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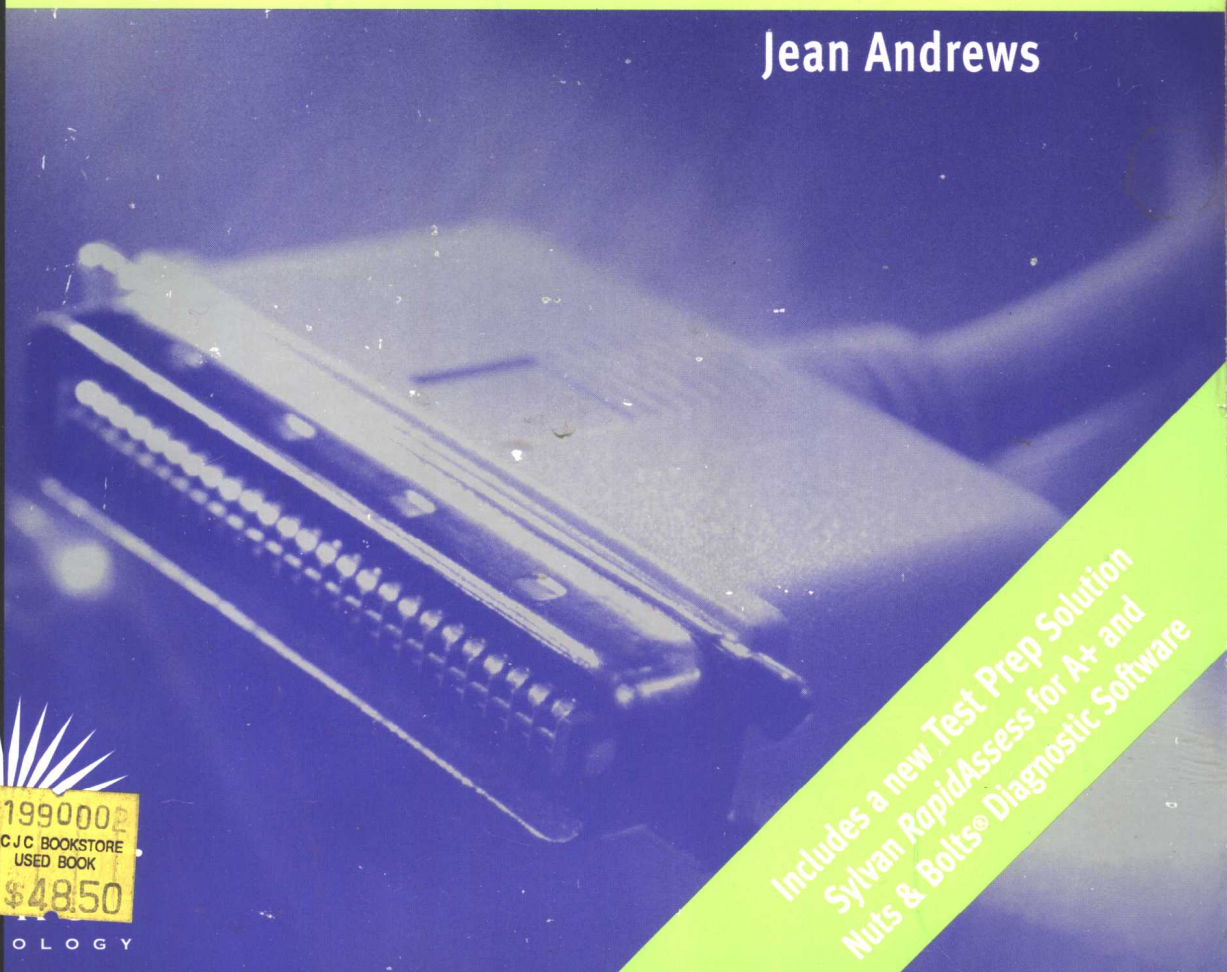


ENHANCED

A GUIDE TO Managing and Maintaining Your PC

Second Edition

Jean Andrews



Includes a new Test Prep Solution
Sylvan RapidAssess for A+ and
Nuts & Bolts® Diagnostic Software





A GUIDE TO **Managing and Maintaining Your PC**

SECOND EDITION

**C O M P R E H E N S I V E
E N H A N C E D**

Jean Andrews, Ph.D.



**COURSE
TECHNOLOGY**

ONE MAIN STREET, CAMBRIDGE, MA 02142

an International Thomson Publishing company **ITP**[®]

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A Guide to Managing and Maintaining Your PC, Second Edition, Comprehensive Enhanced is published by Course Technology.

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ISBN 0-619-00064-3

Printed in Canada

2 3 4 5 6 WC 03 02 01 00 99

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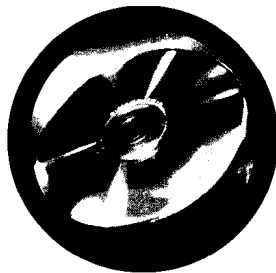
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FIGURE 16-7b: 3Com Corporation

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INTRODUCTION

A Guide to Managing and Maintaining Your PC, Comprehensive Enhanced was written to be the very best tool on the market today to prepare you to support personal computers. The book takes you from the just-a-user level to the I-can-fix-this level for the most common PC hardware and software concerns. The book achieves its goals with an unusually effective combination of tools that powerfully reinforce both concepts and hands-on real-world experience.

This book includes two pieces of software, Sylvan *RapidAssess* for A+—test preparation solution, and Nuts & Bolts—a powerful troubleshooting utility, on the enclosed single convenient CD. This software is integrated into the many Hands-On Projects in the book. The text was developed as a teaching tool, and contains many pedagogical features, including an itemized summary, review questions, comprehensive projects, and key-term definitions; there are also step-by-step guides on installation, maintenance, and optimizing system performance. A unique standalone troubleshooting guide (Appendix E), indexed for both hardware and software, distills all troubleshooting information from the book. Several in-depth, hands-on projects at the end of each chapter are designed to make certain that you not only understand the material, but can execute procedures and make decisions on your own. The carefully structured, clearly written text is accompanied by graphics that provide the visual input essential to learning. In addition, for instructors using the book in a classroom, a special CD-ROM is available that includes an instructor's manual, an online testing system, and a PowerPoint presentation.

Balanced coverage is given to new hardware as well as to the real work of PC repair, where some older technology is still in widespread use, and still needs support. For example, while the book covers the various Pentium processors, it also addresses the capabilities and maintenance of 486 processors because many are still in use. Also included is thorough coverage of operating system and applications support. While Windows 95 is the primary OS of choice for many PCs, DOS and Windows 3.x are still given comprehensive coverage because of their continuing widespread use. In addition, an entire chapter is dedicated to Windows NT, which has many powerful capabilities that make it an important option, especially in the business environment.

This book provides the most comprehensive preparation available for the newly revised A+ Certification examination. This certification credential's popularity among employers is growing exponentially, and obtaining certification increases your ability to gain employment and improve your salary. To get more information on A+ Certification and its sponsoring organization, the Computing Technology Industry Association, see their Web site at www.CompTIA.org.

FEATURES

In order to ensure a successful learning experience, this book includes the following pedagogical features:

- **Learning Objectives:** Every chapter opens with a list of learning objectives that sets the stage for you to absorb the lessons of the text.
- **Comprehensive Step-by-Step Troubleshooting Guidance:** Troubleshooting guidelines are included in almost every chapter. In addition, Appendix E is a unique compilation of troubleshooting information taken directly from the book, indexed for hardware and software problems. The guidelines are regularly updated and available on the Course Technology Web site, www.course.com (search on Andrews or the book title). You are invited to submit suggestions for these troubleshooting tips and guidelines on the Web site.
- **Step-by-Step Procedures:** The book is chock-full of step-by-step procedures covering subjects from hardware installation and maintenance to optimizing system performance.



Notes: The Note icon is used whenever it is appropriate to present additional helpful material related to the subject being described.

- **Nuts & Bolts Utility Software:** The CD-ROM accompanying the book contains a copy of Nuts & Bolts, an award-winning diagnostic utility, receiving top ratings from *PC Advisor*, *Windows Sources*, *Home Office Computing*, *PC Computing*, and *Boot Magazine*. Many end-of-chapter projects direct you to use this software, which is designed to facilitate all aspects of installation, maintenance, diagnosis, repair, and optimization of system performance. The software comes with a 90-day license and with the ability to purchase online as well.
- **Sylvan RapidAssess for A+:** This test prep software is an exciting new way to prepare yourself for the A+ exams. Featuring test questions for both the Core and DOS exams, practice using the Study Mode, which provides answers and detailed explanations along the way. Next, test your acumen in the Certification Mode, which simulates the real exam. After your test, you are presented with a graphical representation of your score, as well as with a visual breakdown of how you performed on each test objective. Best of all, the questions are mapped to the pages in the book, so you have a road map from which to study. You can also buy a comprehensive set of 400 review questions to take the process one step further. Point your browser to www.course.com/Sylvan for more details.
- **End-of-Chapter Material:** Each chapter closes with the following features, which reinforce the material covered in the chapter and provide real-world, hands-on testing of the chapter's skill set:
 - **Summary:** This bulleted list of concise statements summarizes all major points of the chapter.
 - **Review Questions:** You can test your understanding of the chapter material with a comprehensive set of review questions.
 - **Key-Term List:** The content of each chapter is further reinforced by an end-of-chapter key-term list with definitions that are combined at the end of the book in a full-length glossary.



Hands-On Projects: You get to test your real-world understanding with hands-on projects involving a full range of software and hardware problems. Chapters include exercises using Nuts & Bolts software as well. Each hands-on activity in this book is preceded by the Hands-On icon and a description of the exercise that follows.

- **In-Depth Behind-the-Scenes Technology:** Optional sections are included for an elective, more detailed study of the subject at hand, relying on technical tools such as DOS DEBUG. These sections are screened in light gray and may be skipped if desired.

SUPPLEMENTS

For instructors using this book in a classroom environment, the following teaching materials are available on a single CD-ROM:

Electronic Instructor's Manual: The Instructor's Manual that accompanies this textbook includes a list of objectives for each chapter, a detailed chapter outline, suggestions for classroom activities, and answers to end-of-chapter questions.

Course Test Manager 1.1: Accompanying this book is a powerful assessment tool known as the Course Test Manager. Designed by Course Technology, this cutting-edge Windows-based testing software helps instructors design and administer tests and pretests. In addition to being able to generate tests that can be printed and administered, this full-featured program also has an online testing component that allows students to take tests at the computer and have their exams automatically graded. The test bank that accompanies this book contains over 100 questions per chapter.

PowerPoint presentations: This book comes with Microsoft PowerPoint slides for each chapter. The presentation will walk you through all of the salient points of each chapter. These are included as a teaching aid for classroom presentation, to make available to students on the network for chapter review, or to be printed for classroom distribution. Instructors, please feel at liberty to add your own slides for additional topics you introduce to the class.

LAB MANUAL

The Lab Manual offers the most comprehensive method for learning PC Repair. When combined with *A Guide to Managing & Maintaining Your PC, Second Edition*, it gives users clear, concise instruction along with essential hands-on practice. Each of the 60 featured labs is mapped to the newly revised A+ certification objectives, and offers the hands-on experience essential for success in the quickly evolving PC industry. The Lab Manual was developed to assist users in merging tutorial and lab experiences for maximum understanding in a dynamic environment. To order a copy, consult your sales rep or point your browser to www.course.com.

ACKNOWLEDGMENTS

Working with the people at Course Technology has been nothing short of a delight. Kristen Duerr, Jennifer Normandin, and Daphne Barbas of CT, thanks for your support, encouragement, and diligence. Thank you, Janet Weinrib, the Developmental Editor, for keeping me on track. Thank you, Mike Walker, Beth Snider, and David Ridarick, for your tremendous research efforts.

Floyd Winters of Manatee Community College has made important contributions to the book. Thank you, Floyd, for help with the troubleshooting guidelines, review questions, key-term definitions, and hands-on projects. Without your contributions, the book would not be as powerful a learning tool as it is.

The reviewers all showed a genuine interest in the book's success; their help was invaluable. Thank you to: Cindy Childers, Roane State Community College; Melanie Guinn, Indian Hills Community College; Dan Heighton, Clark State Community College; David Koenig, Training Directions College; Shayan Mirabi, ITT Technical Institute; Richard Mossip, Rockland Community College; Don Myers, Vincennes University; Joe Sloop, Surry Community College; Raymond Ward, Garland County Community College; Lynn Wells, Muskingum Area Technical College; and Floyd Winters, Manatee Community College.

A very special thank you to my daughters, Jennifer and Joy. Thank you, girls, for your sincere support, for coffee at midnight, and for all the other many things you did to keep a home running while I wrote.

This book is dedicated to the covenant of God with man on earth.

Jean Andrews, Ph.D.

READ THIS BEFORE YOU BEGIN

The following hardware, software, and other equipment are needed to do the hands-on projects at the end of chapters:

- 8 MB RAM (16 MB recommended)
- You will need a working PC that can be taken apart and reassembled. Use a 486 or higher computer.
- Troubleshooting skills can better be practiced with an assortment of nonworking expansion cards that can be used to simulate problems.
- DOS, Microsoft Windows 3.x, and Microsoft Windows 95 are needed to complete projects in Chapters 1 through 11. Microsoft Windows NT Workstation is needed for Chapter 12. Chapters 13 through 18 use a combination of all these operating systems and environments.
- Equipment required to work on hardware includes a grounding mat and grounding strap and flat-head and Phillips-head screwdrivers. A multimeter is needed for Chapter 10 projects.
- Before undertaking any of the lab exercises, starting with Chapter 3, please review the safety guidelines below.

Installing Nuts & Bolts

Install Nuts & Bolts from the CD-ROM under either Windows 3.x or Windows 95.

PROTECT YOURSELF, THE HARDWARE, AND THE SOFTWARE

When you work on a computer it is possible to harm both the computer and yourself. The most common accident that happens when attempting to fix a computer problem is the erasing of software or data. Experimenting without knowing what you are doing can cause damage. To prevent these sorts of accidents, as well as the physically dangerous ones, take a few safety precautions. The text below describes the potential sources of damage to computers and how to protect against them.

Power to the Computer

To protect both yourself and the equipment, turn off the power before doing anything to the inside of a machine. Consider the monitor and the power supply to be “black boxes.” Never remove the cover or put your hands inside this equipment unless you know about the hazards of charged capacitors. Both the power supply and the monitor can hold a dangerous level of electricity even after they are turned off and disconnected from a power source. When working inside a computer, turn off the power but leave the power cable plugged in to provide a good ground, unless the PC is on a grounded mat.

Static Electricity, or ESD

Electrostatic discharge (ESD), commonly known as static electricity, is an electrical charge at rest. A static charge can build up on the surface of a nongrounded conductor and on nonconductive surfaces such as clothing or plastic. When a nongrounded surface that has a static charge on it touches a grounded conductor, the charge is released. To see how this works, turn off the lights in a room, scuff your feet on the carpet, and touch another person. Occasionally you’ll be able to see and feel the charge in your fingers. If you can feel the charge, then you discharged at least 3,000 volts of static electricity. If you hear the discharge, then you released at least 6,000 volts. If you see the discharge, then you released at least 8,000 volts of ESD. A charge of less than 3,000 volts can damage most electronic components. You can touch a chip on a card or systemboard and damage the chip with ESD and never feel, hear, or see the discharge.

There are two types of damage that ESD can cause in an electronic component: catastrophic failures and upset failures. A catastrophic failure destroys the component beyond use. An upset failure damages the component so that it does not perform well, even though it may still function to some degree. Upset failures are the most difficult to detect because they are not so easily observed.

Protect Against ESD

To protect the computer against ESD, always ground yourself before touching electronic components, including the hard drive, disk drive, systemboard, expansion cards, processors, and SIMMs. Ground yourself and the computer parts, using one or more of the following static control devices or methods:

- **Ground bracelet or static strap:** A ground bracelet is a strap you wear around your wrist. The other end is attached to a grounded conductor such as the computer case or a ground mat, or it can plug into a wall outlet (only the ground prong makes a connection!).
- **Rubber mats or ground mats:** Ground mats can come equipped with a cord to plug into a wall outlet to provide a grounded surface on which to work. Remember, if you lift the component off the mat, it is no longer grounded and is susceptible to ESD.
- **Static shielding bags:** New components come shipped in static shielding bags. Save the bags to store other devices that are not currently installed in a PC.

The best solution to protect against ESD is to use a ground bracelet together with a ground mat. If you do not have a ground mat or a ground bracelet, leave the power cord plugged into the electrical outlet so that the computer case is grounded, and touch the computer case before you touch a component. When passing a chip to another person, ground yourself. Leave components inside their protective bags until ready to use. Work on hard floors, not carpet, or use antistatic spray on the carpets. Generally, don't work on a computer if you or the computer have just come inside from the cold.

There is an exception to grounding yourself when working with computers. Inside a monitor case, there is substantial danger of stored voltage from capacitors. When working inside a monitor, you don't want to be grounded, as you would provide a conduit for the voltage to discharge through your body. In this situation, be careful *not* to ground yourself.

When handling systemboards and expansion cards, don't touch the chips on the boards. Don't stack boards on top of each other, which could accidentally dislodge a chip. Hold cards by the edges, but don't touch the edge connections on the card.

Don't touch a chip with a magnetized screwdriver. When using a multimeter to measure electricity, be careful not to touch a chip with the probes. When changing DIP switches, don't use a graphite pencil, because graphite is magnetized; a ballpoint pen works very well.

After you unpack a new device or software that has been wrapped in cellophane, remove the cellophane from the work area quickly. Don't allow anyone who is not properly grounded to touch components. Do not store cards within one foot of monitors, because they can discharge as much as 29,000 volts of ESD onto the screen.

Hold the component by the edges. Don't touch any of the soldered components on a card. If you need to put an electronic device down, place it on a grounded mat or on a static shielding bag. Keep components away from your hair and clothing.

Protect Hard Drives and Disks

Always turn off a computer before moving it, to protect the hard drive, which is always spinning when the computer is turned on (unless the drive has a sleep mode). Never jar a computer while the hard disk is running. Avoid placing a PC on the floor, where the user can accidentally kick it.

Never close the door of a double-sided 5¼-inch drive without either a disk or a cardboard shipping disk in the drive. If the two read/write heads touch each other, the heads may be scratched.

Follow the usual precautions to protect disks. Keep them away from magnetic fields, heat, and extreme cold. Don't open the floppy shuttle window or touch the surface of the disk inside the housing. Treat disks with care and they'll generally last for years.

GLOSSARY

3D RAM Special video RAM designed to improve 3D graphics simulation.

32-bit flat memory mode A protected processing mode for the CPU that can process programs written in 32-bit code. NT is a full 32-bit OS.

A

A+ Certification A certification awarded by CompTIA (the Computing Technology Industry Association) that measures a PC technician's knowledge of the skills and behaviors expected of entry-level PC technicians. Many companies require that their service technicians have A+ Certification.

Adapter address A 6-byte hex hardware address unique to each NIC card and assigned by manufacturers. The address is often printed on the adapter. An example is 00 00 0C 08 2F 35.

Adapter card Also called an Interface Card. A small circuit board inserted in an expansion slot and used to communicate between the system bus and a peripheral device.

Address Resolution Protocol (ARP) A method used by TCP/IP that dynamically or automatically translates IP addresses into physical network addresses such as Ethernet IDs or Token Ring MAC addresses.

Administrator account In Windows NT, an account that grants to the administrator(s) rights and permissions to all hardware and software resources such as the right to add, delete, and change accounts and to change hardware configurations.

Advanced SCSI programming interface (ASPI) A popular device driver that enables operating systems to communicate with the SCSI host adapter. (The "A" originally stood for Adaptec.)

Alternate gateway An alternate router that is used if the default gateway is down. *See* Gateway.

Alternating current (AC) Current that cycles back and forth rather than traveling in only one direction. Normally between 110 and 115 AC volts are supplied from a standard wall outlet.

Ammeter A meter that measures electrical current in amps.

Ampere (A) or amp A unit of measurement for electrical current. One volt across a resistance of one ohm will produce a flow of one amp.

Amplifier repeater A repeater that amplifies whatever it receives regardless of its source.

Analog signals Signals that have an infinite number of values within a range of possible values. An example is the transmission of sound, in wave format, over traditional telephone lines. Compare to Digital signal.

Analog-to-digital converter (A/D or ADC) A component on a sound card that samples and converts analog sound into digital values that can be stored on hard drives.

Anti-Virus (AV) software Utility programs that prevent infection, or scan a system to detect and remove viruses. Norton AntiVirus and McAfee Associates Virus Scan are two popular AV packages.

Application layer The layer of the OSI model responsible for interfacing with the user or application using the network.

Applications software Programs that perform a specific task, such as word processing, database management, or mathematical calculations (for example, Word, WordPerfect, and Excel).

Asynchronous SRAM A slow version of SRAM that does not work in step with the CPU clock speed.

AT command set A set of commands used by a PC to control a modem. AT is the ATtention command, which alerts a modem to prepare to receive additional commands. For example, ATDT means attention and listen for a dial tone.

ATTRIB command A DOS command that can display file attributes and even lock files so that they are "read-only" and cannot be modified (for example, ATTRIB +R FILENAME makes FILENAME a read-only file).

Authoring software Software that allows the user to incorporate text, sound, graphics, photos, animations, and video into one continuous show.

Auto-detecting BIOS A feature on newer system BIOS and hard drives that provides for auto-detection when identifying and configuring a new hard drive in the CMOS setup.

AUTOEXEC.BAT One startup file on an MS-DOS computer. It tells the computer what commands or programs to execute automatically after bootup.

Autorange meter A multimeter that senses the quantity of input and sets the range accordingly.

B

Back end In a client/server environment, the application on the server that processes requests for data from the client.

Backbone A network used to link several networks together. For example, several Token Rings and Ethernets may be connected using a single FDDI backbone.

Back up (v), Backup (n) To make a second copy of important files or data. Backups can be made by saving a file with a different name or by copying files to a different disk or to a tape drive.

Backup catalog A backup set that displays a list of the files and folders previously backed up. *See* backup set.

Backup set The name for the set of files you backed up. For example, perhaps only the C:\data and C:\mail directories were backed up. DATA and MAIL might be used as the backup set names. *See* backup set.

Backup Windows NT domain controller (BDC) A computer on a network that holds a read-only copy of the SAM (Security Accounts Manager) database.

Bandwidth The range of frequencies that a communications cable or channel can carry. In general use, the term refers to the volume of data that can travel on a bus or over a cable.

Bank An area on the systemboard that contains slots for memory modules (typically labeled bank 0, 1, 2, and 3).

Batch file A text file containing a series of DOS instructions to the computer, telling it to perform a specific task (for example, AUTOEXEC.BAT is a batch file that contains a series of startup commands).

Baud rate A line speed of communication between two devices such as a computer and a printer or a modem. This speed is measured in the number of times a signal changes in one second.

Beam detect mirror Detects the initial presence of a laser printer's laser beam by reflecting the beam to an optical fiber.

Binding Associating an OSI layer to a layer above it or below it.

BIOS (basic input/output system) Firmware that controls much of a computer's input/output functions, such as communication with disk drives, the printer, RAM chips, and the monitor.

Bit-map file A type of graphics file in which the image is written as a series of 0s and 1s. These files have the extension .BMP and can be loaded into paint programs to be edited and printed.

Boot loader menu In Windows NT, a startup menu that gives the user the choice between Windows NT and another OS such as Windows 95.

Boot partition The hard drive partition where the Windows NT operating system is stored. The system partition and the boot partition may be different partitions.

Boot sector virus An infectious program that can replace the boot program with a modified, infected version of the boot command utilities, often causing boot and data retrieval problems.

Bootable disk For DOS, a floppy disk that can upload the operating system files necessary for computer startup. It must have the two hidden system files IO.SYS and MSDOS.SYS, and also COMMAND.COM.

Break code A code produced when a key is released. *See* Make code.

Bridge A hardware device or box, coupled with software at the Data Link Layer, used to connect similar networks and network segments. *See* Router.

Buck-boost regulator A line-interactive UPS that offers good line conditioning and has an automatic voltage regulator that boosts the voltage during electrical sags.

Buffer A temporary memory area where data is kept before being written to a hard drive or sent to a printer, thus reducing the number of writes when devices communicate at different speeds.

Burst SRAM Memory that is more expensive and slightly faster than pipelined burst SRAM. Data is sent as a two-step process; the data address is sent, and then the data itself is sent without interruption.

Burst transfer A means of sending data across the bus, with one packet immediately following the next, without waiting for clock beats and/or addressing of the information being sent.

Bus Strips of parallel wires or printed circuits used to transmit electronic signals on the systemboard to other devices. Most Pentium systems use a 32-bit bus.

Bus enumerator A component of Windows 95 Plug-and-Play that locates all devices on a particular bus and inventories the resource requirements for these devices.

Bus mouse A mouse that plugs into a bus adapter card and has a round, 9-pin mini-DIN connector.

Bus network architecture A network design in which nodes are connected in line with one another, with no centralized point of contact.

Bus speed The speed at which the data on the systemboard is moving.

C

Cache controller The microchip on the systemboard that controls the memory cache to static RAM.

Call tracking A system that tracks the dates, times, and transactions of help-desk or on-site PC support

calls, including the problem presented, the issues addressed, who did what, and when and how each call was resolved.

Cards Adapter boards or interface cards placed into expansion slots to expand the functions of a computer, allowing it to communicate with external devices such as monitors or printers.

Carrier A reference signal used to activate a phone line to confirm a continuous frequency; used to indicate that two computers are ready to receive or transmit data via modems.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD) A feature used in ethernet networks whereby packets are sent after listening for a silence, and are resent if a collision is detected.

CD or CHDIR command A DOS command to change directories (for example, CD\WINDOWS would change the directory to the Windows directory, and CD\ would return to the Root directory).

Chain A group of clusters used to hold a single file.

Checksum A method of error checking of transmitted data, whereby the digits are added up and their sum compared to an expected sum.

Child, parent, grandparent backup method A plan for backing up and reusing tapes or removable disks by rotating them each week (child), month (parent), and year (grandparent).

Chip set A set of chips on the systemboard that collectively controls the memory cache, external buses, and some peripherals.

CHKDSK command A DOS command that checks for some hard drive errors and displays possible problems (for example, CHKDSK C: is used to check drive C).

CHS (cylinders, heads, sectors) The traditional method by which BIOS reads and writes to hard drives by addressing the correct cylinder, head, and sector.

Circuit boards Computer components, such as the main systemboard or an adapter board, that have electronic circuits and chips.

Clamping voltage The maximum voltage allowed through a surge suppressor, such as 175 or 330 volts.

Classless addresses Class C network addresses a service provider owns and then subleases to small companies.

Clock speed The speed at which the CPU operates, usually expressed in MHz. A Pentium may have a speed of 150 MHz, while a Pentium II may operate at 233 MHz.

Clone Originally, a computer that was compatible with IBM computer hardware and MS-DOS software. Today, the word clone often refers to no-name Intel and Microsoft compatibles.

Cluster One or more sectors that constitute the smallest unit of space on a disk for storing data (also referred to as a file allocation unit). Files are written to the disk as groups of whole clusters.

Cluster chain A series of clusters used to hold a single file.

.CMD files Windows NT batch files that contain a list of commands to be executed as a group.

CMOS (complementary metal oxide conductor) A type of microchip that requires relatively less electricity and produces less heat than other types of chips. The configuration chip on the systemboard is an example of a CMOS chip.

COAST (cache on a stick) Chips on a module available for pipelined burst synchronous SRAM.

CODEC (COder/DECOder) A method of compressing and later decompressing sound, animation, and video files. MPEG is a common example.

Collision In an ethernet network, when transmitted packets of data are sent at the same time and collide. Ethernet will first listen for silence before it transmits, and it will stop and resend if a collision occurs.

Color depth The number of possible colors used by the monitor. Determines the number of bits used to compose one pixel. One of two characteristics (the other is screen resolution) that determine the amount of data sent to the video card to build one screen.

Color space conversion Converting images to RGB values before they are displayed. Processing is faster if the video card does the conversion instead of the CPU.

Comment lines Documentation lines that are ignored by the OS or software executing a list of instructions. A REM in front of a line will turn an AUTOEXEC command into a comment. A semi-colon will turn an .ini file line into a comment.

Common access method (CAM) A standard adapter driver used by SCSI.

Compressed drive A drive whose format has been reorganized, in order to store more data. A compressed drive is really not a drive at all; it's actually a type of file, typically with a host drive called H.

Computing Technology Industry Association (CompTIA) A membership trade association that sponsors A+ Certification, a valuable certification for PC technicians.

Configuration data Also called setup information. Information about the computer's hardware, such as what type of hard drive, floppy drive, or monitor is present, along with other detailed settings.

Configuration manager A component of Windows 95 Plug-and-Play that controls the configuration process of all devices and communicates these configurations to the devices.

Configuration parameter Another name for the value names and values of the registry, which is information in the Windows registry.

Connection protocol In networking, confirming that a good connection is made before transmitting data to the other end. To accomplish this, most network applications use TCP rather than UDP.

Connectionless protocol When UDP is used and a connection is not required before sending a packet. Consequently, there is no guarantee that the packet will arrive at its destination. An example of a UDP transmission is a broadcast to all nodes on a network.

Constant linear velocity (CLV) A CD-ROM format in which the spacing of data is consistent on the CD, but the speed of the disc varies depending on whether the drive is reading near the center or the edge of the disc.

Contention-based system A system in which each computer contends for the opportunity to transmit on the network. If there is a collision, a computer waits a random amount of time and resends.

Continuity A continuous, unbroken path for the flow of electricity. A "continuity test" can determine whether or not internal wiring is still intact.

Control blade A laser printer component that prevents too much toner from sticking to the cylinder surface.

Controlled-access unit (CAU) A centralized hub on a Token Ring network. *See* Multistation access unit.

Controller board An adapter board used to interface between the computer and a device such as a scanner.

Coprocessor A chip or portion of the CPU that helps the microprocessor perform calculations and speeds up computations and data manipulations dramatically.

Copy backup A full backup that does not change the archive attributes of files and folders, so that incremental and differential backups don't "sense" this backup.

COPY command A DOS command that copies files from one location to another (for example, COPY FILE.EXT A: is used to copy the file named FILE.EXT to the disk in drive A).

Corrupted files Data and program files that are damaged for any of a variety of reasons, ranging from power spikes to user error.

CPU (central processing unit) Also called a microprocessor. The heart and brain of the computer, which receives data input, processes the information, and executes instructions.

Cross-linked clusters Errors caused when files appear to share the same disk space, according to the file allocation table.

Crosstalk The interference that one wire, in a twisted pair, may produce in the other.

D

DAC (Digital-to-Analog Converter) A component that converts digital data back into analog signals just before output from the computer. For example, DAC technology is used to convert digital sound to analog sound just before playback to the speakers.

Daily copy backup Backs up all files that have changed during a day, but does not change the archive attributes of files; in this way, incremental and differential backups don't "sense" the backup.

Data bits The number of bits used to make up a transmitted character or value. PC communication will typically use 8 data bits and 1 stop bit for communicating data over phone lines.

Data cartridge A type of tape medium typically used for backups. Full-sized data cartridges are $4 \times 6 \times \frac{3}{8}$ inches in size. A minicartridge is only $3\frac{1}{4} \times 2\frac{1}{2} \times \frac{3}{8}$ inches.

Data communications equipment (DCE) The hardware, usually a dial-up modem, that provides the connection between a data terminal and a communication line.

Data compression Reducing the size of files by various techniques such as using a shortcut code to represent repeated data.

Data line protectors Surge protectors designed to protect the telephone line to a modem.

Data Link layer The OSI layer that disassembles packets and reassembles data into packets.

Data path The size of a bus, such as a 32-bit-wide data path in a PCI bus.

Data terminal equipment (DTE) This term refers to both the computer and a remote terminal or other computer to which it is attached.

Datagrams Packets of data that travel between networks from a sender to a receiver. A datagram typically includes an IP header, address information, a checksum, and data.

De facto standard A standard that does not have an official backing, but is considered a standard because of widespread use and acceptance by the industry.

DEBUG utility A DOS utility that shows exactly what is written in memory, using the hexadecimal numbering system to display memory addresses and data.

Default gateway The main gateway or unit that will send or receive packets addressed to other networks.

Default Windows printer The printer that Windows software will use unless the user specifies another printer.

Defragment To "optimize" or rewrite a file to a disk in one continuous chain, thus speeding up data retrieval.

DEL command A DOS command that deletes files (for example, DEL A:FILE.EXT deletes the file named FILE.EXT from drive A).

DELTREE command A DOS command used to delete a directory, all its subdirectories, and all files within it (for example, DELTREE DIRNAME deletes the directory named DIRNAME and everything in it).

Demodulation When digital data that has been converted to analog data is converted back to digital data. See Modulation.

Desktop publishing Using a microcomputer for tasks once done by graphic designers, typesetters, and print shops, to produce professional-quality, camera-ready output.

Device driver A small program that tells the computer how to communicate with an input/output device such as a printer or modem.

Device Manager A Windows 95 program that allows the user to view and set hardware configurations.

Diagnostic cards Adapter cards designed to discover and report computer errors and conflicts at POST time (before the computer boots up), often by displaying a number on the card.

Diagnostic software Utility programs that help troubleshoot computer systems. Some DOS diagnostic utilities are CHKDSK and SCANDISK. PC Technician is an example of a third-party diagnostic program.

Dial-Up Networking A Windows application that allows a PC to remotely connect to a network through a phone line. A Dial-Up Network icon can be found under My Computer.

Differential backup Backs up only files that have changed or have been created since the last *full* backup. When recovering data, only two backups are needed: the full backup and the last differential backup.

Differential SCSI device A device (with a cable up to 75 feet long) that sends signals through a pair of wires and is less vulnerable to noise than single-ended SCSI devices. See Single-ended SCSI devices.

Digital signal A signal that has only a finite number of values in the range of possible values. An example is the transmission of data over a serial cable as bits, where there are only two values: 0 and 1.

Digital video disc (DVD) A faster, larger CD-ROM format that can read older CDs, store over

4 gigabytes of data, and hold full-length motion picture videos.

DIMM (dual in-line memory module) A miniature circuit board that has a 64-bit path, unlike SIMMs, which have a 32-bit path. Because Pentium processors require a 64-bit path, you must install two SIMMs at a time, but you can install DIMMs one at a time.

DIP switch (dual in-line packet switch) A switch that has only two settings, and can be used to set configurations such as modem COM ports or printer setup.

Direct current (DC) Current that travels in only one direction (the type of electricity provided by batteries). Computer power supplies transform AC current to low DC current.

Directory A DOS table that contains file information such as name, size, time, and date of last modification, and the cluster number of the file's beginning location.

Disk cache A method whereby recently retrieved data and adjacent data from a hard drive are read into memory in advance, anticipating the next CPU request. Also a process by which data written to the hard drive is accumulated in memory to reduce the number of writes to the drive.

Disk compression Compressing data on a hard drive to allow more data to be written to the drive.

Disk duplexing An improvement of disk mirroring, whereby redundant data is written to two or more drives, and each hard drive has its own adapter card. This provides greater protection than disk mirroring.

Disk editor A powerful tool for editing any part of a disk, including the partition table, directory entries, DOS boot record, and FAT.

Disk mirroring A strategy whereby the same data is written to two hard drives in a computer, to safeguard against hard drive failure. Disk mirroring uses only a single adapter for two drives.

Disk striping Treating multiple hard drives as a single volume. Data is written across the multiple drives in small segments, in order to increase performance and logical disk volume, and, when parity is also used, to provide fault tolerance. RAID 5 is disk striping with an additional drive for parity.

Disk thrashing A condition that results when the hard drive is excessively used for virtual memory because RAM is full. It dramatically slows down processing and can cause premature hard drive failure.

DISKCOPY command A DOS command that copies the entire contents of one disk to another disk of the same type, while formatting the destination disk so that the two will be identical (for example, DISKCOPY A:A: makes a duplicate floppy disk using drive A).

Display adapter Another name for a video controller card.

Display power management signaling (DPMS) Energy Star standard specifications that allow for the video card and monitor to go into sleep mode simultaneously.

DMA (direct memory access) controller A chip or chip logic on the systemboard that provides channels that a device may use to send data directly to memory, bypassing the CPU.

Docking station A system that is designed to connect to a portable or notebook computer for downloading and uploading data and for sharing local peripheral devices.

Documentation Manuals, tutorials, and help files that provide information that a user needs in order to use a computer system or software application.

Domain A logical group of networked computers, such as those on a college campus, that share a centralized directory database of user account information and security for the entire domain.

Domain name A unique, text-based name that identifies an IP (Internet address). Typically, domain names in the United States end in .edu, .gov, .com, .org, or .net. Domain names also include a country code, such as .uk for the United Kingdom.

Domain name system or domain name service (DNS) A database on a top-level domain name server that keeps track of assigned domain names and their corresponding IP addresses.

Double conversion The process by which the in-line UPS converts the AC power to battery power in DC form and then back to AC power.

Doze time The time before an Energy Star or "green" system will reduce 80% of its activity.

DriveSpace A utility that compresses data on a disk drive, creating a single large file on the disk to hold all the compressed files.

Drop height The height that the manufacturer states that a drive can be dropped without making the drive unusable.

Dual boot The ability to boot using two different operating systems, such as Windows NT and Windows 95. However, programs cannot be shared between Windows NT and the other OS.

Dual ported When the video chip set (input) and the RAM DAC (output) can access video memory at the same time. A special kind of video RAM is required.

Dual voltage CPU A CPU that requires two different voltages, one for internal processing and the other for I/O processing.

Dynamic Host Configuration Protocol (DHCP) The protocol of a server that manages dynamically assigned IP addresses. DHCP is supported by both Windows 95 and Windows NT.

Dynamic IP address An assigned IP address that is used for the current session only. When the session is terminated, the IP address is returned to the list of available addresses.

Dynamic RAM (DRAM) The most commonly used type of system memory with access speeds ranging from 70 to 50 nanoseconds, requiring refreshing every few milliseconds.

Dynamic routing Routing tables that are automatically updated as new information about routes becomes known and is shared by one router with another. Compare to static routing.

E

EDO (extended data output) memory A type of RAM that may be 10–20% faster than conventional RAM because it eliminates the delay before it issues the next memory address.

EEPROM (electrically erasable programmable ROM) chip A type of chip in which higher voltage may be applied to one of the pins to erase its previous memory before a new instruction set is electronically written.

EISA (Extended Standard Industry

Architecture) bus A 32-bit bus that can transfer 4 bytes at a time at a speed of about 20 MHz.

Electrostatic discharge (ESD) Another name for static electricity, which can damage chips and destroy systemboards, even though it may not be felt or seen with the naked eye.

ELF (Extremely Low Frequency) Very low-frequency monitor emission of magnetic fields. ELF guidelines are established to ensure that computers are safe and energy efficient.

Embedded SCSI devices Devices that contain their own host adapter, whereby the SCSI interface is built into the device.

EMM386.EXE A DOS utility that creates upper memory blocks (commonly used in pre-Windows 95 systems).

Encrypting virus A type of virus that transforms itself into a nonreplicating program in order to avoid detection. It transforms itself back into a replicating program in order to spread.

Energy Star systems "Green" systems that satisfy the EPA requirements to decrease the overall consumption of electricity.

Enhanced BIOS A newer BIOS that has been written to accommodate the larger-capacity gigabyte drives.

Enhanced IDE technology A newer drive standard that allows systems to recognize drives larger than 528 MB and to handle up to four devices on the same adapter.

Environment subsystems A Windows NT user mode process in which a subsystem runs an

application in its own private memory address space as a virtual machine. (Compare to integral subsystems.)

EPROM (erasable programmable ROM) chip

A type of chip with a special window that allows the current memory contents to be erased with special ultraviolet light so that the chip can be reprogrammed. Many BIOS chips are EPROMs.

ERASE command A DOS command that deletes or erases files (for example, ERASE FILE.EXT deletes the file named FILE.EXT from the current disk).

Error correction The ability of some modems to identify transmission errors and then automatically request another transmission.

Escalating The process of a technician passing a customer's problem to higher organizational levels, if he or she cannot address the problem.

ESD See Electrostatic discharge.

Ethernet The most popular network topology used today. It uses Carrier Sense Multiple Access with Collision Detection (CSMA/CD) and can be physically configured as a bus or star network.

Event Viewer A Windows NT utility that tracks and logs events as they are performed by the applications, processes, or user actions. Accessed by: clicking Start, Programs, Administrative Tools, and then selecting Event Viewer.

Executive Services _ In Windows NT, a subsystem running in kernel mode that interfaces between the user mode and HAL.

Expanded memory (EMS) Memory outside of the conventional linearly addressed memory that is accessed in 16K segments, or pages, by way of a window to upper memory.

Expert systems Computerized software that uses a database of known facts and rules to simulate a human expert's reasoning and decision-making processes.

Extended memory Memory above the initial 1024 KB, or 1 MB, area.

External cache Static cache memory, stored on the systemboard, that is not part of the CPU (also called Level 2 or L2 cache).

F

Fake parity chip A parity generator chip designed to simulate parity checking so that the user can use less expensive nonparity memory modules on a systemboard that expects parity memory.

Fatal system error An error that prevents the OS from loading. An example is a damaged registry.

Fault tolerance The degree to which a system can tolerate failures. Adding redundant components, such as disk mirroring or disk duplexing, is a way to build in fault tolerance.

FDDI (Fiber Distributed Data Interface)

Pronounced "fiddy." A ring-based network, similar to Token Ring, that does not require a centralized hub. FDDI often uses only fiber-optic cabling.

Ferroresonant regulator A UPS device that contains a magnetic coil that can retain a power charge that can be used during a brownout to raise the voltage at switching time.

FIFO (first-in first-out) A method of storing and retrieving data from a table or stack, whereby the first element stored is the first one retrieved.

FIFO buffer A buffer on a 16550 UART chip that solves the problem of lost data, which sometimes occurred with the older 16450 UART chips.

File A collection of related records or lines that can be written to disk and assigned a name (for example, a simple letter or a payroll file containing data about employees).

File allocation table (FAT) A DOS table at the beginning of a disk that tracks where files are stored on the disk according to the file allocation units used by the files.

File allocation units See Cluster.

File virus A virus that inserts virus code into an executable program and can spread whenever that program is accessed.

Firmware Software that is permanently etched onto a chip.

Fixed frequency Monitors that only support a single refresh rate. Compare to multiscan monitors, which support different video cards and different refresh rates.

Flash memory A type of RAM that can electronically hold memory even when the power is off.

Flash ROM ROM that can be reprogrammed or changed without replacing chips.

Flow control When using modems, a method of controlling the flow of data from a sending PC by having the receiving PC send a message to the sending device to stop or start data flow. Xon/Xoff is an example of a flow control protocol.

FM (Frequency Modulation) method A method of synthesizing sound by making a mathematical approximation of the musical sound wave. MIDI may use FM synthesis or wavetable synthesis.

Folder A Windows directory for a collection of related files (for instance, a person may find it convenient to create a MYDATA directory, or folder, in which to store personal files).

Format To prepare a disk for use by creating a FAT and root directory on the disk. During formatting, any data on the disk is lost.

FPM (fast page mode) memory An earlier memory mode used before the introduction of EDO memory.

Fragmentation The condition that occurs when files are not written in single chains on a disk.

Fragmented files Files that are spread out over different portions of the disk so that they are not in contiguous clusters.

Frame A small, standardized packet of data that also includes header and trailer information as well as error-checking codes.

Frame buffer An area of memory on a video controller that is used to store the data to be displayed on the screen.

Front end In a client/server environment, the application on the client that makes use of data stored on the server.

FTP (File Transfer Protocol) An Internet standard that provides for the transfer of files from one computer to another. FTP can be used at a command prompt, or with a GUI interface, which is available with FTP software or with a Web browser. When using a Web browser, enter the command "ftp" in the browser URL line instead of the usual "http://" used to locate a Web site.

FTP server or FTP site A computer that stores files that can be downloaded by FTP.

Full backup A complete backup, whereby all of the files on the hard drive are backed up each time the backup procedure is performed. It is the safest backup method, but it takes the most time.

G

Gateway A device or process that connects networks with different protocols. *See* Bridge and Router.

General Protection Fault (GPF) error A

Windows error that occurs when a program attempts to access a memory address that is not available or is no longer assigned to it.

Genlock A standard for video-capturing cards that refers to the ability of the card to capture a single unique frame of video, rather than "sampling" pieces of adjoining frames.

Gigabyte Approximately 1 billion bytes of data (actually 2 to the 30th power, or 1,073,741,824 bytes).

Graphics accelerator A type of video card that has an on-board processor that can substantially increase speed and boost graphical and video performance.

Green monitor A monitor that is designed to conserve energy by using such techniques as sleep or doze mode.

Green Standards Standards that mean that a computer or device can go into sleep or doze mode when not in use, thus saving energy and helping the environment.

Ground mat An antistatic mat designed for electronic workbenches to dissipate static electricity. It

often uses a wire attached to the ground connection, in a standard electrical outlet.

Ground strap An antistatic wrist strap used to dissipate static electricity. Typically grounded by attaching an alligator clip to the computer chassis or to a nearby grounded antistatic mat.

Group files Windows 3.x files with the .grp file extension that contain information about a program group and related programs; program groups are displayed in Program Manager.

GUI (graphical user interface) A user interface, such as the Windows interface, that uses graphics or icons on the screen for running programs and entering information.

H

Half-life The time it takes for a medium storing data to weaken to half of its strength. Magnetic media, including traditional hard drives and floppy disks, have a half-life of 5 to 7 years.

Handshaking When two modems begin to communicate, the initial agreement made as to how to send and receive data. It often occurs when you hear the modem making noises as the dial-up is completed.

Hard disk removable drives High-capacity drives, such as Zip or Jaz drives, that have disks that can be removed like floppy disks.

Hard drive standby time The amount of time before a hard drive will shut down to conserve energy.

Hard-disk loading The illegal practice of installing unauthorized software on computers for sale. Hard-disk loading can typically be identified by the absence of original disks in the original system's shipment.

Hardware The physical machinery that constitutes the computer system, such as the monitor, the keyboard, the system unit, and the printer.

Hardware abstraction layer (HAL) The low-level part of Windows NT, written specifically for each CPU technology, so that only the HAL must change when platform components change.

Hardware cache A disk cache that is contained in RAM chips built right on the disk controller.

Hardware Compatibility List (HCL) The list of all computers and peripheral devices that have been tested and are officially supported by Windows NT. (*See* www.microsoft.com/hwtest)

Hardware profiles Configuration information about memory, CPU, and OS, for a PC. A PC may have more than one profile. For example, a docking station PC may have two profiles, one with and one without the notebook PC docked.