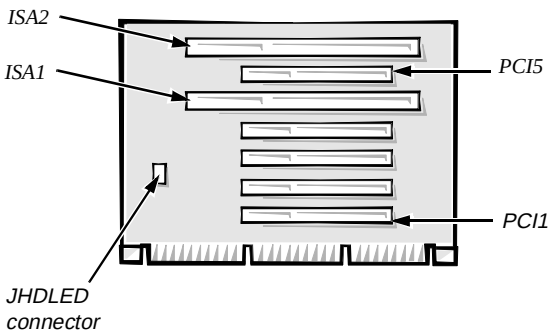



***Figure 8-3. Riser-Board Expansion-Card Connectors***

## Installing an Expansion Card

Follow this general procedure to install an expansion card:

1. **If you are installing an ISA expansion card, enter the ISA Configuration Utility (ICU) and add the new expansion card to your configuration.**

   See Chapter 4, "Using the ISA Configuration Utility," for instructions.

   *NOTE: If you install a PCI or Plug and Play expansion card, your system automatically performs any required configuration tasks during the boot routine.*

2. **Prepare the expansion card for installation, and remove the computer cover according to the instructions in "Removing the Computer Cover" in Chapter 7.**

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

   See the documentation that came with the expansion card for information on configuring the card, making internal connections, or otherwise customizing it for your system.

3. **Remove the expansion-card cage as instructed in "Removing the Expansion-Card Cage" in Chapter 7.**

4. **Unscrew and remove the metal filler bracket that covers the card-slot opening for the expansion slot you intend to use (see Figure 8-4).**

   Save the screw to use when installing the expansion card later in this procedure.

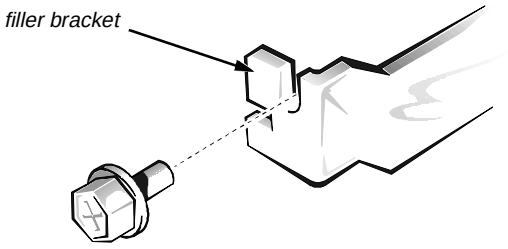



***Figure 8-4. Removing the Filler Bracket***

5. **Install the expansion card.**

   Position the expansion-card cage so that the riser board lies horizontal on your work surface.

   To orient the expansion card correctly, match the notch in the card's edge connector to the cross-bar in the desired expansion-card connector on the riser board.

   Insert the card's edge connector firmly into the expansion-card connector. Gently rock the card into the connector until it is fully seated (see Figure 8-5).

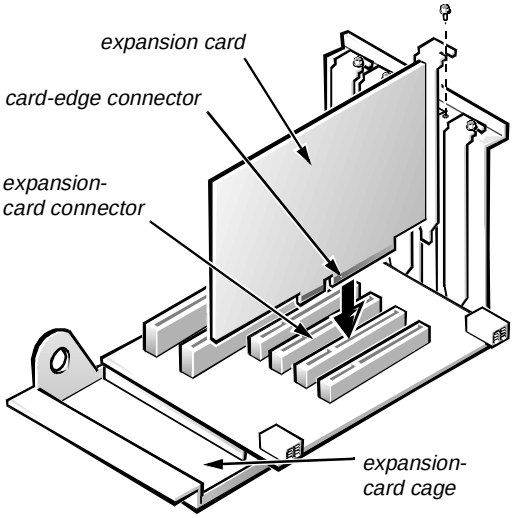



***Figure 8-5. Installing an Expansion Card***

6. **When the card is firmly seated in the connector and the card-mounting bracket is flush with the brackets on either side of it, secure the bracket with the screw you removed in step 4.**

7. **Replace the expansion-card cage in the chassis as instructed in "Replacing the Expansion-Card Cage" in Chapter 7.**

8. **Connect any cables that should be attached to the card.**

   See the documentation that came with the card for information about its cable connections.

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

### *Removing an Expansion Card*

Follow this general procedure to remove an expansion card:

1. **If you are removing an ISA expansion card, enter the ICU and remove the expansion card from your configuration.**

   See Chapter 4, "Using the ISA Configuration Utility," for instructions.

2. **Remove the computer cover according to the instructions in "Removing the Computer Cover" in Chapter 7.**

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

3. **If necessary, disconnect any cables connected to the card.**
4. **Remove the expansion-card cage as instructed in "Removing the Expansion-Card Cage" in Chapter 7.**
5. **Position the expansion-card cage with the riser board lying horizontal on your work surface, and unscrew the mounting bracket of the card you want to remove.**
6. **Grasp the card by its outside corners, and ease it out of its connector.**
7. **If you are removing the card permanently, install a metal filler bracket over the empty card-slot opening.**

   *NOTE: Installing filler brackets over empty card-slot openings is necessary to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of your computer.*

8. **Replace the expansion-card cage in the chassis as instructed in "Replacing the Expansion-Card Cage" in Chapter 7.**
9. **Replace the computer cover, reconnect your computer and peripherals to their power sources, and turn them on.**

## *Adding Memory*

Dell OptiPlex GX*pro* systems use extended-data out (EDO) and error correcting code (ECC) memory modules.

Memory can be increased to a maximum of 512 megabytes (MB) by installing combinations of 3.3-volt (V) 16-, 32-, 64-, and 128-MB dual in-line memory modules (DIMMs) in the four DIMM sockets (DIMM A—closest to the edge of the system board, DIMM B, DIMM C, and DIMM D) on the system board. Figure 8-6 shows the DIMMs and DIMM sockets.

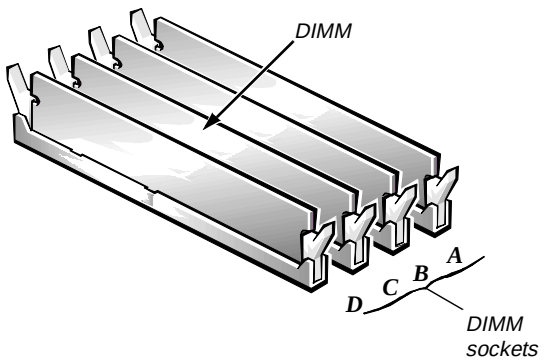



***Figure 8-6. DIMMs and DIMM Sockets***

### *DIMM Installation Guidelines*

Because the DIMMs used in this computer are each the equivalent of two single in-line memory modules (SIMMs), it is not necessary to install the memory modules in pairs as it was with SIMMs. For optimum operation, Dell recommends installing the DIMMs starting with socket A and working toward socket D, leaving no open sockets between installed DIMMs.

When adding system memory, you may install the 16-, 32-, 64-, and 128-MB DIMMs in any order. Table 8-1 lists some sample memory configurations that demonstrate this flexibility.

*Table 8-1. Sample DIMM Configuration Options*

| Total Desired Memory | DIMM Socket | | | |
|---|---|---|---|---|
| | A | B | C | D |
| 16 MB | 16 MB | | | |
| 32 MB | 16 MB | 16 MB | | |
| 48 MB | 16 MB | 32 MB | | |
| 64 MB | 32 MB | 16 MB | 16 MB | |
| 64 MB | 64 MB | | | |
| 96 MB | 32 MB | 16 MB | 32 MB | 16 MB |
| 112 MB | 32 MB | 16 MB | 32 MB | 32 MB |
| 128 MB | 32 MB | 32 MB | 32 MB | 32 MB |
| 256 MB | 128 MB | 128 MB | | |
| 384 MB | 64 MB | 64 MB | 128 MB | 128 MB |
| 512 MB | 128 MB | 128 MB | 128 MB | 128 MB |

## Performing a Memory Upgrade

Follow this procedure to perform a memory upgrade:

1. **Remove the computer cover according to the instructions in "Removing the Computer Cover" in Chapter 7.**

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

2. **To access the DIMM sockets on the system board, rotate the power supply up out of the chassis as described in "Rotating the Power Supply Away From the System Board" in Chapter 7.**

3. **Determine the DIMM sockets into which you will install DIMMs or replace existing DIMMs.**

4. **Install or replace DIMMs as necessary to reach the desired memory total.**

   Follow the instructions in "Installing a DIMM" or "Removing a DIMM," as appropriate, found later in this section.

5. **Rotate the power supply back into position, making sure the securing tab snaps into place.**

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

   After the system completes the power-on self-test (POST) routine, the system runs a memory test that displays the total memory of all installed DIMMs, including those you just installed.

   *NOTE: If the memory total is incorrect, turn off and disconnect your computer and peripherals from their power sources, remove the computer cover, and make sure that the installed DIMMs are seated properly in their sockets. Then repeat this step.*

   The system detects that the new memory does not match the existing system configuration information, which is stored in nonvolatile random-access memory (NVRAM), and generates the following message:

   ```
   The amount of system memory has
   changed.
   Strike the F1 key to continue, F2 to
   run the setup utility
   ```

7. **Press <F2> to enter the System Setup program, and check the SYSTEM MEMORY category in the lower-right corner of Page 1.**

   The system should have already changed the value in the **SYSTEM MEMORY** category to reflect the newly installed memory. Verify the new total.

   *NOTES: The value of* **SYSTEM MEMORY** *is given in kilobytes. To convert kilobytes to megabytes, divide the kilobyte total by 1024.*

   *If the memory total is incorrect, turn off and disconnect your computer and peripherals from their power sources, remove the computer cover, rotate the power supply, and check the installed DIMMs to make sure that they are seated properly in their sockets. Then repeat steps 5, 6, and 7.*

8. **When the SYSTEM MEMORY total is correct, press the <ESC> key to exit the System Setup program.**

9. **Run the Dell diagnostics to verify that the DIMMs are operating properly.**

   See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur.

### Installing a DIMM

If a DIMM is already installed in the socket you want to use, you must remove it. To do so, follow the instructions in the next subsection, "Removing a DIMM."

Use the following procedure to install a DIMM (see Figure 8-7):

1. **Locate the plastic securing clips at each end of the socket. Press the clips outward until they snap open.**
2. **Orient the DIMM to the socket by aligning the notches in the DIMM's edge connector with the cross-bars in the socket.**
3. **Press the DIMM straight down into the slot running down the center of the socket until the securing tabs snap into place around the ends of the DIMM.**

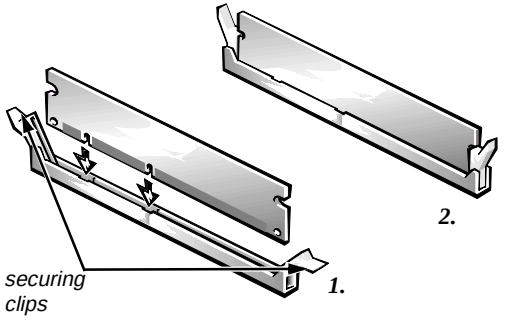



***Figure 8-7. Installing a DIMM***

### Removing a DIMM

To remove a DIMM, press the securing clips outward simultaneously until the DIMM disengages from the socket (it should pop up slightly) (see Figure 8-8).

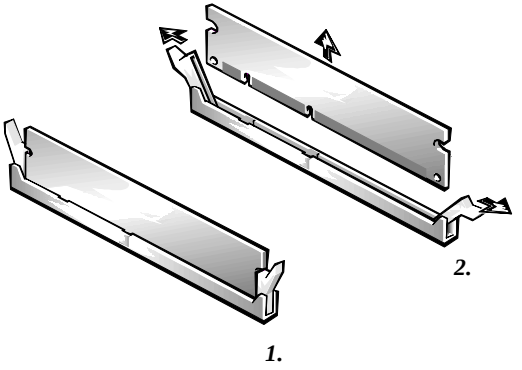



***Figure 8-8. Removing a DIMM***

## Microprocessor Upgrades

To take advantage of future options in speed and functionality, you can replace the microprocessor on your system board with one of several compatible microprocessors.

Because your system has dual-processor capability, you can elect to install a second microprocessor (which must run at the same speed as the first microprocessor) via an add-in card. The add-in card is also upgradable, allowing you to upgrade *both* microprocessors at a later date.

**CAUTION: The second microprocessor must be of the same type and speed as the microprocessor on the system board.**

The following subsections, all found later in this chapter, cover upgrading the microprocessor on your system board and adding and upgrading a microprocessor add-in card:

- "Upgrading the System Board Microprocessor"
- "Adding a Secondary Microprocessor"
- "Upgrading the Secondary Microprocessor"

Call Dell for information on available microprocessor upgrades.

## Upgrading the System Board Microprocessor

The following items are included in a microprocessor upgrade kit:

- The new microprocessor chip
- A new heat sink with adhesive tape

The following procedure describes how to replace the microprocessor on your system board.

*NOTES: Dell recommends that only a technically knowledgeable person perform this procedure.*

*In the following instructions, **left** and **right** refer to your left and right as you face the **front** of the computer. See Figure 7-4 to orient yourself.*

1. **Remove the computer cover according to the instructions in "Removing the Computer Cover" in Chapter 7.**

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

2. **If you have a dual-processor system, remove the microprocessor add-in card/bracket assembly from the secondary microprocessor card connector**.

   (You do not need to remove a terminator card installed in the secondary microprocessor card connector.)

   See Figure 8-1 to locate the connector for the microprocessor add-in card (the illustration does not show a card installed in the connector).

   To remove the card/bracket assembly, grasp the bracket by its top corners and pull it straight up, just until it clears the top of its connector. Then move it slightly toward the front of the chassis (so that the metal tab at the bottom will clear the card guide on the chassis wall—see Figure 8-15), and lift it out of the chassis.

   *NOTE: If you have a microprocessor add-in card installed, you need to remove it at this point to access the system board microprocessor.*

   *However, if you are **upgrading** the system board microprocessor (as opposed to just replacing it with a same-speed processor), you **must** also upgrade the secondary microprocessor on the add-in card at this time. If this is the case, perform this procedure up to step 15, and then, while the microprocessor card/bracket assembly is still out of the computer, perform steps 3 through 5 of "Upgrading the Secondary Microprocessor" found later in this chapter.*

   *Only after you have replaced **both** microprocessors should you replace the computer cover, boot the system, and perform the System Setup program and diagnostic tasks at the end of each procedure.*

3. **See Figure 8-1 to locate the microprocessor socket (labeled "MICROPROCESSOR") on the system board.**

4. **Remove the metal clip that secures the heat sink to the microprocessor socket.**

   **CAUTION: Never remove the heat sink from a microprocessor unless you intend to remove the microprocessor. The heat sink is necessary to maintain proper thermal conditions.**

   Press down on the folded part of the clip with a small screwdriver to release the clip (see Figure 8-9).

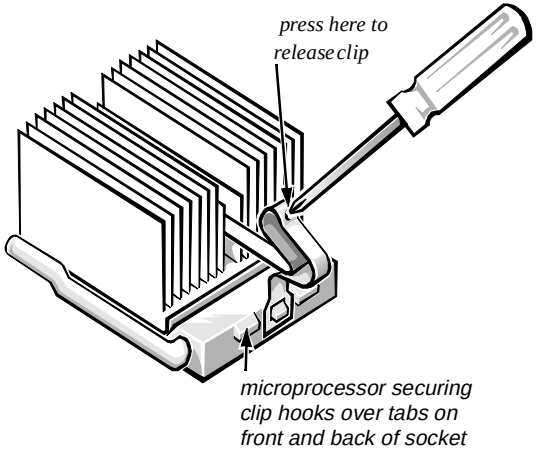



***Figure 8-9. Microprocessor Securing Clip***

**5. Remove the microprocessor chip assembly from the socket.**

> **CAUTION: Be careful not to bend any of the pins when removing the microprocessor chip from its socket. Bending the pins can permanently damage the microprocessor chip.**

Your microprocessor socket is a zero insertion force (ZIF) socket with a lever-type handle that secures the chip in, or releases it from, the socket.

To remove the chip, pull the microprocessor-socket release lever straight up until the chip is released (see Figure 8-10). Then lift the chip out of the socket. Leave the release lever up so that the socket is ready for the new microprocessor.

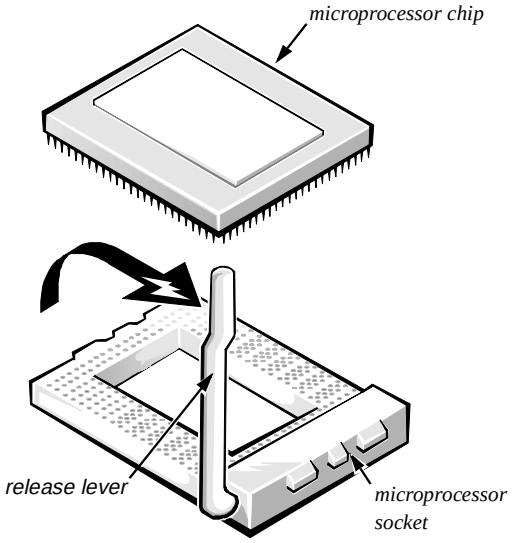



***Figure 8-10. Removing the Microprocessor***

**6. Unpack the new microprocessor.**

> **CAUTION: Be careful not to bend any of the pins when unpacking the microprocessor. Bending the pins can permanently damage the microprocessor.**

If any of the pins on the chip appear to be bent, see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide* for instructions on obtaining technical assistance.

**7. Align the pin-1 corner of the microprocessor chip (see Figure 8-11) with the pin-1 corner of the microprocessor socket (see Figure 8-12).**

*NOTE: Identifying the pin-1 corners is critical to positioning the chip correctly.*

Identify the pin-1 corner of the microprocessor by turning the chip over and locating the tiny gold finger that extends from one corner of the large central rectangular area. The gold finger points toward pin 1, which is also uniquely identified by a square pad.

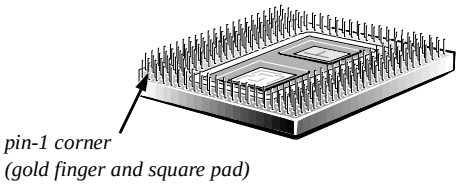



***Figure 8-11. Pin-1 Identification***

The pin-1 corner of the socket is the corner to your *left* and closest to the *back* of the chassis as you face the front of the computer (see Figure 8-1).

**8. Install the microprocessor chip in the socket (see Figure 8-12).**

> **CAUTION: Positioning the microprocessor chip incorrectly in the socket can permanently damage the chip and the computer when you turn on the system.**

If the release lever on the microprocessor socket is not all the way up, move it to that position now.

With the pin-1 corners of chip and socket aligned, align the pins on the chip with the holes in the socket. Set the chip lightly in the socket and make sure all pins are headed into the correct holes. Because your system uses a ZIF microprocessor socket, there is *no need to use force* (which could bend the pins if the chip is misaligned). When the chip is positioned correctly, it should drop down into the socket with minimal pressure.

> **CAUTION: When placing the microprocessor chip in the socket, be sure that all of the pins go into the corresponding holes on all sides of the socket. Be careful not to bend the pins.**

When the chip is fully seated in the socket, pivot the microprocessor-socket release lever back down until it snaps into place, securing the chip.

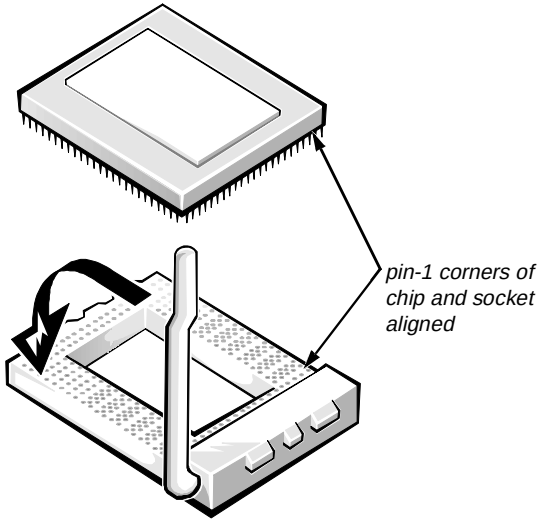



***Figure 8-12. Installing the Microprocessor Chip***

**9. Unpack the heat sink included in your upgrade kit.**

Peel the release liner from the adhesive tape that is attached to the bottom of the heat sink.

**10. Place the heat sink on top of the microprocessor chip.**

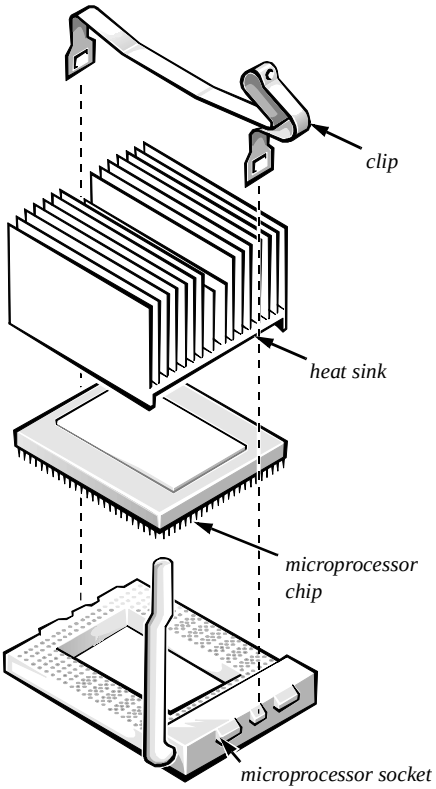



***Figure 8-13. Installing the Heat Sink***

**11. Replace the microprocessor securing clip.**

Orient the clip as shown in Figure 8-13, and hook the unfolded end of the clip over the tab on the edge of the socket facing the front of the computer. Then press down on the folded end of the clip to snap the clip over the tab on the back of the socket.

**12. If necessary, change the microprocessor speed jumper setting (see Figure B-1 to locate system board jumpers).**

The microprocessor speed jumper should be set for the installed microprocessor's rated internal speed. For example, for a 180-megahertz (MHz) Intel Pentium Pro processor, a jumper plug should be installed on the pins labeled "180MHZ." (See Appendix B, "Hardware Configuration Features," for more information on the jumpers.)

**13. If you have a dual-processor system, do one of the following as appropriate:**

- If you need to upgrade the secondary microprocessor, perform the add-in card upgrade now, starting with step 3 of "Upgrading the Secondary Microprocessor" found later in this chapter.
- If you are not upgrading the secondary microprocessor, replace the add-in microprocessor card now, as follows (see Figure 8-15):

  Orient the card so that its metal mounting bracket faces the left side of the chassis (the secondary microprocessor will be facing the primary microprocessor on the system board).

  Locate the vertical plastic card guide attached to the back wall of the chassis to the left of the fan. Fit the edge of the mounting bracket into the card guide.

  *NOTE: Because of a small tab that extends from the bottom of the bracket edge, you cannot insert the bracket into the guide from the top and slide it down. Before inserting the bracket in the guide, make sure the tab is below the bottom of the guide.*

  When the bracket is engaged in the card guide, press the card firmly down into the connector.

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

As the system boots, it detects the presence of the new microprocessor and automatically changes the system configuration information in the System Setup program.

**15. Enter the System Setup program, and confirm that the MICROPROCESSOR category correctly identifies the installed microprocessor.**

See Chapter 3, "Using the System Setup Program."

**16. Run the Dell diagnostics to verify that the new microprocessor is operating correctly.**

See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur.

## Adding a Secondary Microprocessor

Your system supports the addition of a second microprocessor, available on an add-in card available from Dell. The second microprocessor allows two-way symmetric multiprocessing (SMP), which improves performance under operating systems that support multiprocessing, such as Microsoft Windows NT 3.51 and 4.0.

*NOTE: For instructions on upgrading the microprocessor on the add-in card, see "Upgrading the Secondary Microprocessor" found later in this chapter.*

**CAUTION: The second microprocessor must be of the same type and speed as the microprocessor on the system board.**

### Installing the Microprocessor Add-In Card

To install a secondary microprocessor via an add-in card, perform the following procedure:

1. **Remove the computer cover according to the instructions in "Removing the Computer Cover" in Chapter 7.**

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

2. **See Figure 8-1 to locate the secondary microprocessor card connector (labeled "2ND_CPU") on the system board.**

   If you do not already have a secondary microprocessor card installed, a terminator card is installed in the connector.

   *NOTE: For proper system operation, either a secondary microprocessor card* ***or*** *a terminator card* ***must*** *be installed in the secondary microprocessor card connector at all times.*

3. **Remove the terminator card (or previous secondary microprocessor card).**

   To remove the terminator card, use the small white plastic "handle" that was included in your upgrade kit. Fit the handle over the middle of the top edge of the terminator card so that the two tabs in the handle snap through the two holes near the top of the card. Then grasp the handle and work the card up out of the connector (see Figure 8-14).

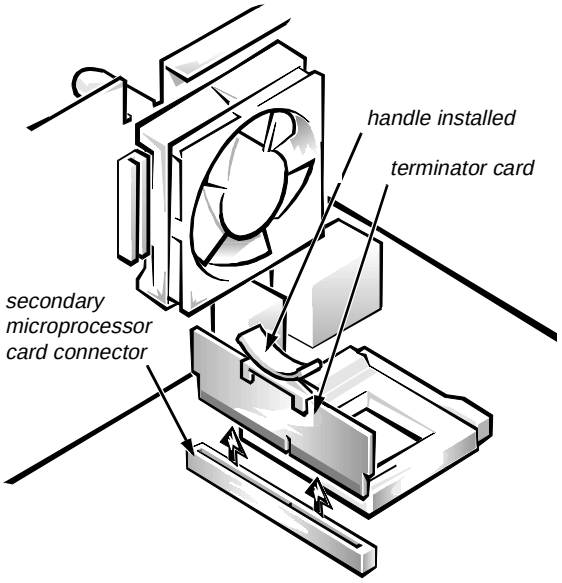



***Figure 8-14. Removing the Terminator Card***

   To remove a secondary microprocessor card/bracket assembly, grasp the bracket by its top corners and pull it straight up, just until it clears the top of its connector. Then move it slightly toward the front of the chassis (so that the metal tab at the bottom will clear the card guide on the chassis wall—see Figure 8-15), and lift it out of the chassis.

4. **Remove the new microprocessor card from its packaging. Handle the card carefully; try to handle it by its edges only.**

5. **Install the card in the secondary microprocessor card connector (see Figure 8-15).**

   Orient the card so that its metal mounting bracket faces the left side of the chassis (the secondary microprocessor will be facing the primary microprocessor on the system board).

   Locate the vertical plastic card guide attached to the back wall of the chassis to the left of the fan. Fit the edge of the mounting bracket into the card guide.

*NOTE: Because of a small tab that extends from the bottom of the bracket edge, you cannot insert the bracket into the guide from the top and slide it down. Before inserting the bracket in the guide, make sure the tab is below the bottom of the guide.*

When the bracket is engaged in the card guide, press the card firmly down into the connector.

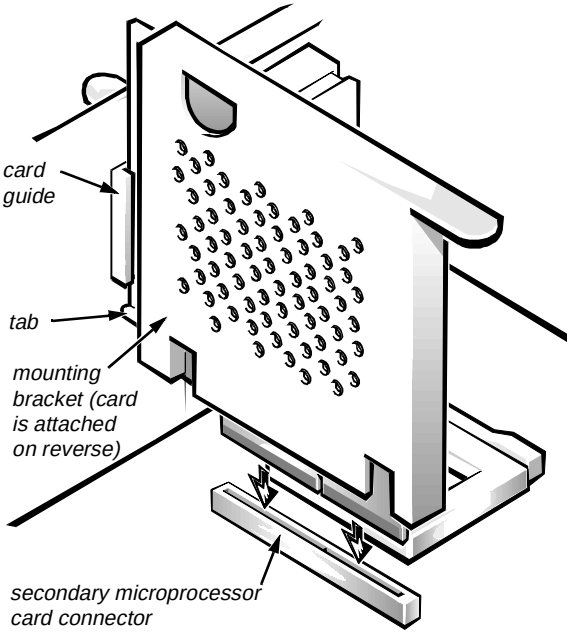



***Figure 8-15. Installing the Secondary Microprocessor Card***

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

   As the system boots, it detects the presence of the new microprocessor and displays the following message:

   ```
   Second processor detected
   ```

7. **If your system is running Windows NT 3.51 or 4.0, reinstall the operating system.**

   See your Windows NT documentation for instructions.

   When you reinstall Windows NT 3.51 or 4.0, the operating system detects the secondary microprocessor.

8. **Run the Dell diagnostics to verify that the new microprocessor is operating correctly.**

   See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur.

## *Upgrading the Secondary Microprocessor*

The microprocessor on the add-in card is replaceable, allowing you to upgrade it at the same time you upgrade the system board microprocessor.

**CAUTION: The second microprocessor must be of the same type and speed as the microprocessor on the system board.**

To replace the add-in card's microprocessor, perform the following procedure:

1. **Remove the computer cover according to the instructions in "Removing the Computer Cover" in Chapter 7.**

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

2. **Locate and remove the microprocessor add-in card/bracket assembly.**

   See Figure 8-1 to locate the connector for the microprocessor add-in card (the illustration does not show a card installed in the connector).

   To remove the card/bracket assembly, grasp the bracket by its top corners and pull it straight up, just until it clears the top of its connector. Then move it slightly toward the front of the chassis (so that the metal tab at the bottom will clear the card guide on the chassis wall—see Figure 8-15), and lift it out of the chassis.

3. **Lay the bracket/card assembly on your work surface, bracket-side down.**

4. **Perform steps 3 through 12 of "Upgrading the System Board Microprocessor" (found earlier in this chapter) but with the following differences:**

   - In step 7 (aligning the pin-1 corners of chip and socket), locate the pin-1 corner of the socket on the add-in card by holding the card/bracket assembly vertically in front of you, with the card facing you and its edge connector pointing down. In this position, the pin-1 corner of the microprocessor socket is the lower left corner of the socket.
   - In step 12 (replacing the securing clip), hook the unfolded end of the clip over the tab on the end of the socket that will be facing the *back* of the computer when the card in reinstalled. Then press down on the folded end of the clip, which will face the *front* of the computer when the card is reinstalled.

5. **Reinstall the card/bracket assembly in the secondary microprocessor card connector (see Figure 8-15).**

   Orient the card so that its metal mounting bracket faces the left side of the chassis (the secondary microprocessor faces the primary microprocessor on the system board).

   Fit the edge of the mounting bracket into the vertical plastic card guide attached to the back wall of the chassis to the left of the fan.

   *NOTE: Because of the small tab that extends from the bottom of the bracket edge, you cannot insert the bracket into the guide from the top and slide it down. Before inserting the bracket in the guide, make sure the tab is below the bottom of the guide.*

   When the bracket is engaged in the card guide, press the card firmly down into the connector.

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

   As the system boots, it detects the presence of the new microprocessor and displays the following message:

   ```
   Second processor detected
   ```

7. **Run the Dell diagnostics to verify that the new microprocessor is operating correctly.**

   See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur.

## Replacing the System Battery

A 3.0-V CR2032 coin-cell battery installed on the system board maintains system configuration, date, and time information in a special section of memory.

The operating life of the battery can extend up to ten years. The battery may need replacing if an incorrect time or date is displayed during the boot routine along with a message such as:

```
Time-of-day not set – please run SETUP
program
```

or

```
Invalid configuration information –
please run SETUP program
```

or

```
Strike the F1 key to continue,
F2 to run the setup utility
```

To determine whether the battery needs replacing, reenter the time and date through the System Setup program (not through the MS-DOS **time** and **date** commands) and exit the program properly to save the information. Turn off and unplug your system for a few hours, and then plug in and turn on your system. Enter the System Setup program. If the date and time are not correct in the System Setup program, replace your battery.

You can operate your system without a battery; however, without a battery, the system configuration information maintained by the battery is erased if the system is unplugged or alternating current (AC) power is lost. In

this case, you must enter the System Setup program and reset the configuration options.

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

Use the following procedure to replace the system battery with another CR2032 coin-cell battery:

1. **If you have not already done so, make a copy of your system configuration information in the System Setup program.**

   If the settings are lost while you are replacing the battery, refer to your written or printed copy of the system configuration information to restore the correct settings. See Chapter 3, "Using the System Setup Program," for instructions.

2. **Remove the computer cover according to the instructions in "Removing the Computer Cover" in Chapter 7.**

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

3. **To access the battery on the system board, rotate the power supply up out of the chassis as described in "Rotating the Power Supply Away From the System Board" in Chapter 7.**
4. **Locate the battery and remove it.**

The battery (see Figure 8-1) is mounted in a socket labeled "BATTERY" at the back right corner of the system board (as you face the front of the system).

**CAUTION: If you pry the battery out of its socket with a blunt object, be careful not to touch the system board with the object. Make certain that the object is inserted between the battery and the socket before attempting to pry the battery out. Otherwise, you may damage the system board by prying off the socket or by breaking circuit traces on the system board.**

Pry the battery out of its socket with your fingers or with a blunt, nonconductive object, such as a plastic screwdriver (see Figure 8-16).

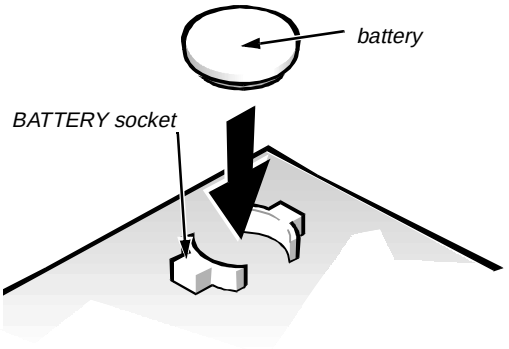



***Figure 8-16. System Battery and Battery Socket***

5. **Install the new battery.**

   Orient the battery with the side labeled "+" facing up. Then insert the battery into the socket, and snap it into place.

6. **Rotate the power supply back into position, making sure that the securing tab snaps into place.**
7. **Replace the computer cover, reconnect your computer and peripherals to their power sources, and turn them on.**
8. **Enter the System Setup program, and confirm that the battery is operating properly.**

See Chapter 3, "Using the System Setup Program," for information on running the System Setup program.

Enter the correct time and date through the System Setup program's **TIME** and **DATE** categories. Also, reenter any system configuration information that is no longer displayed on the System Setup screens, and then exit the System Setup program.

9. **Turn your computer off, and unplug it for at least ten minutes.**

10. **After ten minutes, plug in the computer, turn it on, and enter the System Setup program. If the time and date are still incorrect, see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide* for instructions on obtaining technical assistance.**

# Chapter 9
# Installing Drives

Your Dell computer has five drive bays for installing the following types of drives:

- The user-accessible drive cage at the front of the computer consists of one 3.5-inch bay (dedicated to a 3.5-inch diskette drive) and two 5.25-inch drive bays that can hold up to two half-height, 5.25-inch devices—typically tape drives or CD-ROM drives.
- The two vertically positioned hard-disk drive bays can each hold a 3.5-inch enhanced integrated drive electronics (EIDE) or small computer system interface (SCSI) hard-disk drive. The bay on the right (as you face the front of the computer) can hold a 1-inch-high (or smaller) drive, whereas the bay on the left accommodates a 1.6-inch-high (or smaller) drive.

The next four sections contain information that you will need in several of the installation procedures described later in the chapter. The remaining sections of this chapter cover installing each type of drive individually.

*NOTE: In all the following procedures,* ***left*** *and* ***right*** *refer to your left and right as you face the* ***front*** *of the computer (see Figure 9-1).*

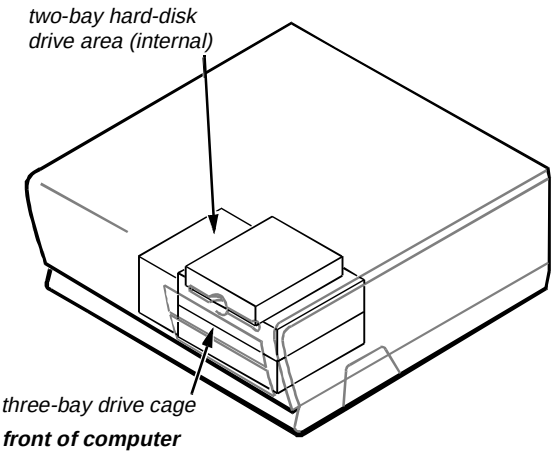



***Figure 9-1. Drive Locations***

## Determining the Boot Diskette Drive

If your computer has *only one diskette drive*, that drive is designated as drive A, regardless of where it is installed in the drive cage.

If your computer has *two* diskette drives, drive A (the boot drive) is determined by the **DRIVE A LOCATION** setting on Page 1 of the System Setup screens (see "System Setup Categories" in Chapter 3).

# Configuring Your Drive

Because you may need to tailor a drive to work with your system, certain installation instructions in this chapter refer you to the documentation that came with the drive for information on removing a terminator or changing jumpers or switches.

## Jumpers and Switches

Drives installed by Dell are configured to work with your system. However, check the documentation that came with the drive to verify that the jumpers and switches are set correctly for your particular configuration, and make any necessary alterations (see "Jumpers" and "Switches" in Appendix B).

For example, when daisy-chaining two EIDE hard-disk drives together, you may need to reconfigure one or both drives to differentiate between them for proper operation.

*NOTE: If you are installing a second EIDE drive that is a different type than the first drive and you do not have the documentation for the first drive (and the first drive was purchased from Dell), you can contact Dell for the necessary reconfiguration information. (See the chapter titled "Getting Help" in your* Diagnostics and Trouble-shooting Guide *for instructions on obtaining technical assistance.)*

# Removing and Replacing Front-Panel Inserts

Empty drive bays contain a front-panel insert to protect the inside of the computer from dust particles and to also ensure proper airflow within the computer. Before you install a drive in an empty drive bay, you must first remove the front-panel insert.

*To remove a front-panel insert for a 5.25-inch bay,* follow these steps:

1. **Turn off the system, including any attached peripherals, and disconnect all the alternating current (AC) power cables from their power sources.**
2. **Remove the computer cover as instructed in "Removing the Computer Cover" in Chapter 7.**
3. **Lay the computer cover upside down on a flat work surface, with the front of the cover facing toward you.**
4. **With your thumbs, press in against each end of the insert at about the midpoint until it snaps free of the cover (see Figure 9-2).**

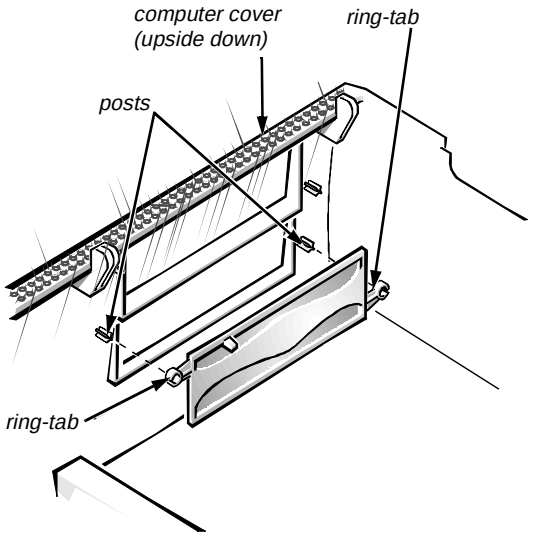



***Figure 9-2. Removing a Front-Panel Insert***

*To remove the insert covering the 3.5-inch bay at the top of the drive cage,* follow these steps:

1. **Complete steps 1 through 3 of the procedure for removing a 5.25-inch insert.**
2. **Inside the cover, locate the spring-loaded back end of the eject button mechanism for the 3/5-inch bay. Press the mechanism toward the front panel to snap the plastic insert out of its opening.**

*To replace a front-panel insert for a 5.25-inch bay:* From inside the cover, position the insert behind the bay opening, insert the two ring-tabs (one on each end of the insert) over the posts on the inside of the opening, and carefully press both ends of the insert into place (see Figure 9-2).

*To replace the front-panel insert for the 3.5-inch bay:* From outside the cover, place the insert in position and press it into the opening.

# Connecting Drives

When installing a diskette drive, tape drive, or hard-disk drive, you connect two cables—a direct current (DC) power cable and an interface cable—to the back of the drive. Your drive's power input connector (to which you connect the DC power cable) resembles the connector shown in Figure 9-3.

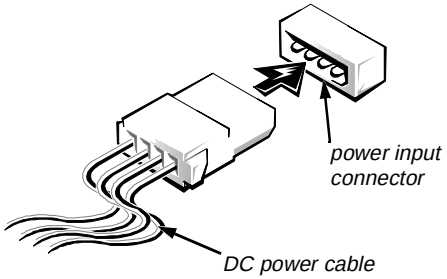



***Figure 9-3. DC Power Cable Connector***

The drive's interface connector is a card-edge connector or a header connector, as shown in Figure 9-4.

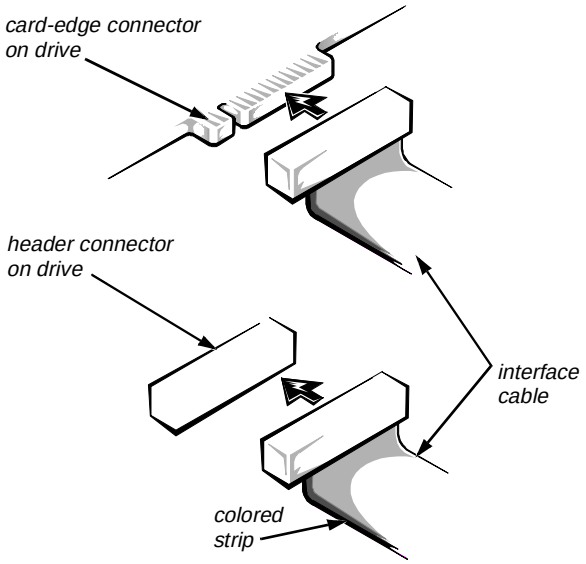



***Figure 9-4. Drive Interface Connectors***

When attaching the interface cable to a drive, be sure to match the colored strip on the cable to pin 1 of the drive's interface connector. For the location of pin 1 on the drive's interface connector, see the documentation that came with the drive.

**CAUTION: If the pin-1 end of the connector does not match the colored strip, the drive may not operate or the system and/or drive may be damaged.**

# Installing Drives in the Drive Cage

The user-accessible drive cage at the front of the chassis can hold up to two half-height, 5.25-inch devices—typically tape drives or CD-ROM drives—and one 3.5-inch diskette drive on the 3.5-inch bracket attached to the top of the cage.

*NOTE: This section covers the physical installation of devices in the drive cage; it also covers cabling and system configuration information for diskette drives, non-SCSI tape drives, and non-SCSI CD-ROM drives. (See "Installing SCSI Devices" found later in this chapter for information on installing SCSI devices.)*

## Installing a Drive That Uses a Built-In Drive Interface in a 5.25-Inch Drive Bay

This subsection describe how to install the following items:

- A diskette drive or tape drive that uses the diskette/ tape drive controller or the secondary EIDE interface
- A CD-ROM drive that uses the secondary EIDE interface

*NOTE: For instructions on installing a diskette drive in the 3.5-inch bay, see the next subsection,"Installing a Diskette Drive on the 3.5-Inch Bracket."*

1. **Unpack the drive and prepare it for installation.**

   Ground yourself by touching an unpainted metal surface on the back of the computer, unpack the drive, and compare the jumper or switch settings with those

in the documentation for the drive. Change any settings necessary for your configuration.

*NOTE: If you are installing a non-EIDE tape drive, check the documentation for the drive to determine the jumper or switch settings used to designate the drive as drive address DS4 (not DS2 or DS3 as may be indicated in the drive documentation). Unless the drive is already set to drive 4, reconfigure its jumper or switch setting (see "Jumpers" and "Switches" in Appendix B).*

If the drive will be the second drive on the diskette/tape drive interface cable, check the documentation for the drive to determine whether you need to remove or disable the terminator.

Check the documentation that accompanied the drive to verify that the drive is configured for your computer system.

If you are installing an EIDE CD-ROM or EIDE tape drive, configure the drive as a master drive or single drive, depending on the particular drive.

Configuring the drive usually involves resetting jumpers on the circuit card on the underside of each drive. For details about your specific drive, refer to the drive documentation included in your upgrade kit.

2. **Remove the computer cover as instructed in "Removing the Computer Cover" in Chapter 7.**

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

3. **Remove the drive bracket from the bay you want to use.**

   Squeeze the metal tabs that extend from each side of the drive bracket toward each other, and pull the bracket out the bay.

   *NOTE: For easier access inside the chassis, you may want to rotate the power supply out of the way temporarily. To do so, see "Rotating the Power Supply Away From the System Board" in Chapter 7.*

   If a drive is already installed in the bay and you are replacing it, be sure to disconnect the DC power cable and interface cable from the back of the drive before sliding the bracket out of the bay. To remove the old drive from the bracket, turn the drive/bracket assembly over and unscrew the four screws holding it together.

4. **Attach the bracket to the new drive.**

   Turn the drive upside down and locate the four screw holes around its perimeter. Fit the bracket over the drive, and then tilt the drive (front upward) so that the bracket drops down into place. To ensure proper installation, all screw holes should be aligned and the tabs on the front of the bracket should be flush with the front of the drive.

   To further ensure proper positioning of the drive in the chassis, insert and tighten all four screws *in the order in which the holes are numbered* (the holes are marked "1" through "4").

5. **Slide the new drive into the drive bay until it snaps securely into place.**

   Make sure that both bracket tabs snap into place in the drive bay.

6. **Connect a DC power cable to the power input connector on the back of the drive (see Figure 9-5).**

7. **Connect the appropriate interface cable to the interface connector on the back of the drive (see Figure 9-5).**

   Match the colored strip on the interface cable to the pin-1 end of the connector on the drive.

   If your system shipped with an EIDE CD-ROM or tape drive, use the spare connector on the existing interface cable. Otherwise, use the EIDE interface cable provided in the drive kit.

> **CAUTION: You must match the colored strip on the cable with pin 1 on the drive's interface connector to avoid possible damage to your system.**

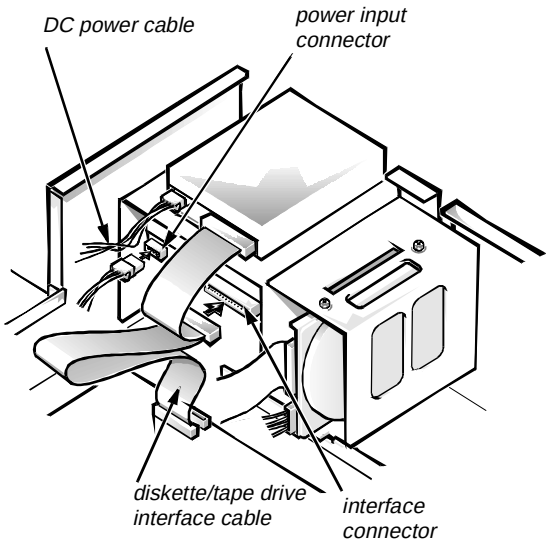



***Figure 9-5. Attaching Diskette Drive or Tape Drive Cables***

8. **For an EIDE tape drive or CD-ROM drive, connect the other end of the interface cable to the interface connector labeled "IDE2" on the system board.**

   **For a diskette drive, connect the cable from the drive to the interface connector labeled "DSKT" on the system board.**

   Check all cable connections. Fold cables out of the way to provide airflow for the fan and cooling vents.

9. **If the drive bay was previously empty, remove the front-panel insert from the computer cover.**

   See "Removing and Replacing Front-Panel Inserts" found earlier in this chapter.

10. **Replace the computer cover.**

    If the bezel on your drive is not flush with the bezel on your computer, remove the drive and adjust the position of the drive on the bracket, making sure to insert and tighten the screws in the order marked. Replace the drive in the drive bay, and then replace the computer cover.

11. **Reconnect your computer and peripherals to their power sources, and turn them on.**

12. **Update your system configuration information.**

    For a diskette drive, enter the System Setup program and update the appropriate **DISKETTE DRIVE** category (**A** or **B**) on Page 1 of the System Setup screens to reflect the size and capacity of your new diskette drive. (For more information, see Chapter 3, "Using the System Setup Program.")

    If you installed a non-EIDE tape drive as the second drive, set the **DISKETTE DRIVE B** category to **NOT INSTALLED**.

    For EIDE CD-ROM and tape drives, set the appropriate **DRIVE** category (**0** or **1**) to **AUTO**.

13. **Verify that your system works correctly.**

    See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur. Use the following guidelines to determine which test to use:

    - If you installed a diskette drive, test it by running all the subtests in the Diskette Drive(s) Test Group of the Dell diagnostics.
    - If you installed a tape drive, first verify that your diskette drive is still running correctly by running all the subtests in the Diskette Drive(s) Test Group of the Dell diagnostics.

    Then perform a tape backup and verification test with the drive as instructed in the tape-drive software documentation that came with the drive.

    *NOTE: The tape drives sold by Dell come with their own operating software and documentation. After you install a tape drive, refer to the documentation that came with the drive for instructions on installing and using the tape drive software.*

## *Installing a Diskette Drive on the 3.5-Inch Bracket*

Use the following procedure to install a 3.5-inch diskette drive on the 3.5-inch bracket attached to the top of the drive cage:

1. **Remove the computer cover as instructed in "Removing the Computer Cover" in Chapter 7.**

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

2. **Detach the drive bracket from the top of the drive cage.**

   If you are replacing a drive already installed on the bracket, be sure to detach the cables from the back of the drive before removing the bracket/drive assembly.

   Locate the one screw (near the middle of the left edge of the bracket) that secures the bracket to the drive bay beneath. Remove the screw, rotate the bracket up toward the right, and lift the bracket away from the chassis.

   To remove a previously installed drive, unscrew the two screws securing the left side of the drive to the bracket, pivot the drive up to the right, and detach it from the two hooks at the right.

3. **Unpack the new drive and install it on the bracket (see Figure 9-6).**

   Two hooks extend up from the bracket near its right side. Fit the hooks into the two small holes on the right side of the drive, and then position the drive on the bracket. At the left side of the drive, align the two screw-tabs with the screw holes in the drive, and insert and tighten the two mounting screws that came with the drive.

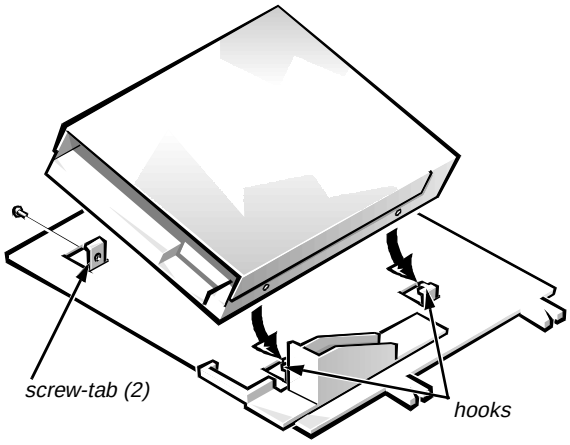



***Figure 9-6. Installing a Drive on the 3.5-Inch Bracket***

4. **Reinstall the bracket.**

   Fit the two notched tabs on the right edge of the bracket into the notched tabs in the right wall of the chassis. Pivot the bracket down, and align the screw hole on its left edge with the hole in the top drive bay. Insert and tighten the screw you removed in step 2.

5. **Connect the DC power cable with the small connector (labeled "P4") to the power input connector on the back of the drive.**

6. **Connect the diskette/tape drive interface cable to the interface connector on the back of the drive.**

   **CAUTION: You must match the colored strip on the cable with pin 1 on the drive's interface connector to avoid possible damage to your system.**

7. **If it is not already connected, connect the other end of the diskette/tape drive interface cable to the connector labeled "DSKT" on the system board.**
8. **If the 3.5-inch front-panel insert is still present in the computer cover, remove it as described in "Removing and Replacing Front-Panel Inserts" found earlier in this chapter.**
9. **Perform steps 10 through 13 of the previous procedure, "Installing a Drive That Uses a Built-In Drive Interface in a 5.25-Inch Drive Bay."**

## *Installing an Internal Tape Drive or CD-ROM Drive That Uses a Controller Card*

For internal CD-ROM drives and internal tape drives that come with their own controller card and interface cable, use the following installation procedure.

*NOTE: For SCSI devices, see "Installing SCSI Devices" found later in this chapter.*

1. **Configure the controller card if necessary.**

   Refer to the documentation accompanying the drive and the card. If the card incorporates jumpers or switches that must be set to work with your system, verify or change the settings as necessary.
2. **Perform steps 1 through 5 of "Installing a Drive That Uses a Built-In Drive Interface in a 5.25-Inch Drive Bay" found earlier in this section.**
3. **Install the controller card in an expansion slot.**

   See "Installing an Expansion Card" in Chapter 8.

   Try to avoid installing the controller card below any expansion cards that take up the full height of the slot.

   **CAUTION: Dell does not recommend routing cables over full-height cards because the cables can restrict airflow, cause cooling problems, and interfere with removing and replacing the computer cover. If you must route cables over full-height cards, be sure to use extra caution thereafter when removing and replacing the computer cover.**
4. **Connect a DC power cable to the drive (see Figure 9-5).**

   Plug the DC power cable into the 4-pin power input connector on the back of the drive.
5. **Attach the interface cable that came with your drive kit to the card-edge connector on the back of the drive.**

   **CAUTION: Check the cable orientation—match the colored strip to the pin-1 end of the connector.**
6. **Connect the other end of the interface cable to the controller connector on the card.**

   Refer to the documentation that came with the drive to identify the controller connector on the card.

   **CAUTION: Check the cable orientation—match the colored strip to the pin-1 end of the connector.**
7. **Check all cable connections that may have been loosened during this procedure. Arrange cables so they will not catch on the computer cover or block the airflow of the fan or cooling vents.**
8. **Replace the computer cover. Then reconnect your computer and peripherals to their power sources, and turn them on.**
9. **If you installed a tape drive, perform a tape backup and verification test with the drive as instructed in the tape-drive software documentation that came with your drive.**

   *NOTE: You do not need to update the system configuration information for a tape drive or CD-ROM drive attached to its own dedicated controller card.*
10. **If you installed a CD-ROM drive, see the documentation that came with the drive for instructions on loading device drivers and using the drive.**

# Installing an External Tape Drive

Install an external tape drive and its controller card as follows:

1. **Unpack the drive and the controller card, and prepare them for installation.**

   Check the documentation that came with the drive and controller card for instructions on how to configure them for your computer system. Place the tape drive next to the computer.

2. **Remove the computer cover as instructed in "Removing the Computer Cover" in Chapter 7.**

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

3. **Install the controller card in an expansion slot.**

   See "Installing an Expansion Card" in Chapter 8.

4. **Disconnect the diskette/tape drive interface cable from the diskette/tape drive interface connector labeled "DSKT" on the system board.**

   For the location of the DSKT connector, see Figure 8-1.

5. **Connect the unkeyed end of the ribbon cable (the end without any connector holes plugged) that came with the controller card to the DSKT connector on the system board.**

   Make sure that the colored strip on the cable goes to the pin-1 end of the connector.

   **CAUTION: You must match the colored strip on the cable with pin 1 on the DSKT connector on the system board to avoid possible damage to your system.**

6. **Connect the middle connector on the controller card's ribbon cable to the diskette/tape drive interface cable.**

   Match the colored strips on the cables to ensure a proper connection.

   **CAUTION: You must match the colored strip on the interface cable with the colored strip on the ribbon cable to avoid possible damage to your system.**

7. **Connect the keyed end of the controller card's ribbon cable to the external tape-drive interface connector on the internal part of the controller card (see Figure 9-7).**

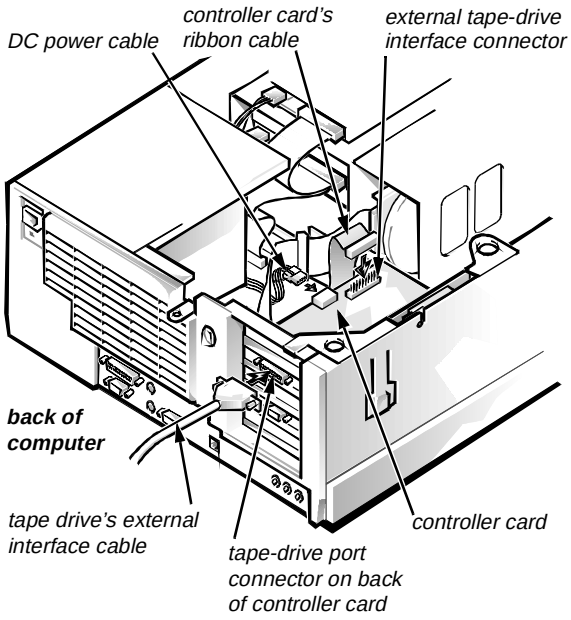



***Figure 9-7. External Tape-Drive Cable Connections***

8. **Connect a DC power cable to the controller card.**

   If none of the DC power cables from the power supply can reach the controller card, connect one end of an optional Y-shaped power cable extension to one of the DC power cables from the power supply (see Figure 9-8). Connect another end of the Y-shaped power cable extension to the controller card.

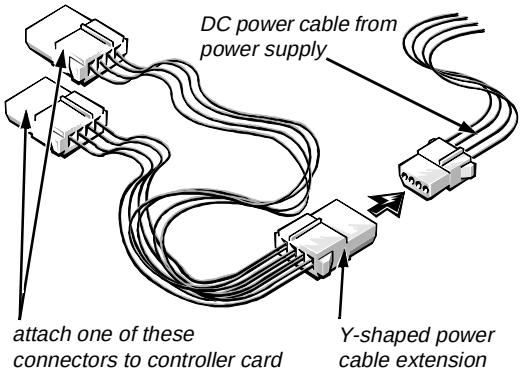



***Figure 9-8. Connecting the Y-Shaped Power Cable Extension***

   Check all cable connections. Fold cables out of the way to provide airflow for the fan and cooling vents.

9. **Replace the computer cover.**
10. **Connect the tape drive's external interface cable to the tape-drive port connector on the back of the controller card, and tighten the screws on the connectors.**
11. **Reconnect your computer and peripherals to their power sources, and turn them on.**
12. **Install and test the tape drive software as instructed in the software documentation that came with the tape drive.**

# Installing an EIDE Hard-Disk Drive

This section includes information on installing, partitioning, and formatting EIDE hard-disk drives. For instructions on installing a SCSI hard-disk drive, see "Installing SCSI Devices" found later in this chapter. For information on partitioning and formatting a SCSI hard-disk drive, refer to the documentation that came with the SCSI software and your operating system.

Up to two EIDE drives (one of which must be 1 inch high or less) can be installed in the hard-disk drive bracket to the left of the power supply. The first EIDE drive is installed in the left (1.6-inch) drive bracket; a second drive is installed in the 1-inch bracket.

## EIDE Drive Addressing

When two EIDE devices are connected to a single EIDE interface cable, a master/slave relationship must be defined between the two devices so that they will operate correctly while cabled together.

If your computer includes an EIDE hard-disk drive and another EIDE device such as a CD-ROM or tape drive, the boot EIDE drive should be configured as the master drive connected to the EIDE interface on the system board. Before installing a second EIDE drive, you must designate it as the slave drive.

Assigning the master and slave designations usually involves resetting jumpers on the circuit card on the underside of each drive. The master/slave relationship is defined in different ways for different types of drives. For details about your specific drive, refer to the drive documentation included in your upgrade kit. That documentation describes how to reconfigure both drives to ensure correct operation.

*NOTES: If you want to install a second EIDE drive that is a different type than the first drive but you do not have the specifications for the first drive, do one of the following:*

- *If you purchased the drive from Dell, you can contact Dell for the necessary reconfiguration information. (See the chapter titled "Getting Help" in the* Diagnostics and Troubleshooting Guide *for instructions on obtaining technical assistance.)*
- *If you did not purchase the drive from Dell, call the drive manufacturer.*

With the two EIDE interface connectors on the system board, your system can support up to four EIDE devices. EIDE hard-disk drives should be connected to the EIDE interface connector labeled "IDE1." (EIDE tape drives and CD-ROM drives should be connected to the EIDE interface connector labeled "IDE2.")

## *Installing an EIDE Hard-Disk Drive in the Hard-Disk Drive Bracket*

Install an EIDE hard-disk drive in the hard-disk drive bracket as follows:

1. **If you are replacing a hard-disk drive that contains data you want to keep, be sure to make a backup of your files before you begin this procedure.**

   Check the documentation that accompanied the drive to verify that it is configured for your computer system.

2. **Unpack the hard-disk drive and prepare it for installation.**

   Check the documentation that accompanied the drive to verify that it is configured for your computer system.

3. **Remove the computer cover as instructed in "Removing the Computer Cover" in Chapter 7.**

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

4. **Remove the drive bracket from the chassis**

   If a hard-disk drive is already installed on the drive bracket, disconnect the DC power cable and EIDE cable from the drive.

   Remove the screw securing the hard-disk drive bracket to the front wall of the chassis (see Figure 9-9).

   Grasp the front part of the bracket that serves as a handle, and rotate the bracket up toward the back of the computer until it disengages from the floor of the chassis.

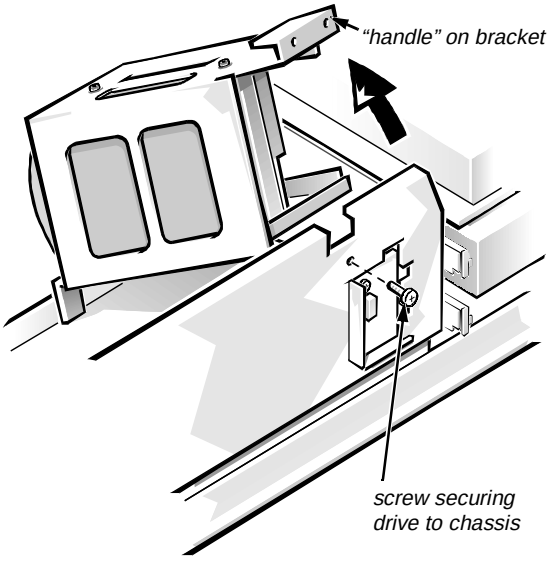



***Figure 9-9. Removing the Hard-Disk Drive Bracket***

5. **Slide the drive into the chosen bay of the bracket, oriented so that the connectors on the back of the drive will face the back of the chassis—and the power input connector will be closest to the floor of the chassis—when the bracket is reinstalled (see Figure 9-10).**

6. **Align the four screw holes along one side of the drive and bracket. Insert and tighten the screws that came with your upgrade kit.**

7. **Reinstall the hard-disk drive bracket in the chassis.**

   Hold the bracket by its handle, so that it stays at the proper tilt. Let it brush the side of the drive cage as you lower it into the chassis until the two tabs at the bottom back of the bracket fit flush against the *front* of the rail that extends across the chassis floor, and the horizontal lip at the back fits *over* the rail (see Figure 9-10, which shows the bracket from the *back*).

   Rotate the bracket down into position, and reinstall the screw you removed in step 4.

8. **Connect one of the device connectors on the EIDE cable to the 40-pin interface connector on the back of the hard-disk drive (see Figure 9-10).**

**CAUTION: You must match the colored strip on the EIDE cable with pin 1 on the IDE1 connector to avoid possible damage to your system.**

The cable is keyed so that the colored edge of the EIDE cable lines up with the pin-1 end of the interface connector.

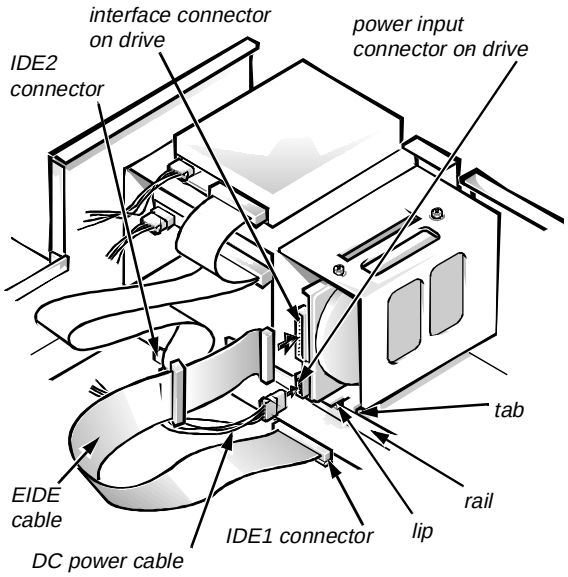



***Figure 9-10. Attaching Hard-Disk Drive Cables***

9. **If it is not already connected, connect the other end of the EIDE cable to the appropriate EIDE interface connector on the system board.**

**CAUTION: You must match the colored strip on the EIDE cable with pin 1 on the drive's interface connector to avoid possible damage to your system.**

There are two EIDE interface connectors on your system board. IDE1 is used for high-speed EIDE devices such as high-capacity hard-disk drives. IDE2 is used for slower devices such as EIDE CD-ROM drives or tape drives.

Connect the EIDE cable to the interface connector labeled "IDE1" on the system board. To locate the IDE1 connector, see Figure 8-1.

10. **Connect a DC power cable into the power input connector on the back of the drive (see Figure 9-10).**

Check all connectors to be certain that they are properly cabled and firmly seated.

11. **Replace the computer cover. Then reconnect your computer and peripherals to their power source, and turn them on.**

12. **Insert a bootable diskette (such as the diagnostics diskette) into drive A, and turn on the computer system.**

13. **Enter the System Setup program, and update the DRIVE 0 category under DRIVES: PRIMARY.**

See "System Setup Categories" in Chapter 3.

After you update the System Setup settings, reboot the system.

14. **Partition and logically format your drive as described later in the next subsection before proceeding to the next step.**

15. **Test the hard-disk drive by running the Hard-Disk Drive(s) Test Group in the Dell diagnostics.**

See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur.

16. **Install your operating system on your hard-disk drive.**

Refer to the documentation that came with your operating system.

### Partitioning and Logically Formatting Your EIDE Hard-Disk Drive

Every EIDE hard-disk drive must be physically formatted, partitioned, and logically formatted before it can be used to store data.

*NOTE: On systems with hard-disk drives larger than 2 gigabytes (GB), Dell creates a primary partition of 2 GB and divides the remaining capacity into partitions of 2 GB or less. For example, a system with a 2.5-GB hard-disk drive has a primary partition of 2 GB (drive C) and a second partition of 500 megabytes (MB) (drive D). If you add a 2.5-GB hard-disk drive to a system that already has a 2.5-GB drive, the system will have a primary partition of 2 GB (drive C), a partition of 500 MB (drive D), a partition of 2 GB (drive E), and a partition of 500 MB (drive F). Hard-disk drives are partitioned this way because MS-DOS-based operating systems (including Windows NT when using a file allocation table (FAT)16 file system) do not support drive partitions larger than 2 GB.*

Every hard-disk drive from Dell is physically formatted before it is sent to you.

To partition and logically format your hard-disk drive, use the program(s) offered by your operating system.

*For MS-DOS*, use the **fdisk** and **format** commands to perform these procedures. The **fdisk** and **format** commands are described in the MS-DOS reference documentation.

*For OS/2*, see the discussion on partitioning and logical formatting in the documentation that came with the operating system.

**CAUTION: If you format your hard-disk drive under the OS/2 High Performance File System (HPFS), you cannot reformat the drive for MS-DOS without losing all HPFS data. See your OS/2 documentation for details.**

*For Windows NT*, see the discussion on partitioning and logical formatting in the documentation that came with the operating system.

**CAUTION: If you format your hard-disk drive under the Windows NT File System (NTFS), you cannot reformat the drive for MS-DOS without losing all NTFS data. See your Windows NT documentation for details.**

*For the UNIX® operating system*, refer to your UNIX documentation.

## Installing SCSI Devices

To use SCSI devices in your Dell computer, you must have a SCSI host adapter card, which comes with its own SCSI cable. This cable can be used to attach a variety of SCSI devices (hard-disk drives, tape drives, and so on). The SCSI host adapter configures the devices attached to it as one subsystem—not as independent devices.

Although SCSI devices are installed essentially the same way as other devices, their configuration requirements are different.

### SCSI Configuration Guidelines

For details on configuring your SCSI subsystem, refer to the documentation that came with your SCSI devices and/or your host adapter card. The following subsections offer some general guidelines.

#### SCSI ID Numbers

Each device attached to a SCSI host adapter card, as well as the card itself, must have a unique SCSI identification (SCSI ID) number from 0 to 7. When SCSI devices are shipped from Dell, the default SCSI ID numbers are assigned as follows:

- A SCSI host adapter card is configured as SCSI ID 7 (the default ID for a host adapter card).

- A SCSI tape drive is configured as SCSI ID 6 (the default ID number for a tape drive).
- SCSI hard-disk drives are usually configured as SCSI ID 0 (the drive used to boot your system should always be configured as SCSI ID 0).

*NOTE: There is **no** requirement that SCSI ID numbers be assigned sequentially or that devices be attached to the cable in order by ID number.*

## SCSI Cable and SCSI Terminators

The type of cabling you receive with your SCSI device depends on whether you are installing an internal or external SCSI device:

- *If you have an internal SCSI device*, the internal SCSI cable that came with the device supports a maximum of four internal SCSI devices—two in the hard-disk drive bracket and two in the drive cage—as shown in Figure 9-11.

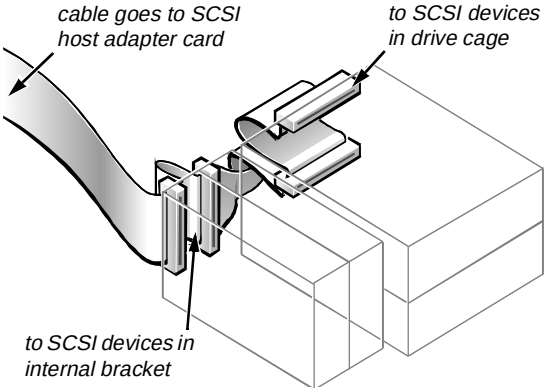



***Figure 9-11. Internal SCSI Cable***

- *If you have an external SCSI device*, you have a shielded external cable that connects to the external SCSI connector on the SCSI host adapter card. You have a separate power cable to connect the SCSI device to power.

Before installing SCSI devices in your computer, you must configure the terminators on your SCSI device(s) to conform to the guidelines that follow.

*NOTE: The SCSI host adapter card is shipped with terminators installed.*

- *If only one SCSI device is installed internally*, connect the device as follows:
  - — Attach the end connector on the internal SCSI cable to the SCSI device, and leave the terminator on the SCSI device.
  - — Attach the other end connector on the internal SCSI cable to the SCSI host adapter card, and leave the terminator on the adapter card.
- *If two or more SCSI devices are installed internally*, connect the devices as follows:
  - — Attach one of the devices to one of the end connectors on the SCSI cable, and leave the terminator on that device.
  - — Attach the other end of the SCSI cable connector to the SCSI host adapter card, and leave the terminator on the adapter card.
  - — Remove the terminators from all other devices you attach to the cable.
- *If both internal and external SCSI devices are attached to the SCSI host adapter card*, connect the devices as follows:
  - — Attach an end connector on the internal SCSI cable to the internal device, and leave the terminator on the last device.
  - — Attach the other end connector on the internal SCSI cable to the SCSI host adapter card, and remove the terminator on the adapter card.
  - — Attach the external SCSI cable to the external connector on the SCSI host adapter card, and leave the terminator on the last external device.

**CAUTION: Dell does not recommend connecting both internal and external devices to a single channel on a SCSI host adapter card. Such a configuration is likely to cause read and write failures.**

## General Procedure for Installing SCSI Devices

Configure and install one or more SCSI devices in your computer as follows:

1. **Determine which connector on the internal SCSI cable you will attach to each SCSI device.**

   See "SCSI Configuration Guidelines" found earlier in this section.

2. **Unpack each SCSI device and prepare it for installation.**

   Configure the device for a SCSI ID number, and remove the terminator, if necessary. For instructions, see the documentation that came with the SCSI device as well as "SCSI Configuration Guidelines" found earlier in this section.

3. **If you are installing a SCSI host adapter card, configure the adapter card.**

   Before configuring the card, see "Safety First—For You and Your Computer" in Chapter 7 for instructions on grounding yourself.

   For instructions on configuring the card, see the documentation that came with the adapter card as well as "SCSI Configuration Guidelines" found earlier in this section.

4. **Install the SCSI devices as appropriate.**

   - *To install an internal SCSI hard-disk drive*, complete steps 3 through 8 of "Installing an EIDE Hard-Disk Drive in the Hard-Disk Drive Bracket" found earlier in this chapter. Then continue with step 5 of this procedure.
   - *To install a SCSI tape drive, CD-ROM drive, or digital audio tape (DAT) drive in the drive cage*, complete steps 2 through 5 of "Installing a Drive That Uses a Built-In Drive Interface in a 5.25-Inch Drive Bay" found earlier in this chapter. Then continue with step 5 of this procedure.
   - *To install an external SCSI tape drive*, continue with step 5 of this procedure.

5. ***If you are installing a new SCSI host adapter card*, install it in an expansion slot now.**

   See "Installing an Expansion Card" in Chapter 8.

   *If a SCSI host adapter card is already installed*, remove, reconfigure, and reinstall the card at this time.

   See the documentation that came with the SCSI host adapter card as well as "Removing an Expansion Card" and "Installing an Expansion Card" in Chapter 8.

6. **Attach the SCSI cable to each SCSI device.**

   For additional instructions on connecting SCSI devices, see "SCSI Cable and SCSI Terminators" found earlier in this section.

   - *If you are installing an internal SCSI device*, firmly press the SCSI cable's header connectors onto the 50-pin connectors on the back of the devices.

     **CAUTION: You must match the colored strip on the cable with pin 1 on the drive's interface connector to avoid possible damage to your system.**

     The connectors are keyed for proper positioning—a raised area on the outside of the header connector fits into a notch in the shroud surrounding the 50-pin connector on the device.
   - *If you are installing an external SCSI device*, connect one end of the external SCSI cable to the SCSI bus connector on the back of the device.

7. **Attach the SCSI cable to the connector on the SCSI host adapter card.**

   - *If you are installing an internal SCSI device*, connect the colored edge on the internal SCSI cable to the pin-1 end of the 50-pin connector on the adapter

card, and then press the cable connector firmly onto the adapter card connector.

**CAUTION: You must match the colored strip on the internal SCSI cable with pin 1 on the adapter card connector to avoid possible damage to your system.**

- *If you are installing an external SCSI device*, connect the other end of the external SCSI cable to the external connector on the adapter card.

For additional instructions, see the documentation that came with the adapter card.

8. **Connect the SCSI device(s) to power.**

   - *If you are installing an internal SCSI device*, connect a DC power cable to the power input connector on the SCSI device.
   - *If you are installing an external SCSI device*, connect the socket-end of the power cable into the AC power receptacle on the back of the SCSI device. Connect the other end of the power cable into a standard electrical wall outlet.

   Check all other cable connections. Fold all internal cables out of the way to provide airflow for the fan or cooling vents.

9. **Replace the computer cover. Then reconnect your computer and peripherals to their power sources, and turn them on.**

10. **If necessary, enter the System Setup program to update the system configuration information.**

    If you installed a SCSI hard-disk drive, set the **DRIVE 0** and **DRIVE 1** System Setup categories under **DRIVES: PRIMARY** to **NONE**. For instructions, see Chapter 3, "Using the System Setup Program."

    Tape drives attached to a SCSI host adapter card are not part of the system configuration information.

11. **If you installed a SCSI hard-disk drive, install the SCSI software drivers and configure the SCSI interface.**

    To install the SCSI software drivers and configure the SCSI interface, see the documentation that came with the SCSI drivers.

12. **Test the SCSI devices.**

    Test a SCSI hard-disk drive by running the Hard-Disk Drive(s) Test Group of the Dell diagnostics. See your *Diagnostics and Troubleshooting Guide* for information on running the diagnostics and troubleshooting any problems that may occur.

    To test a SCSI tape drive, refer to the documentation for the tape drive software to perform a tape drive backup and verification test.

## 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. Refer to the documentation that came with your SCSI software drivers for information on installing the appropriate drivers and preparing your SCSI hard-disk drive for use.

*NOTE: On systems with hard-disk drives larger than 2 gigabytes (GB), Dell creates a primary partition of 2 GB and divides the remaining capacity into partitions of 2 GB or less. For example, a system with a 2.5-GB hard-disk drive has a primary partition of 2 GB (drive C) and a second partition of 500 megabytes (MB) (drive D). If you add a 2.5-GB hard-disk drive to a system that already has a 2.5-GB drive, the system will have a primary partition of 2 GB (drive C), a partition of 500 MB (drive D), a partition of 2 GB (drive E), and a partition of 500 MB (drive F). Hard-disk drives are partitioned this way because MS-DOS-based operating systems (including Windows NT when using a FAT16 file system) do not support drive partitions larger than 2 GB.*

# Appendix A
# Technical Specifications

***Table A-1. Technical Specifications***

| | |
|---|---|
| **Microprocessor** | |
| Microprocessor type | Intel Pentium Pro microprocessor that runs at 180 MHz internally/60 MHz externally or at 200 MHz internally/66 MHz externally. Design provides for future upgrades. A slower compatibility speed can be set through the System Setup program. |
| Internal cache | 16-KB first-level (8-KB data cache; 8-KB instruction cache); 256-KB or 512-KB second-level unified data/instruction cache |
| Math coprocessor | internal to the microprocessor |
| **System Information** | |
| System chip set | Intel 82440FX PCIset |
| Data bus width | 64 bits |
| Address bus width | 32 bits |
| DMA channels | seven |
| Interrupt levels | 15 |
| System BIOS chip | 2 Mb |

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

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

| Expansion Bus | |
|---|---|
| Bus types | PCI and ISA |
| Bus speed | PCI: 30 MHz (180/60 processor); 33 MHz (200/66 processor)<br>ISA: 7.5 MHz (180/60 processor); 8.25 MHz (200/66 processor) |
| PCI expansion-card connectors | five (two PCI connectors share card-slot openings with the two ISA connectors) |
| ISA expansion-card connectors | two (both ISA connectors share card-slot openings with two of the PCI connectors) |
| ISA expansion-card connector size | 98 pins |
| ISA expansion-card connector data width (maximum) | 16 bits |
| PCI expansion-card connector size | 120 pins |
| PCI expansion-card connector data width (maximum) | 32 bits |
| **System Clocks** | |
| System clock | 60 or 66 MHz (matches external processor speed) |
| Diskette/communications ports | 24 MHz from the system clock |
| **Memory** | |
| Architecture | 64-bit, noninterleaved |
| DIMM sockets | four |
| DIMM capacities | 16, 32, 64, and 128 MB, EDO and ECC modes |
| Standard RAM | 16 MB |

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

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

| **Memory** *(Continued)* | |
|---|---|
| Maximum RAM | 512 MB |
| BIOS address | F000:0000h–F000:FFFFh |
| **Drives** | |
| Externally accessible bays | one 3.5-inch bay, dedicated to a 3.5-inch diskette drive; two 5.25-inch bays for half-height diskette drives, tape drives, or CD-ROM drives |
| Internally accessible bays | two hard-disk drive bays; one 1.6-inch-high and one 1-inch-high EIDE or SCSI hard-disk drive |
| **Ports** | |
| Externally accessible: | |
| Serial (DTE) | two 9-pin connectors; 16550-compatible |
| Parallel | one 25-hole connector (bidirectional) |
| Video | one 15-hole connector (on add-in video card) |
| PS/2-style keyboard | 6-pin mini-DIN |
| PS/2-compatible mouse | 6-pin mini-DIN |
| NIC | RJ45 connector |
| Audio line in | miniature audio jack |
| Audio speaker out | miniature audio jack |
| Audio mike in | miniature audio jack |
| Internally accessible: | |
| EIDE hard-disk drive | two 40-pin connectors on PCI local bus |
| Diskette drive | 34-pin 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 | PCI video card (see manufacturer's specifications) |
| **Key Combinations** | |
| <CTRL><ALT><DEL> | restarts (reboots) the system |
| <CTRL><ALT><ENTER> | starts System Setup program (during POST only) |
| <CTRL><ALT><\> | toggles microprocessor speeds on 101-key keyboard (in MS-DOS real mode only) |
| <CTRL><ALT><#> | toggles microprocessor speeds on 102-key keyboard (in MS-DOS real mode only) |
| **Controls and Indicators** | |
| Reset control | push button |
| Power control | push button |
| Power indicator | green LED |
| Hard-disk drive access indicator | green LED |
| Link integrity indicator (on NIC connector) | green LED |
| Activity indicator (on NIC connector) | yellow LED |
| **Power** | |
| DC power supply: | |
| Wattage | 230 W |
| Heat dissipation | 600 BTUs (nominal) |
| Voltage | 90 to 135 V at 60 Hz; 180 to 265 V at 50 Hz |
| Backup battery | 3-V CR2032 coin cell |

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

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

| Physical | |
|---|---|
| Height | 16.5 cm (6.5 inches) |
| Width | 41.9 cm (16.5 inches) |
| Depth | 44.5 cm (17.5 inches) |
| Weight | 12.7 kg (28 lb) or more, depending on options installed |
| **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 30 min |
| Storage | 0.5 G at 3 to 200 Hz for 30 min |
| Maximum shock: | |
| Operating | half-sine wave form: 50 G for 2 ms |
| Storage | half-sine wave form: 110 G for 2 ms<br>square wave form: 27 G for 15 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
# Hardware Configuration Features

This appendix provides specific information about the jumpers on your system board and the input/output (I/O) ports and connectors on the back panel of your computer. It also provides some basic information on jumpers and switches, a listing of interrupt request (IRQ) assignments, and memory maps.

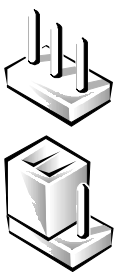
## Jumpers and Switches—A General Explanation

Jumpers and switches provide a convenient and reversible way of reconfiguring the circuitry on a printed circuit board. When reconfiguring your system, you may need to change jumper settings on your system board; you may also need to change jumper and/or switch settings on expansion cards or drives.

### Jumpers

Jumpers are small blocks on a circuit board with two or more pins emerging from them.

Plastic plugs containing a wire fit down over the pins. The wire connects the pins and creates a circuit.



To change a jumper setting, pull the plug off its pin(s) and carefully fit it down onto the pin(s) indicated.

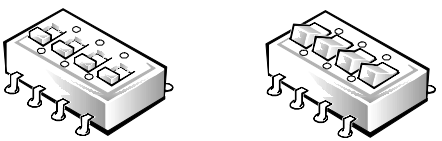
**CAUTION: Make sure your system is turned off before you change a jumper setting. Otherwise, damage to your system or unpredictable results may occur.**

A jumper is referred to as *open* or *unjumpered* when the plug is pushed down over only one pin or if there is no plug at all. When the plug is pushed down over two pins, the jumper is referred to as *jumpered*. The jumper setting is often shown in text as two numbers, such as *1-2*. The number *1* is printed on the circuit board so that you can identify each pin number based on the location of pin 1.

Figure B-1 shows the location and default settings of the jumper blocks on your system board. See Table B-1 for the designations, default settings, and functions of your system's jumpers.

### Switches

Switches control various circuits or functions in your computer system. The switches you are most likely to encounter are dual in-line package (DIP) switches, which are normally packaged in groups of two or more switches in a plastic case. Two common types of DIP switches are *slide* switches and *rocker* switches (see the following illustration).



*slide switches* *rocker switches*

Each of these switches has two positions, or *settings* (usually *on* and *off*). To change the setting of a slide switch, use a small, pointed object such as a small screwdriver or a straightened paper clip to slide the switch to the proper position. To change the setting of a rocker switch, use the screwdriver or paper clip to press down on the appropriate side of the switch. In either case, do not use a pen, pencil, or other object that might leave a residue on the switch.

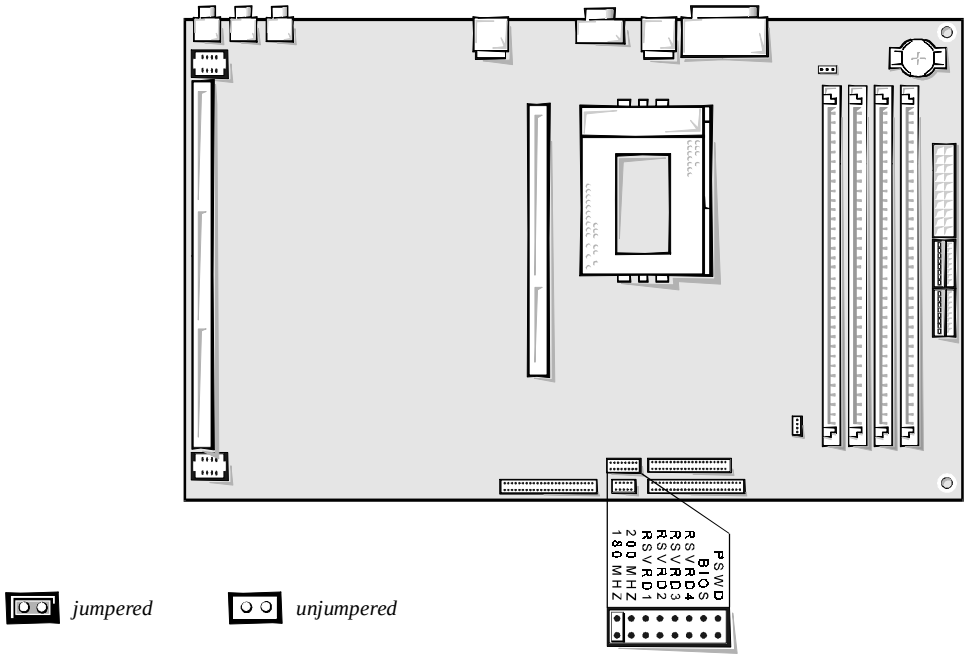



***Figure B-1. System Board Jumpers***

***Table B-1. System-Board Jumper Settings***

| Jumper | Setting | | Description |
|---|---|---|---|
| PSWD |  | (default) | Password feature enabled. |
| |  | | Password feature disabled. |
| BIOS |  | | Reserved *(do not change)*. |
| RSRVD4 | | | Reserved (*do not change*). |
| RSRVD3 | | | Reserved (*do not change*). |
| RSRVD2 | | | Reserved (*do not change*). |
| RSRVD1 | | | Reserved (*do not change*). |
| 200MHZ | | | Jumpered when the microprocessor's internal speed is 200 MHz. |
| 180MHZ | | | Jumpered when the microprocessor's internal speed is 180 MHz. |

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

 *jumpered*  *unjumpered*

# *System Board Labels*

Table B-2 lists the labels for connectors and sockets on your system board and riser board, and it gives a brief description of their functions.

**Table B-2. System Board and Riser Board Connectors and Sockets**

| Connector or Socket | Description |
|---|---|
| 2ND_CPU | Microprocessor card connector (for second microprocessor) |
| BATTERY | Battery socket |
| CD_IN | CD-ROM drive interface connector |
| DIMM *x* | DIMM socket |
| DSKT | Diskette/tape drive interface connector |
| ENET | NIC connector |
| FAN | Microprocessor fan connector |
| IDE*n* | EIDE interface connector |
| ISA*n** (on riser board) | ISA expansion-card connector (on riser board) |
| JHDLED (on riser board) | Hard-disk drive access indicator connector |
| KYBD | Keyboard connector |
| LINE-IN | Line-in jack |
| MIC-IN | Microphone jack |
| MICROPROCESSOR | Microprocessor socket |
| MOUSE | Mouse connector |
| PANEL | Control panel connector |
| PARALLEL | Parallel port connector; sometimes referred to as *LPT1* |
| PCI*n** (on riser board) | PCI expansion-card connector (on riser board) |
| POWER1 | Main power input connector |
| POWER2 | 3.3-V power input connector |
| RISER | Riser board connector |
| SERIAL*n* | Serial port connector; sometimes referred to as *COM1* and *COM2* |
| SPKR-OUT | Speaker-out jack |
| VIDEO (two connectors on riser board) | The bottom two connectors on the riser board, either of which will accept the add-in PCI video card |

* *The following connector pairs each share a single card-slot opening, so that only one of each pair can be used: ISA2/PCI5; ISA1/PCI4.*

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

# I/O Ports and Connectors

The I/O ports and connectors on the back panel of your computer are the gateways through which your computer system communicates with external devices, such as a keyboard, mouse, printer, and monitor. Figure B-2 identifies the I/O ports and connectors for your computer.

## 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 *COM*munications) plus a number to designate a serial port (for example, COM*1* or COM*2*). The default designations of your computer's built-in serial ports are COM1 and COM2.

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 *L*ine *P*rin*T*er) plus a number to designate a parallel port (for example, LPT*1*). The default designation of your 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 your printer is attached, thus telling your software where to send its output. (An incorrect designation prevents the printer from printing or causes scrambled print.)

## Adding an Expansion Card Containing Serial or Parallel Ports

Your 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 IRQ setting, as follows:

COM1, COM3: IRQ4 (shared setting)
COM2, COM4: IRQ3 (shared setting)

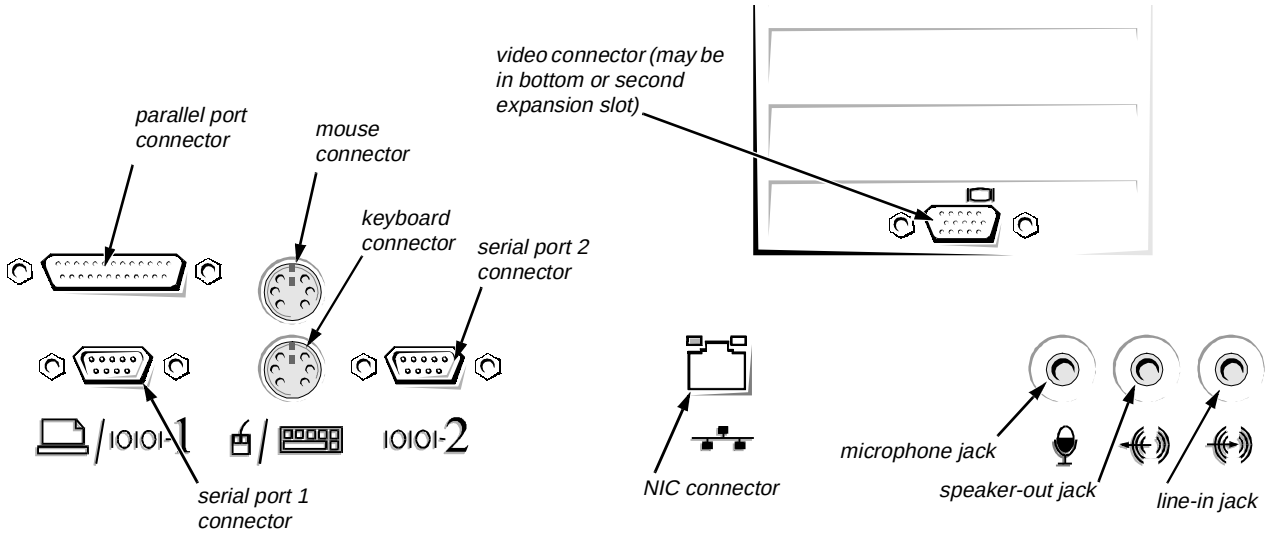



***Figure B-2. I/O Ports and Connectors***

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, as described in "Serial Port 1 and Serial Port 2" in Chapter 3.

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 or switches on the expansion card so that *its* 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.

For general information on how your operating system handles serial and parallel ports as well as 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-3 illustrates the pin numbers for the serial port connectors, and Table B-3 lists and defines the pin assignments and interface signals for the serial port connectors.

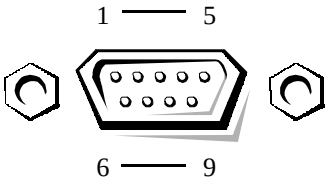



***Figure B-3. Pin Numbers for the Serial Port Connectors***

***Table B-3. 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-4 illustrates the pin numbers for the parallel port connector, and Table B-4 lists and defines the pin assignments and interface signals for the parallel port connector.

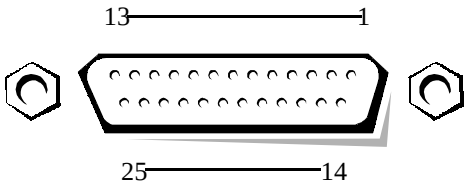



***Figure B-4. Pin Numbers for the Parallel Port Connector***

***Table B-4. 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*

Your 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.

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 made. 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-5 illustrates the pin numbers for the keyboard connector, and Table B-5 lists and defines the pin assignments and interface signals for the keyboard connector.

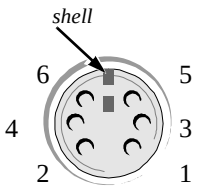



***Figure B-5. Pin Numbers for the Keyboard Connector***

***Table B-5. 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-6 illustrates the pin numbers for the mouse connector, and Table B-6 lists and defines the pin assignments and interface signals for the mouse connector.

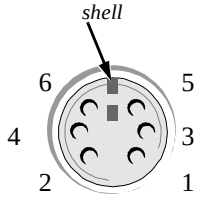



***Figure B-6. Pin Numbers for the Mouse Connector***

***Table B-6. 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 |

## *Video Connector*

For information on your video connector, see the manufacturer's specifications that accompanied your video card.

# *Interrupt Assignments*

Problems can arise if two devices attempt to use the same IRQ line. To avoid this type of conflict, check the documentation for the default IRQ line setting for each installed device. Then consult Table B-7 to configure the device for one of the available IRQ lines.

**Table B-7. Interrupt Assignments**

| IRQ Line | Used By/Available |
|---|---|
| IRQ0 | Generated by system timer. |
| IRQ1 | Generated by keyboard controller to indicate that keyboard's output buffer is full. |
| IRQ2 | Generated internally by interrupt controller to enable IRQ8 through IRQ15. |
| IRQ3 and IRQ4 | Generated by super I/O controller to indicate that device connected to corresponding serial port requires service (IRQ3 for COM2 or COM4, IRQ4 for COM1 or COM3). |
| IRQ5 | Available for use by expansion card unless this IRQ line is used by secondary parallel port. |
| IRQ6 | Generated by super I/O controller to indicate that diskette or tape drive requires service. |
| IRQ7 | Generated by super I/O controller to indicate that device connected to parallel port requires service. |
| IRQ8 | Generated by keyboard controller for each tick of RTC. |
| IRQ9 | Available for use by expansion card. |
| IRQ10 | Available for use by expansion card. |
| IRQ11 | Available for use by expansion card. |
| IRQ12 | Generated by keyboard controller to indicate that mouse's output buffer is full. |
| IRQ13 | Generated by math coprocessor to indicate coprocessor error. |
| IRQ14 | Generated by device connected to primary EIDE port to indicate that device requires service. If no EIDE devices are installed, this line is available for other use. |

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

**Table B-7. Interrupt Assignments** *(Continued)*

| IRQ Line | Used By/Available |
|---|---|
| IRQ15 | Generated by device connected to secondary EIDE port to indicate that device requires service. If no device is connected to secondary EIDE port, IRQ15 is available for use by expansion card. |

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

## Memory Allocations

A microprocessor and programs operating under MS-DOS (real-mode operation) can address only 1 megabyte (MB) (1024 kilobytes [KB]) of system memory. This area is divided into *conventional memory* (sometimes called *base memory*) and upper memory. All system memory above this 1 MB is called *extended memory* and cannot be directly addressed by MS-DOS-based programs without the aid of some special memory-managing software.

Table B-8 provides a map of the conventional memory area. When the microprocessor or a program addresses a location within the conventional memory range, it is physically addressing a location in main memory, which is the only main memory it can address under MS-DOS.

### *Table B-8. Conventional Memory Map*

| Address Range | Use |
|---|---|
| 00000h–003FFh | Interrupt vector table |
| 00400h–004FFh | BIOS data area |
| 00500h–005FFh | MS-DOS and BASIC work area |
| 00600h–0FFFFh | User memory |
| 10000h–1FFFFh | User memory |
| 20000h–2FFFFh | User memory |
| 30000h–3FFFFh | User memory |
| 40000h–4FFFFh | User memory |
| 50000h–5FFFFh | User memory |
| 60000h–6FFFFh | User memory |
| 70000h–7FFFFh | User memory |
| 80000h–8FFFFh | User memory |
| 90000h–9FBFFh | User memory |

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

Table B-9 provides a map of the upper memory area. Some of these addresses are dedicated to various system devices, such as the system/video basic input/output system (BIOS). Others are available for use by expansion cards and/or an expanded memory manager (EMM). When the microprocessor or a program addresses a location within the upper memory area, it is physically addressing a location within one of these devices.

### *Table B-9. Upper Memory Map*

| Address Range | Use |
|---|---|
| 0009FC00–0009FFFF | PS/2-mouse data area |
| 000A0000–000BFFFF | Video RAM |
| 000C0000–000C7FFF | Video BIOS |
| 000C8000–000EFFFF | Available |
| 000F0000–000FFFFF | System BIOS |
| 00100000–0010FFEF | High memory area |
| 0010FFF0–1FFFFFFF | Extended memory |
| 20000000–FFFBFFFF | Reserved |
| FFFC0000–FFFFFFFF | BIOS ROM |

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

# Appendix C
# Beep Codes and System Messages

This appendix provides supplemental information about the diagnostics tests, beep codes, and system messages described in your *Diagnostics and Troubleshooting Guide* as well as messages generated by the ISA Configuration Utility (ICU).

## New Diagnostics Test

A new diagnostics subtest, the Multiprocessor Test, has been added under the System Set Test Group documented in your *Diagnostics and Troubleshooting Guide*.

For dual-processor systems, the Multiprocessor Test confirms that the secondary microprocessor is operational.

## Beep Code Update

The 4-4-1 beep code documented in your *Diagnostics and Troubleshooting Guide* as a serial-port test failure code now indicates a serial- *or* parallel-port test failure.

If you receive the 4-4-1 code, run both the Serial Port Test Group and the Parallel Port Test Group in the diskette-based diagnostics. See the chapter titled "Running the Diskette-Based Diagnostics" in your *Diagnostics and Troubleshooting Guide*.

## Additional System Error Messages

System error messages, which can help you find the source of a problem, are documented in your *Diagnostics and Troubleshooting Guide*. Table C-1 lists (in alphabetical order) messages that do not yet appear in the *Diagnostics and Troubleshooting Guide*.

*NOTE: The first four messages in the following table indicate fatal errors. When a fatal error occurs, the system usually cannot be rebooted until an appropriate hardware change has been made.*

***Table C-1. System Error Messages***

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `Incompatible Processor: CPU0 is B0 step or below!`<br>`Incompatible Processor: CPU1 is B0 step or below!` | An old, unsupported version of the microprocessor is installed.<br>In a single-microprocessor system, *CPU0* refers to the system board microprocessor; in a dual-microprocessor system, it refers to the secondary microprocessor on the add-in card.<br>The *CPU1* message appears only on a dual-microprocessor system and always refers to the system board microprocessor. | Replace the indicated microprocessor with a current version of the microprocessor. If you need technical assistance, see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide*. |
| `Incompatible Processors: Cache sizes different!` | This message appears for a dual-microprocessor system if both microprocessors do not have the same-size level-2 cache. | Replace one of the microprocessors to make the level-2 cache sizes match. If you need technical assistance, see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide*. |
| `Terminator/processor card not installed!` | Neither a terminator card nor a secondary microprocessor card is installed in the secondary microprocessor card connector (2ND_CPU). | Make sure either a terminator card or a secondary microprocessor card is installed in the 2ND_CPU connector. Reseat the card and start the system. If the error persists, see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide* for instructions on obtaining technical assistance. |
| `Warning - Temperature is too high.` | At system start-up, the BIOS has detected that one or both microprocessors are overheated. After displaying this message, the BIOS halts the boot process and turns off the system. | Let the system cool down before attempting to start it again. |

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

***Table C-1. System Error Messages*** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `Warning - Thermal probes failed.` | At system start-up, the BIOS has detected that one or both of the thermal probes in the computer are nonoperational. | You can continue to use the system, but be aware that the temperature probe(s) are disabled and a processor overheat condition will not warn the Thermal Shutdown service to shut down the system.<br><br>*NOTE: The Pentium Pro microprocessor in your computer has a built-in thermal couple that halts microprocessor operation if the microprocessor exceeds its rated temperature.*<br><br>To correct this problem, you must replace your system board. For technical assistance, see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide*. |

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

# ISA Configuration Utility Messages

The ICU and its Configuration Manager are capable of identifying problems and alerting you to them. Both utilities can alert you to problems with card configuration as well as problems that prevent proper operation of the utility. This appendix describes each type of message and lists the possible causes and actions you can take to resolve any problems indicated by a message. See the following tables to locate your message and identify any possible corrective actions.

## ICU Error Messages

The ICU can display a variety of error messages while in operation. These messages alert you to problems that prevent the ICU from running correctly, as well as informing you of resource conflicts that prevent the configuration of various cards in your computer. If you receive a message from the ICU, see Table C-2 for suggestions on resolving any problems indicated by the message.

***Table C-2. Configuration Utility Messages***

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `Out of memory.`<br><br>`Memory allocation failed.` | Either of these messages can appear if the system runs out of memory during your operation. | Disable any TSR programs or any unneeded device drivers. Another possible solution is to load the **dwcfgmg.sys** driver in high memory. See "Modifying the Configuration Manager" in Chapter 4 for an example of loading the **dwcfgmg.sys** driver into high memory using a memory manager. |
| `Not enough memory to run the ICU.` | This message appears when you start the ICU if the system does not have enough memory to run the utility. | |
| `Can't open index file. This file is required for ICU to run.` | The ICU cannot find the index file for its database. | Verify that you are starting the ICU from the directory where it is installed. Make sure to switch to drive A before attempting to start the utility. |
| `No Configuration Manager.` | The device driver needed by the ICU is corrupted or is not correctly configured. | Verify that the following **device** statement appears in your **config.sys** file:<br><br>device=*drive*:*directory*\drivers\dos\dwcfgmg.sys<br><br>In this statement, *drive* and *directory* represent the drive and directory where the driver resides. The default is c:\plugplay. |

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

***Table C-2. Configuration Utility Messages*** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `At least one Plug and Play card in your system is not configured due to conflicts. These are marked "config err" in the list of configured cards.`<br><br>`Due to conflicts, the ICU could only configure some Plug and Play cards in your system. Unconfigured cards are marked "config err" in the list of configured cards.` | The Configuration Manager or the ICU cannot configure at least one Plug and Play expansion card because of resource conflicts with one or more cards. | You must reconfigure the conflicting card(s). To find the conflicting card, perform the following steps:<br><br>**1. Select the Plug and Play expansion card marked with** config err**, and then click Modify.**<br><br>The Card Configuration dialog box displays the functions assigned to the Plug and Play expansion card.<br><br>**2. Select a function and then click Settings. Click Cancel if the ICU does not display a message naming the conflicting card.**<br><br>**3. Repeat step 2 until the ICU displays a message box naming the conflicting card and the resource(s) in conflict. See the following table entry for an explanation of this message box.** |
| `This device is unconfigurable because of a resource conflict with card` *`card_name`*`. The conflicting resource is` *`resource_name`*`. To fix, reconfigure the conflicting card.` | The selected card is unconfigurable because one of its resources is already being used by another device. | Perform the following procedure:<br><br>**1. Make a note of the card name and the type of conflicting resource.**<br><br>**2. Follow the procedure in "Modifying a Card" in Chapter 4, and change the value for** *resource_name* **used by** *card_name***.** |
| `The ICU has successfully configured all Plug and Play cards in your system. For the new configuration to take effect, save the configuration, then reboot your system.` | The ICU has successfully configured all of the Plug and Play expansion cards that were not configured by the Configuration Manager. | To accept these settings, save the configuration information into NVRAM by selecting **EXIT** from the File menu and then selecting **YES** to save. You must reboot your system for these settings to take effect. |
| `The loaded card is not a` *`category`* `card. Press OK to proceed.` | The category you have chosen is not the correct category under which to add this card. | Select **OK**. The ICU automatically opens the correct category's dialog box. Continue the procedure for adding the card as described in "Adding a Listed Card" or "Adding an Unlisted Card" in Chapter 4. |

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

***Table C-2. Configuration Utility Messages*** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `No more DMA values can be added.`<br><br>`No more interrupt values can be added.`<br><br>`No more memory values can be added.`<br><br>`No more I/O port values can be added.` | No more values are available for the resource you are trying to add or modify. | The maximum number of values for each resource is as follows:<br>• 4 DMA channels<br>• 7 IRQ lines<br>• 9 memory address blocks<br>• 20 I/O ports<br>To free values for the resource you are trying to add or modify, delete some of the values listed in the resource box for the card. If your card requires all of the values listed, contact your card manufacturer to resolve the issue. |

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

***Table C-2. Configuration Utility Messages*** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `The ICU detects a resource conflict between this card and` *`conflicting_card`*`. The conflicting resource was:` *`resource`*`.` | You added or modified a card that now requires a *resource* value already in use by *conflicting_card*. | Try each of the following options until the problem is resolved:<br>• Modify the card you are adding so that it uses a different value for *resource*. See "Modifying a Card" in Chapter 4 for instructions.<br>• Modify *conflicting_card* so that it uses a different value for *resource*. See "Modifying a Card" in Chapter 4 for instructions.<br>• If *conflicting_card* is not the system board, remove it from the computer. See "Removing a Card" in Chapter 4 for instructions.<br>• Remove all expansion cards from the ICU, and then add them back one at a time, beginning with the new card and resolving resource conflicts as they arise. See "Removing a Card" and "Adding a Listed Card" or "Adding an Unlisted Card" in Chapter 4 for instructions.<br>*NOTE: Before reconfiguring your system, save your current system configuration in an image file so that you have a backup copy of a working system configuration. See "Using Image Files" in Chapter 4 for instructions.*<br>• If you cannot resolve the resource conflict by any of the preceding methods, remove the new card. If you were modifying an existing card, reset the modified card to its previous resource value. |

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

***Table C-2. Configuration Utility Messages*** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `The configuration (.cfg) file used by the ICU for this card is now invalid or does not exist. Do you wish to load the file?` | This message appears when you try to add a listed card and the configuration file for this card has been corrupted or deleted from the database. | You can get a copy of the configuration file from the *ISA Configuration Utility Diskette*. Use the following procedure:<br>**1. Insert the *ISA Configuration Utility Diskette* into drive A.**<br>**2. Change to the** db **subdirectory on the diskette drive.**<br>For example, type cd a:\db.<br>**3. Use a text editor to search the** icu.ndx **file for the card ID of the card you want to add or modify.**<br>The name of the configuration file is part of this card ID. For example, if the card ID is ICU0200, the configuration file is **!icu0200.cfg**.<br>**4. Copy the configuration file from the diskette into the directory containing the ICU on your hard-disk drive.** |
| `No configuration (.cfg) file exists for the card being modified. Do you want to load one?` | This message appears when you modify a card and its configuration file does not exist or has been deleted. | |
| `This is an EISA system. Use an ECU, not the ICU, to configure your system.` | This message appears if you attempt to run the ICU on an EISA system. | To use the ICU, you must load the utility onto a non-EISA system. |
| `You have added a card using settings different from factory default. Reconfigure the card to the settings in the next display (see the card's manual) before installing it.` | This message can appear in two situations:<br>• You added an ISA expansion card, selected **OK**, and the ICU had to use resource values different from the card's defaults to avoid conflicts.<br>• You added an ISA expansion card, selected **ADVANCED**, and chose resource values different from the card's defaults. | Make a note of the new card configuration shown in the Card Resource Usage dialog box displayed after this message. Change jumper settings on the ISA expansion card to match the new card configuration. |

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

## Configuration Manager Messages

The Configuration Manager for the ICU identifies problems following system boot and generates messages if necessary. These messages alert you to any unsuccessful attempts to configure Plug and Play or Peripheral Component Interconnect (PCI) expansion cards, as well as any problems that interfere with the operation of the Configuration Manager. If you receive a message from the Configuration Manager, see Table C-3 for suggestions on resolving any problems indicated by the message.

***Table C-3. Configuration Manager Messages***

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `Found Plug and Play ISA card: Plug and Play ISA Card Name.` | This message appears at system boot for each Plug and Play ISA expansion card recognized by the Configuration Manager. | Status message; no action is required. |
| `NOTICE: Boot Device Not Active! CSN=Card Select Number.` | A boot device was found to be inactive. | Status message; no action is required. The Configuration Manager automatically configures and activates the device. |
| `One or more active devices have been reconfigured -- system requires reboot. Press any key to reboot system.` | You modified the resource values of one or more PCI or Plug and Play ISA expansion cards. | Reboot the system to reconfigure the card(s). |
| `The Plug and Play ISA card has been successfully configured.`<br><br>`Card Count Plug and Play ISA cards have been successfully configured.` | The Configuration Manager has successfully configured the given number of cards. | If this message does not match the number of Plug and Play ISA expansion cards installed in your computer, reinstall any Plug and Play expansion cards not listed and reboot the system. |
| `ERROR: Insufficient CM Memory.` | There is not enough memory available to the Configuration Manager for it to run. | Disable any TSR programs or any unneeded device drivers. Another possible solution is to load the **dwcfgmg.sys** driver in high memory. See "Modifying the Configuration Manager" in Chapter 4 for an example of loading the **dwcfgmg.sys** driver into high memory using a memory manager. |

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

***Table C-3. Configuration Manager Messages*** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `ERROR: Fatal BIOS error` *`Internal Error Code`*`.` | A BIOS call failed with an internal error. The most likely cause is an incompatibility between the BIOS and the Configuration Manager. | See the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide* for instructions on obtaining technical assistance. |
| `ERROR: Could not read NVS, Error=`*`Internal Error Code`*`.` | An attempt to read the NVRAM failed. | See the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide* for instructions. |
| `ERROR: Failed NVS write. Error=`*`Internal Error Code`*`.` | An attempt to write to NVRAM failed. | Run the diskette-based diagnostics to verify the integrity of your system NVRAM. See the chapter titled "Running the Diskette-Based Diagnostics" in your *Diagnostics and Troubleshooting Guide* for instructions.<br><br>If you are unable to determine the cause of the error, see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide* for instructions. |
| `ERROR: Failed to activate device, CSN=`*`Card Select Number`*`.` | A Plug and Play expansion card could not be activated. | Use the following procedure:<br><br>**1. Exit the ICU and turn off your system.**<br><br>**2. Remove the Plug and Play expansion card that could not be activated.**<br><br>Follow steps 2 through 6 of "Removing an Expansion Card" in Chapter 8, and then return to this procedure.<br><br>**3. Reinstall the Plug and Play expansion card.**<br><br>Follow steps 5 through 9 of "Installing an Expansion Card" in Chapter 8, and then return to this procedure.<br><br>**4. Turn the system on again.**<br><br>If you still receive this error message, contact the manufacturer of the Plug and Play expansion card for assistance. |

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

**Table C-3. Configuration Manager Messages** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| WARNING: Could not configure *Plug and Play Card Name*.<br><br>WARNING: Could not configure PCI device, ID=*DeviceID*.<br><br>Failed to configure *Number* of *Total Count* Plug and Play ISA devices. Use your system's configuration utility to resolve conflicts. Press any key to continue. | The card(s) mentioned are not fully configured due to resource conflicts. | If you have documentation that lists the allowable resource values for your Plug and Play or PCI expansion card, you can use the following procedure to locate and resolve the resource conflict.<br><br>*NOTE: If you do not have documentation listing the allowable resource values, see the corrective action for these messages on the following page.*<br><br>**1. Start the ICU.**<br><br>Any Plug and Play or PCI expansion cards that could not be configured should be marked config err on the list of cards in the ICU window.<br><br>**2. Select the SYSTEM RESOURCES option from the View menu.**<br><br>The System Resource Usage dialog box displays all resources currently used by the system.<br><br>**3. Select one of the resources used by your Plug and Play or PCI expansion card, and click Used By Card.**<br><br>The Card Resources Usage dialog box displays the information.<br><br>**4. Repeat step 3 until you have identified all conflicting resources and the cards that use them.**<br><br>**5. Modify the cards as needed to free the resources required by the unconfigured Plug and Play or PCI expansion card.**<br><br>See "Modifying a Card" in Chapter 4 for instructions. |

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

**Table C-3. Configuration Manager Messages** *(Continued)*

| Message | Probable Cause | Corrective Action |
|---|---|---|
| `WARNING: Could not configure Plug and Play Card Name.`<br><br>`WARNING: Could not configure PCI device, ID=DeviceID.`<br><br>`Failed to configure Number of Total Count Plug and Play ISA devices. Use your system's configuration utility to resolve conflicts. Press any key to continue.` | The card(s) mentioned are not fully configured due to resource conflicts. | If you do not know the allowable resource values for your Plug and Play or PCI expansion card, use the following procedure to locate and resolve the resource conflict:<br><br>**1. Remove all card configurations from the ICU.**<br>See "Removing a Card" in Chapter 4 for instructions.<br>**2. Reboot your system.**<br>The ICU should automatically configure your Plug and Play or PCI expansion card.<br>**3. Add the ISA expansion cards back into the ICU, resolving any resource conflicts as they arise.**<br>See "Adding a Listed Card" in Chapter 4 for instructions.<br><br>If your Plug and Play or PCI expansion card is not automatically configured when you reboot the system with all other cards removed, you should contact the manufacturer of the card or see the chapter titled "Getting Help" in your *Diagnostics and Troubleshooting Guide*. |
| `WARNING: Boot Device conflict detected! CSN=Card Select Number Error=Error.` | One of the devices is attempting to use one or more resources assigned to the system's boot device. | Perform the following procedure:<br><br>**1. Start the ICU.**<br>**2. Identify the card marked** config err.<br>This should be the card that is attempting to use one or more resources required by the system's boot device.<br>**3. Go to the procedure for the preceding error message in this table.** |

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

# Appendix D
# 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 200 MB to 8 gigabytes (GB) 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 540-MB hard-disk drive requires approximately 375 diskettes (when using 1.44-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.
- 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 8 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 5.25-inch diskettes in their paper sleeves, and 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" discussed earlier in this appendix.

## ESD

ESD results from the buildup of static electricity on the human body and certain other objects. This static electricity is often produced by simple movements such as walking across a carpet. ESD is a discharge of a static electrical charge, 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. Overvoltage, 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:
  - Kitchen appliances
  - 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 Laboratory (UL) safety-approved.

# Appendix E
# 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 the Class B rating, 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.**

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.

### Class A

NOTE: 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

NOTE: 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.

## 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 stítku pocítace uvedeno, ze spadá do trídy A podle EN 55022, spadá automaticky do trídy B podle EN 55022. Pro zarízení zarazená do trídy A (ochranné pásmo 30m) podle EN 55022 platí následující. Dojde-li k rusení telekomunikacních nebo jinych zarízení, je uzivatel povinen provést taková opatrení, aby rusení 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.*

  **CAUTION: 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 2 information technology equipment (ITE). However, the inclusion of certain options changes the rating of some configurations to Class 1. 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 1 ITE. If *all* labels carry an FCC Class B identification number, your system is considered to be VCCI Class 2 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 1 Notice

This equipment complies with the limits for a Class 1 digital device (devices used in commercial and/or industrial environments) and conforms to the standards for information technology equipment that are set by the Voluntary Control Council for Interference for preventing radio frequency interference in commercial and/or industrial areas.

Consequently, when used in a residential area or in an area adjacent to a residential area, this equipment may cause radio interference with radio and television receivers or other communications equipment.

To ensure that such radio interference does not occur, it is important to install and use this equipment in accordance with the manufacturer's instruction manual.

## Class 2 Notice

This equipment complies with the limits for a Class 2 digital device (devices used in or adjacent to a residential environment) and conforms to the standards for information technology equipment that are set by the Voluntary Control Council for Interference for preventing radio frequency interference in residential areas.

However, this equipment does generate, use, 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. Therefore, it is important to adhere to the manufacturer's instructions for installing and using this equipment.

# 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 the 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 the Class B rating, your system is considered to be a Class B digital device.

*NOTE: Class A devices are for business purposes. Class B devices are for nonbusiness 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).

All the equipment that works together must switch off when the power supply cable plug is 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).

Całkowite odłączenie urządzenia od sieci zasilającej następuje po wyjęciu wtyczki sznura zasilającego z gniazda sieciowego, które powinno być usytuowane 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.

# Appendix F
# 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; sound cards; speakers; 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 transferrable 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; sound cards; speakers; 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.

### ATAPI
Abbreviation for AT Attachment Packet Interface. An extension of the EIDE command set that allows CD-ROM and tape drives to operate on the EIDE 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. 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.

### *COM*n
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. Intel486™ DX, IntelDX2™, IntelDX4™, and Pentium® microprocessors include 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.

### DDC

Abbreviation for Display Data Channel. A VESA® standard mechanism that allows the system to communicate with the monitor and retrieve information about its capabilities.

### 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** and **embedded diagnostics**.

### DIMM

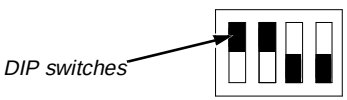
Acronym for dual in-line memory module.

### DIN

Acronym for *Deutsche Industrie Norm*.

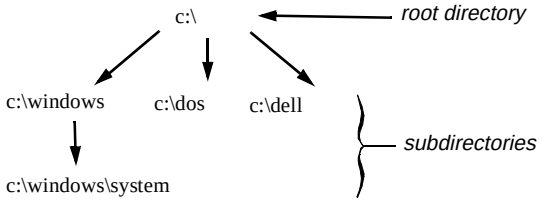
### DIP

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 *Diagnostics 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.

### DMI

Abbreviation for Desktop Management Interface. DMI support enables the management of your computer system's software and hardware. DMI defines the software, interfaces, and data files that enable your system to determine and report information about its components.

### 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 out. A memory technology that offers improved performance over fast-page mode technology by using a shorter page-mode cycle time while accessing data within a single page of memory.

### *EEPROM*

Acronym for electrically erasable programmable read-only memory.

### *EGA*

Abbreviation for enhanced graphics adapter.

### *EIDE*

Abbreviation for enhanced integrated drive electronics.

### *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.

### *embedded diagnostics*

Diagnostic tests stored in flash memory on some Dell computers to assist in troubleshooting component failure that can prevent your computer from booting. Refer to your *Diagnostics and Troubleshooting Guide* for a complete discussion about how to use the embedded diagnostics.

### *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**.

### *EPA*

Abbreviation for Environmental Protection Agency.

### *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® and OS/2® operating systems 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 1024 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 IBM® OS/2 and Windows NT operating systems.

### *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.

### *ICU*
Abbreviation for ISA Configuration Utility.

### *ID*
Abbreviation for identification.

### *IDE*
Abbreviation for integrated drive electronics.

### *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*
Instruction and data cache built in to the microprocessor. Intel486, IntelDX2, and IntelDX4 microprocessors include an 8-KB internal cache. The original Pentium microprocessor 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. Pentium Pro microprocessors offer 16 KB of internal first-level cache and 256 or 512 KB of second-level cache.

### *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.

### *LPT*n
The MS-DOS device names for the first through third parallel printer ports on your computer are LPT1, LPT2, and LPT3.

### *m*
Abbreviation for meter(s).

### *mA*
Abbreviation for milliampere(s).

### *mAh*
Abbreviation for milliampere-hour(s).

### *math coprocessor*
See **coprocessor**.

### *Mb*
Abbreviation for megabit(s).

### *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.

### *MIDI*
Abbreviation for musical instrument digital interface.

### *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).

### *NIC*
Abbreviation for network interface controller.

### *NiCad*
Acronym for nickel cadmium.

### *NiMH*
Abbreviation for nickel-metal hydride.

### *NLM*
Abbreviation 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.

### *OLE*
Abbreviation for object linking and embedding.

### *OS/2*
Abbreviation for Operating System/2.

### *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, OS/2, and UNIX® 32-bit operating systems run 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.

### 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.

### SIMM
Acronym for single in-line memory module.

### 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**.

### *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.

### *UTP*

Abbreviation for unshielded twisted pair.

### *V*

Abbreviation for volt(s).

### *VAC*

Abbreviation for volt(s) alternating current.

### *VCCI*

Abbreviation for Voluntary Control Council for Interference.

### *VCR*

Abbreviation for video cassette recorder.

### *VDC*

Abbreviation for volt(s) direct current.

### *VDE*

Abbreviation for *Verband Deutscher Elektrotechniker*.

### *VESA*

Acronym for Video Electronics Standards Association.

### *VGA*

Abbreviation for video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than EGA and CGA, the previous standards.

To display a program at a specific resolution, you must install the appropriate video drivers and your monitor must support the resolution. Similarly, the number of colors that a program can display depends on the capabilities of the monitor, the video driver, and the amount of memory installed for the video adapter.

### *VGA feature connector*

On some systems with a built-in VGA video adapter, a VGA feature connector allows you to add an enhancement adapter, such as a video accelerator, to your computer. A VGA feature connector can also be called a *VGA pass-through connector*.

### *video adapter*

The logical circuitry that provides—in combination with the monitor or display—your computer's video capabilities. A video adapter may support more or fewer features than a specific monitor offers. Typically, a video adapter comes with video drivers for displaying popular application programs and operating environments in a variety of video modes.

On most current Dell computers, a video adapter is integrated into the system board. Also available are many video adapter cards that plug into an expansion-card connector.

Video adapters can include memory separate from RAM on the system board. The amount of video memory, along with the adapter's video drivers, may affect the number of colors that can be simultaneously displayed. Video adapters can also include their own coprocessor chip for faster graphics rendering.

### *video driver*

Graphics-mode application programs and operating environments, such as Windows, often require video drivers in order to display at a chosen resolution with the desired number of colors. A program may include some "generic" video drivers. Any additional video drivers may need to

match the video adapter; you can find these drivers on a separate diskette with your computer or video adapter.

### *video memory*

Most VGA and SVGA video adapters include VRAM or DRAM memory chips in addition to your computer's RAM. The amount of video memory installed primarily influences the number of colors that a program can display (with the appropriate video drivers and monitor capability).

### *video mode*

Video adapters normally support multiple text and graphics display modes. Character-based software (such as MS-DOS) displays in text modes that can be defined as *x* columns by *y* rows of characters. Graphics-based software (such as Windows) displays in graphics modes that can be defined as *x* horizontal by *y* vertical pixels by *z* colors.

### *video resolution*

Video resolution—640 x 480, for example—is expressed as the number of pixels across by the number of pixels up and down. To display a program at a specific graphics resolution, you must install the appropriate video drivers and your monitor must support the resolution.

### *virtual 8086 mode*

An operating mode supported by Intel386 or higher microprocessors, virtual 8086 mode allows operating environments—such as Windows—to run multiple programs in separate 1-MB sections of memory. Each 1-MB section is called a *virtual machine*.

### *virtual memory*

A method for increasing addressable RAM by using the hard-disk drive. (MS-DOS does not support true virtual memory, which must be implemented at the operating system level.) For example, in a computer with 8 MB of RAM and 16 MB of virtual memory set up on the hard-disk drive, the operating system would manage the system as though it had 24 MB of physical RAM.

### *virus*

A self-starting program designed to inconvenience you. Virus programs have been known to corrupt the files stored on a hard-disk drive or to replicate themselves until a system or network runs out of memory.

The most common way that virus programs move from one system to another is via "infected" diskettes, from which they copy themselves to the hard-disk drive. To guard against virus programs, you should do the following:

- Periodically run a virus-checking utility on your computer's hard-disk drive
- Always run a virus-checking utility on any diskettes (including commercially sold software) before using them

### *VL-Bus™*

An abbreviation for VESA local bus. A standard for local bus implementation developed by the Video Electronics Standards Association.

### *VLSI*

Abbreviation for very-large-scale integration.

### *Vpp*

Abbreviation for peak-point voltage.

### *VRAM*

Abbreviation for video random-access memory. Some video adapters use VRAM chips (or a combination of VRAM and DRAM) to improve video performance. VRAM is dual-ported, allowing the video adapter to update the screen and receive new image data at the same time.

### *W*

Abbreviation for watt(s).

### win.ini *file*

When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **win.ini** file records what printer(s) and fonts are installed for Windows. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard-disk drive.

Running the Control Panel or Windows Setup program may change options in the **win.ini** file. On other occasions, you may need to change or add options to the **win.ini** file manually with a text editor, such as Notepad.

### *write-protected*

Read-only files are said to be *write-protected*. You can write-protect a 3.5-inch diskette by sliding its write-protect tab to the open position and a 5.25-inch diskette by placing an adhesive label over its write-protect notch.

### *XMM*

Abbreviation for extended memory manager, a utility that allows application programs and operating environments to use extended memory in accordance with the XMS. See also **conventional memory**, **EMM**, **expanded memory**, **extended memory**, and **memory manager**.

### *XMS*

Abbreviation for eXtended Memory Specification. See also **EMS**, **extended memory**, and **memory manager**.

### *ZIF*

Acronym for zero insertion force. Some computers use ZIF sockets and connectors to allow devices such as the microprocessor chip to be installed or removed with no stress applied to the device.

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