Appendix

A

Glossary

This glossary contains computer and electronics terms that are applicable to the subject matter in this book. The glossary is meant to be as comprehensive as possible on the subject of upgrading and repairing PCs. Many terms correspond to the latest technology in disk interfaces, modems, video and display equipment, and standards that govern the PC industry. Although a glossary is a resource not designed to be read from beginning to end, you should find that scanning through this one is interesting, if not enlightening, with respect to some of the newer PC technology.

For a more complete dictionary of computer terms, I recommend the *Scott Mueller Library – Computer Dictionary*, ISBN 0-7897-1670-4 (www.amazon.com/dp/0789716704).

The following websites can also help you with terms not included in this glossary:

- **FOLDOC (Free On-Line Dictionary Of Computing)**—www.foldoc.org
- **Webopedia**—www.webopedia.com

1–50X CD-ROM maximum speeds in relation to the speed of a music CD (1X = 150KBps). At speeds of 16X or above, most drives are CAV and reach their rated speeds only on the outer edges of the disc. See also *CLV* and *CAV*.

3GIO The original name for PCI Express, a replacement for existing PCI connections. See also *PCI Express*.

10BASE-2 IEEE standard for baseband Ethernet at 10Mbps over RG-58 coaxial cable to a maximum distance of 185 meters. Also known as Thin Ethernet (Thinnet) or IEEE 802.3.

10BASE-5 IEEE standard for baseband Ethernet at 10Mbps over thick coaxial cable to a maximum distance of 500 meters. Also known as Thick Ethernet or Thicknet.

10BASE-T A 10Mbps CSMA/CD Ethernet LAN that works on Category 3 or better twisted-pair wiring, which is very similar to standard telephone cabling. 10BASE-T Ethernet LANs work on a "star" configuration, in which the wire from each workstation routes directly to a 10BASE-T hub. Hubs can be joined together. 10BASE-T has a maximum distance of 100 meters between each workstation and the hub.

24x7 Refers to continuous 24 hours a day, 7 days a week computer or services operation.

56K The generic term for modems that can receive data at a maximum rate of 56Kbps. See also *V.90*, *V.92, X2*, *K56flex*.

64-bit processor A processor that has 64-bit registers. The Intel Itanium and Itanium 2 processors for workstations and servers, which can also emulate 32-bit Intel processors; the AMD Athlon 64 desktop processor, which also emulates 32-bit x86 Intel and AMD processors; and the AMD Opteron, designed for use in server and workstation tasks, are some of the 64-bit processors now available.

100BASE-T A 100Mbps CSMA/CD Ethernet local area network (LAN) that works on Category 5 twisted-pair wiring. 100BASE-T Ethernet LANs work on a "star" configuration in which the wire from each workstation routes directly to a central 100BASE-T hub. This is the current standard for 100Mbps Ethernet, replacing 100BASE-VG.

100BASE-VG The joint Hewlett-Packard–AT&T proposal for Fast Ethernet running at 100Mbps. It uses four pairs of Category 5 cable using the 10BASE-T twisted-pair wiring scheme to transmit or receive. 100BASE-VG splits the signal across the four wire pairs at 25MHz each. This standard has not found favor with corporations and has been almost totally replaced by 100BASE-T.

286 See *80286*.

386 See *80386DX*.

404 Website error code indicating the specified page is not found. Some websites display a customized error message instead of the standard 404 code.

486 See *80486DX*.

586 A generic term used to refer to fifth-generation processors similar to the Intel Pentium, such as the AMD K6 series and the VIA Cyrix MII.

640KB barrier The limit imposed by the PC-compatible memory model using DOS mode. DOS programs can address only 1MB total memory, and PC compatibility generally requires the top 384KB to be reserved for the system, leaving only the lower 640KB for DOS or other real-mode applications.

802.11 The family name for various wireless Ethernet standards. See also *IEEE 802.11 family*.

1000BASE-T A 1,000Mbps Ethernet local area network (LAN) that runs over four pairs of Category 5 cable. Popularly known as Gigabit Ethernet, 1000BASE-T can be used as an upgrade to a properly wired 100BASE-T network because the same cable and distance limitations (100 meters) apply.

1394 See *FireWire*.

8086 An Intel microprocessor with 16-bit registers, a 16-bit data bus, and a 20-bit address bus. This processor can operate only in real mode.

8087 An Intel math coprocessor designed to perform floating-point math with much greater speed and precision than the main CPU. The 8087 can be installed in most 8086- and 8088-based systems and adds more than 50 new instructions to those available in the primary CPU alone.

8088 An Intel microprocessor with 16-bit registers, an 8-bit data bus, and a 20-bit address bus. This processor can operate only in real mode and was designed as a low-cost version of the 8086.

8514/A An analog video display adapter from IBM for the PS/2 line of personal computers. Compared to previous display adapters, such as EGA and VGA, it provides a high resolution of 1,024×768 pixels with as many as 256 colors or 64 shades of gray. It provides a video coprocessor that performs two-dimensional graphics functions internally, thus relieving the CPU of graphics tasks. It uses an interlaced monitor and scans every other line every time the screen is refreshed.

80286 An Intel microprocessor with 16-bit registers, a 16-bit data bus, and a 24-bit address bus. It can operate in both real and protected virtual modes.

80287 An Intel math coprocessor designed to perform floating-point math with much greater speed and precision than the main CPU. The 80287 can be installed in most 286- and some 386DX-based systems, and it adds more than 50 new instructions to what is available in the primary CPU alone.

80386 See *80386DX*.

80386DX An Intel microprocessor with 32-bit registers, a 32-bit data bus, and a 32-bit address bus. This processor can operate in real, protected virtual, and virtual real modes.

80386SX An Intel microprocessor with 32-bit registers, a 16-bit data bus, and a 24-bit address bus. This processor, designed as a low-cost version of the 386DX, can operate in real, protected virtual, and virtual real modes.

80387DX An Intel math coprocessor designed to perform floating-point math with much greater speed and precision than the main CPU. The 80387DX can be installed in most 386DX-based systems and adds more than 50 new instructions to those available in the primary CPU alone.

80387SX An Intel math coprocessor designed to perform floating-point math with much greater speed and precision than the main CPU. The 80387SX can be installed in most 386SX-based systems and adds more than 50 new instructions to those available in the primary CPU alone.

80486 See *80486DX*.

80486DX An Intel microprocessor with 32-bit registers, a 32-bit data bus, and a 32-bit address bus. The 486DX has a built-in cache controller with 8KB of cache memory as well as a built-in math coprocessor equivalent to a 387DX. The 486DX can operate in real, protected virtual, and virtual real modes.

80486DX2 A version of the 486DX with an internal clock-doubling circuit that causes the chip to run at twice the motherboard clock speed. If the motherboard clock is 33MHz, the DX2 chip will run at 66MHz. The DX2 designation applies to chips sold through the OEM market, whereas a retail version of the DX2 sold by Intel and designed for use as an upgrade was sold as an Overdrive processor.

80486DX4 A version of the 486DX with an internal clock-tripling circuit that causes the chip to run at three times the motherboard clock speed. If the motherboard clock is 33.33MHz, the DX4 chip will run at 100MHz.

80486SX An Intel microprocessor with 32-bit registers, a 32-bit data bus, and a 32-bit address bus. The 486SX is the same as the 486DX, except that it lacks the built-in math coprocessor function and was designed as a low-cost version of the 486DX. The 486SX can operate in real, protected virtual, and virtual real modes.

80487SX An Intel microprocessor with 32-bit registers, a 32-bit data bus, and a 32-bit address bus. Although the name implies that the 80487SX adds floating-point math capabilities, in reality the 487SX is the same as the 486DX, except that it uses a modified pinout and must be installed in a special 80487SX socket. When installed, the 80487SX replaces the 80486SX for all processing tasks. The 487SX can operate in real, protected virtual, and virtual real modes.

A+ Refers to the CompTIA A+ Certification, a vendor-neutral certification for computer hardware technicians. A+ Certification exams test knowledge of basic hardware and software skills. The A+ Certification can be used as part of the exam requirements for the Microsoft Certified System Administrator (MCSA) credential.

abend Short for *abnormal end*. A condition that occurs when the execution of a program or task is terminated unexpectedly because of a bug or crash.

absolute address An explicit identification of a memory location, device, or location within a device.

AC (alternating current) The frequency is measured in cycles per seconds (cps) or hertz (Hz). The standard value running through the wall outlet is 120 volts at 60Hz through a fuse or circuit breaker that usually can handle about 15 or 20 amps.

accelerated graphics port See *AGP*.

Accelerated Hub Architecture (AHA) An Intel technology used on its 800-series chipsets to transfer data between the memory controller hub (MCH), which is equivalent to the North Bridge, and the input/output controller hub (ICH), which is equivalent to the South Bridge. AHA transfers data at 266MBps, twice the speed of the PCI bus previously used.

accelerator board An add-in board replacing the computer's CPU with circuitry that enables the system to run more quickly. See also *graphics accelerator*.

access light The LED on the front of a drive or other device (or on the front panel of the system) that indicates the computer is reading or writing data on the device.

access mechanism See *actuator*.

access time The time that elapses from the instant information is requested to the point that delivery is completed. It's usually described in nanoseconds (ns) for memory chips and in milliseconds (ms) for disk drives. Most manufacturers rate average access time on a hard disk as the time required for a seek across one third of the total number of cylinders plus one-half the time for a single revolution of the disk platters (latency).

accumulator A register (temporary storage) in which the result of an operation is formed.

acoustic coupler A device used to connect a computer modem to a phone line by connecting to the handset of a standard AT&T-style phone. The audible sounds to and from the modem are transmitted to the handset through the coupler while the handset is resting in the coupler. Although often thought of as obsolete, an acoustic coupler can be used to ensure the availability of a modem connection when traveling and access to an RJ-11 jack is unavailable.

ACPI (Advanced Configuration and Power Interface) A standard developed by Intel, Microsoft, and Toshiba that is designed to implement power management functions in the operating system. ACPI is a replacement for APM. See also *APM*.

ACR Short for Advanced Communication Riser, this is an alternative to CNR advocated by the ACR Special Interest Group (www.acrsig.org). ACR, like CNR, is designed to allow motherboard designers to add low-cost network capabilities to motherboards but uses the same PCI connector used by PCI expansion cards.

Acrobat Refers to the Adobe Acrobat program for creating and reading cross-platform documents created in Adobe's Portable Document Format (PDF) file format. Many computer and component manuals are available online in Acrobat format. The Acrobat Reader can be downloaded free from Adobe's website.

active heatsink A heatsink that includes a fan. It's commonly used to cool processors and North Bridge/Memory Controller Hub chips.

active high Designates a digital signal that must go to a high value to be true. Synonymous with positive.

active low Designates a digital signal that must go to a low value to be true. Synonymous with negative.

active matrix A type of LCD screen that contains at least one transistor for every pixel on the screen. Color active matrix screens use three transistors for each pixel—one each for the red, green, and blue dots. The transistors are arranged on a grid of conductive material, with each connected to a horizontal and a vertical member. See also *TFT*.

active partition Any partition marked as bootable in the partition table. See also *boot manager*.

actuator The device that moves a disk drive's read/write heads across the platter surfaces. Also known as an access mechanism.

adapter The device that serves as an interface between the system unit and the devices attached to it. It's often synonymous with a circuit board, circuit card, or card, but it also can refer to a connector or cable adapter that changes one type of connector to another.

adapter description files (ADF) Refers to the setup and configuration files and drivers necessary to install an adapter card, such as a network adapter card. Primarily used with Micro Channel Architecture (MCA) bus cards.

add-in board See *expansion card*.

address Refers to where a particular piece of data or other information is found in the computer. Also can refer to the location of a set of instructions.

address bus One or more electrical conductors used to carry the binary-coded address from the microprocessor throughout the rest of the system.

ADSL (asymmetric digital subscriber line) A high-speed transmission technology originally developed by Bellcore and now standardized by ANSI as T1.413. ADSL uses existing UTP copper

wires to communicate digitally at high speed between the telephone company central office (CO) and the subscriber. ADSL sends information asymmetrically, meaning it is faster one way than the other. The original ADSL speed was T-1 (1.536Mbps) downstream from the carrier to the subscriber's premises and 16Kbps upstream. However, ADSL is available in a variety of configurations and speeds. See also *DSL*.

Advanced Encryption Standard (AES) A 128-bit block data encryption standard often used to encrypt traffic in secure wireless networks.

AdvancedTCA Advanced Telecom Computing Architecture is a new series of standards for telecom processor blades and chassis. It is also known as the PICMG 3.0 specification. See also *PICMG*.

AGP (accelerated graphics port) Developed by Intel, AGP is a fast, dedicated interface between the video adapter or chipset and the motherboard chipset North Bridge. AGP is 32 bits wide; runs at 66MHz base speed; and can transfer 1, 2, 4, or 8 bits per cycle (1x, 2x, 4x, or 8x modes) for a throughput of up to 2132MBps. AGP has been replaced by PCI Express in newer systems.

aliasing Undesirable visual effects (sometimes called *artifacts*) in computer-generated images caused by inadequate sampling techniques. The most common effect is jagged edges along diagonal or curved object boundaries. See also *antialiasing*.

allocation unit See *cluster*.

alphanumeric characters A character set that contains only letters (A–Z) and digits (0–9). Other characters, such as punctuation marks, also might be allowed.

AMD Short for Advanced Micro Devices, the number-two PC processor maker. AMD makes the popular K6, Athlon, Opteron, and Duron series of processors, as well as chipsets and flash memory devices.

AMD64 AMD-developed 64-bit extensions to the standard IA-32 system architecture (originally known as x86-64). Supported by AMD Opteron, Athlon 64, and other AMD 64-bit processors.

ampere The basic unit for measuring electrical current. Also called *amp*.

ampere hour (Ah) A current of one ampere flowing for one hour. Often used to indicate the storage capacity of a rechargeable battery.

AMR Short for *Audio/Modem Riser*, AMR is an Intel-developed specification for packaging modem I/O ports and a codec chip into a small card that can be installed into an AMR slot on a motherboard. Although many motherboards have AMR slots, AMR risers have not been popular, and the CNR specification has largely replaced AMR. See also *CNR*.

analog The representation of numerical values by physical variables such as voltage, current, and so on; continuously variable quantities whose values correspond to the quantitative magnitude of the variables.

analog loopback A modem self-test in which data from the keyboard is sent to the modem's transmitter, modulated into analog form, looped back to the receiver, demodulated into digital form, and returned to the screen for verification.

analog signals Continuously variable signals. Analog circuits are more subject to distortion and noise than are digital circuits but are capable of handling complex signals with relatively simple circuitry. See also *digital signals*.

analog-to-digital converter An electronic device that converts analog signals to digital form.

AND A logic operator having the property that if P is a statement, Q is a statement, and R is a statement, then the AND of P, Q, R is true if all statements are true and is false if any statement is false.

AND gate A logic gate in which the output is 1 only if all inputs are 1.

animation The process of displaying a sequential series of still images to achieve a motion effect.

ANSI (American National Standards Institute) A nongovernmental organization founded in 1918 to propose, modify, approve, and publish data-processing standards for voluntary use in the United States. It's also the U.S. representative to the International Standards Organization (ISO) in Paris and the International Electrotechnical Commission (IEC). Contact ANSI at 1430 Broadway, New York, NY 10018.

answer mode A state in which the modem transmits at the predefined high frequency of the communications channel and receives at the low frequency. The transmit/receive frequencies are the reverse of the calling modem, which is in originate mode. See also *originate mode*.

antialiasing Software adjustment to make diagonal or curved lines appear smooth and continuous in computer-generated images. See also *aliasing*.

antistatic mat A pad that's set next to a computer upon which components are placed while the system is being serviced to prevent static damage. Also can refer to a larger-sized mat below an entire computer desk and chair to discharge static from a user before he touches the computer.

antivirus Software that prevents files containing viruses from running on a computer, or software that detects, repairs, cleans, or removes virus-infected files.

APA (all points addressable) A mode in which all points of a displayable image can be controlled by the user or a program.

aperture grille A type of shadow mask used in CRTs. The most common is used in Sony's Trinitron monitors, which use vertical phosphor stripes and vertical slots in the mask, compared to the traditional shadow mask that uses phosphor dots and round holes in the mask. See also *shadow mask*.

API (application programming interface) A system call (routine) that gives programmers access to the services provided by the operating system. In IBM-compatible systems, the ROM BIOS and DOS together present an API that a programmer can use to control the system hardware.

APM (Advanced Power Management) A specification sponsored by Intel and Microsoft originally proposed to extend the life of batteries in battery-powered computers. It is now used in desktop computers as well. APM enables application programs, the system BIOS, and the hardware to work together to reduce power consumption. An APM-compliant BIOS provides built-in power-management services to the operating system. The application software communicates power-saving data via predefined APM interfaces. Replaced in newer systems by ACPI. See also *ACPI*.

application End-user-oriented software, such as a word processor, spreadsheet, database, graphics editor, game, or web browser.

Application Layer See *OSI*.

arbitration A method by which multiple devices attached to a single bus can bid or arbitrate to get control of that bus.

archive bit The bit in a file's attribute byte that sets the archive attribute. Tells whether the file has been changed since it last was backed up.

archive file A collection of files that has been stored (often in a compressed format) within a single file. Zip and CAB files are the most common types of archive file formats used with Windows-based PCs. See also *Zip file* and *CAB file*.

archive medium A storage medium (floppy disk, tape cartridge, or removable cartridge) to hold files that need not be accessible instantly.

ARCnet (Attached Resource Computer Network) A baseband, token-passing LAN technology offering a flexible bus/star topology for connecting personal computers. Operating at 2.5Mbps, it is one of the oldest LAN systems and was popular in low-cost networks. It was originally developed by John Murphy of Datapoint Corporation. Although ARCnet (www.arcnet.com) is no longer used for office networking, it is still a popular choice for networking embedded systems, such as heating and air conditioning systems.

areal density A calculation of the bit density (bits per inch, or BPI) multiplied by the track density (tracks per inch, or TPI), which results in a figure indicating how many bits per square inch are present on the disk surface.

arithmetic logic unit (ALU) The portion of a processor where arithmetic and logical operations are performed.

ARQ (automatic repeat request) A general term for error-control protocols that feature error detection and automatic retransmission of defective blocks of data.

ASCII (American Standard Code for Information Interchange) A standard 7-bit code created in 1965 by Robert W. Bemer to achieve compatibility among various types of data

processing equipment. The standard ASCII character set consists of 128 decimal numbers ranging from 0 to 127, which are assigned to letters, numbers, punctuation marks, and the most common special characters. In 1981, IBM introduced the extended ASCII character set with the IBM PC, extending the code to 8 bits and adding characters from 128 to 255 to represent additional special mathematical, graphics, and foreign characters.

ASCII character A 1-byte character from the ASCII character set, including alphabetic and numeric characters, punctuation symbols, and various graphics characters.

ASME (American Society of Mechanical Engineers; www.asme.org) ASME International has nearly 600 codes and standards in print, and its many committees involve more than 3,000 individuals, mostly engineers but not necessarily members of the society. The standards are used in more than 90 countries throughout the world.

aspect ratio The measurement of a film or television viewing area in terms of relative height and width. The aspect ratio of most modern motion pictures varies from 5:3 to as large as 16:9, which creates a problem when a wide-format motion picture is transferred to the more square-shaped television screen or monitor, with its aspect ratio of 4:3. See also *letterbox*.

assemble The act of translating a program expressed in an assembler language into a computer machine language.

assembler language A computer-oriented language whose instructions are usually in one-to-one correspondence with machine language instructions.

asymmetrical modulation A duplex transmission technique that splits the communications channel into one high-speed channel and one slower channel. During a call under asymmetrical modulation, the modem with the greater amount of data to transmit is allocated the high-speed channel. The modem with less data is allocated the slow, or back, channel. The modems dynamically reverse the channels during a call if the volume of data transfer changes.

asynchronous communication Data transmission in which the length of time between transmitted characters can vary. Timing depends on the actual time for the transfer to take place, as opposed to synchronous communication, which is timed rigidly by an external clock signal. Because the receiving modem must be signaled about when the data bits of a character begin and end, start and stop bits are added to each character. See also *synchronous communication*.

asynchronous memory Memory that runs using a timing or clock rate different from (usually slower than) the motherboard speed.

AT clock Refers to the Motorola 146818 real-time clock (RTC) and CMOS RAM chip, which first debuted in the IBM AT and whose function has been present in all PC-compatible systems since. Keeps track of the time of day and makes this data available to the operating system or other software.

ATA (AT Attachment Interface) An IDE disk interface standard introduced in March 1989 that defines a compatible register set, a 40-pin connector, and its associated signals. ATA standards are developed and published by Technical Committee T13 (www.t13.org). ATA has evolved over time, resulting in a number of standards, the latest of which is in development as ATA8. See also *IDE, ATAPI* and *SATA*.

ATAPI (AT Attachment Packet Interface) A specification that defines device-side characteristics for an IDE-connected peripheral, such as a CD-ROM or tape drive. ATAPI is essentially an adaptation of the SCSI command set to the IDE interface. ATA-4 and newer ATA standards include ATAPI.

Athlon An AMD sixth-generation processor family roughly comparable to the Intel Pentium III and Pentium 4. Later models (beginning with the Thunderbird core) include on-die L2 cache running at full core speed. It includes MMX and AMD 3DNow! instructions for multimedia performance. Originally available in a Slot-A cartridge package, all Athlons are now available only in the Socket-A (462-pin) package. The Mobile Athlon XP, which replaced the Athlon 4, is designed for mobile applications, the Athlon MP is designed for workstation/server multiprocessor configurations, and

the Athlon XP is designed mainly for single processor applications. All three use the improved Thoroughbred core and 3DNow! Professional multimedia extensions. The Athlon XP processors include AMD's new QuantiSpeed design for faster internal operation and are rated by their performances relative to the Intel Pentium 4, rather than by their clock speeds. For example, the Athlon XP 2600+, which performs comparably to the Pentium 4 2.6GHz processor, runs at a clock speed of about 2.1GHz.

Athlon 64 An AMD processor (code-named Clawhammer) that includes the standard 32-bit x86 instruction set as well as 64-bit extensions. It uses a new ball grid array socket called Socket 754; an integrated DDR memory controller (instead of using the North Bridge for memory connections); an improved version of the AMD-developed HyperTransport connection to AGP, PCI, and other components; and an improved heatsink-mounting solution. It supports MMX and AMD 3DNow! Instructions for multimedia and uses a performance-rating system similar to that used by 32-bit Athlon processors. See also *Athlon*. See also *Socket 754*.

Athlon 64 FX An AMD processor based on the Athlon 64, but offering an integrated dual-channel memory controller, faster clock speeds, and a 1MB memory cache in all models. Initial versions used Socket 940, but later models use Socket 939, AM2 and F. See also *Socket 939, Socket AM2, Socket F* and *Socket 940*.

Athlon 64 X2 A dual-core version of the AMD Athlon 64 processor that features separate L2 memory caches for each core and an integrated crossbar memory switch for fast transfer of information between each core. This processor uses Socket 939 and AM2. See also *Socket 939*.

ATM (asynchronous transfer mode) A high-bandwidth, low-delay, packet-like switching and multiplexing technique. Usable capacity is segmented into fixed-size cells consisting of header and information fields, allocated to services on demand.

attribute byte A byte of information, held in the directory entry of any file or folder, that describes various attributes of the file or folder, such as whether it is read-only or has been backed up since it last was changed. Attributes can be set by the DOS `ATTRIB` command or with Windows Explorer.

ATX A motherboard and power supply form factor standard designed by Intel in 1995. It is characterized by a double row of rear external I/O connectors on the motherboard, a single keyed power supply connector, memory and processor locations that are designed not to interfere with the installation of adapter cards, and an improved cooling flow. The current specification—ATX 2.0—was introduced in December 1996.

audio A signal that can be heard, such as through the speaker of the PC. Many PC diagnostic tests use both visual (onscreen) codes and audio signals.

audio frequencies Frequencies that can be heard by the human ear (approximately 20Hz–20,000Hz).

auto-answer A setting in modems enabling them to answer incoming calls over the phone lines automatically.

auto-dial A feature in modems enabling them to dial phone numbers without human intervention.

auto-disconnect A modem feature that enables a modem to hang up the telephone line when the modem at the other end hangs up.

auto-redial A modem or software feature that automatically redials the last number dialed if the number is busy or does not answer.

`AUTOEXEC.BAT` A special batch file DOS and Windows 9x execute at startup. Contains any number of DOS commands that are executed automatically, including the capability to start programs at startup. See also *batch file*.

autoloader A tape or Iomega REV–based drive that contains multiple media cartridges and a mechanism for removing and inserting cartridges as each cartridge is filled.

automatic head parking Disk drive head parking performed whenever the drive is powered off. Found in all modern hard disk drives with a voice-coil actuator.

available memory Memory currently not in use by the operating system, drivers, or applications, which can be used to load additional software.

average access time The average time it takes a disk drive to begin reading any data placed anywhere on the drive. This includes the average seek time, which is when the heads are moved, as well as the latency, which is the average amount of time required for any given data sector to pass underneath the heads. Together, these factors make up the average access time. See also *average seek time* and *latency*.

average latency The average time required for any byte of data stored on a disk to rotate under the disk drive's read/write head. Equal to one-half the time required for a single rotation of a platter.

average seek time The average amount of time it takes to move the heads from one random cylinder location to another, usually including any head settling time. In many cases, the average seek time is defined as the seek time across one-third of the total number of cylinders.

AVI (audio video interleave) A storage technique developed by Microsoft for its Video for Windows product that combines audio and video into a single frame or track, saving valuable disk space and keeping audio in synchronization with the corresponding video. AVI files are widely supported by media players and video production programs.

AWG American Wire Gauge, a U.S. standard for measuring the thickness of copper and aluminum wire for electrical and data-transmission use. Thinner wire is used to save space and for short distances, but thicker wire has less resistance and is better for long wire runs.

B Channel The bearer channel in an ISDN network. It's used to carry data at a rate of 64KBps. See also *BRI*.

backbone The portion of the Internet or wide area network (WAN) transmission wiring that connects the main Internet/WAN servers and routers and is responsible for carrying the bulk of the Internet/WAN data.

backplane A rarely used motherboard design in which the components typically found on a motherboard are instead located on an expansion adapter card plugged into a slot. In these systems, the board with the slots is the backplane. The PCI Industrial Computer Manufacturers Group (PICMG) single-board computer designs for rackmount systems are the primary users of backplane designs today.

backup The process of duplicating a file or library onto a separate piece of media. It's good insurance against the loss of an original. Depending on how the backup was made, the data might need to be restored with a special program before reuse.

backup disk Contains information copied from another disk. Used to ensure that original information is not destroyed or altered.

backward compatibility The design of software and hardware to work with previous versions of the same software or hardware.

bad sector A disk sector that can't hold data reliably because of a media flaw or damaged format markings.

bad track table A label affixed to the casing of an ST412/506 or ESDI hard disk drive that tells which tracks are flawed and incapable of holding data. The listing is entered into the low-level formatting program. Modern ATA (IDE) and SCSI drives are low-level formatted during manufacture and don't have (or need) a bad track table.

balanced signal Refers to signals consisting of equal currents moving in opposite directions. When balanced or nearly balanced signals pass through twisted-pair lines, the electromagnetic interference effects—such as crosstalk caused by the two opposite currents—largely cancel each other out. Differential signaling (used by some types of SCSI interfaces) is a method that uses balanced signals.

balun Short for *balanced/unbalanced*. A type of transformer that enables balanced cables to be joined with unbalanced cables. Twisted-pair (balanced) cables, for example, can be joined with coaxial (unbalanced) cables if the proper balun transformer is used.

bandwidth 1) Generally, the measure of the range of frequencies within a radiation band required to transmit a particular signal. The difference between the lowest and highest signal frequencies. The bandwidth of a computer monitor is a measure of the rate at which a monitor can handle information from the display adapter. The wider the bandwidth, the more information the monitor can carry and the greater the resolution. 2) to describe the data-carrying capacity of a given communications circuit or pathway. The bandwidth of a circuit is a measure of the rate at which information can be passed.

bank The collection of memory chips or modules that make up a block of memory readable or writeable by the processor in a single cycle. This block, therefore, must be as large as the data bus of the particular microprocessor. In PC systems, the processor data bus (and therefore the bank size) is usually 8, 16, 32, or 64 bits wide. Optionally, some systems also incorporate an additional parity or ECC bit for each 8 data bits, resulting in a total of 9, 18, 36, or 72 bits (respectively) for each bank. Memory in a PC always must be added or removed in full-bank increments. The number of memory chips or modules that make up a bank varies with the width of the memory in bits and the size of the processor's data bus. For example, a K6-2 processor has a data bus that is 64 bits wide. If the motherboard uses 72-pin SIMMs (which are 32 data bits wide), a bank is two SIMMs. However, if the motherboard uses DIMMs, which are 64 data bits wide, a bank is one DIMM.

bar code The code used on consumer products and inventory parts for identification purposes. Consists of bars of varying thickness that represent characters and numerals that are read with an optical reader. The most common version is called the universal product code (UPC).

base-2 Refers to the computer numbering system that consists of two numerals: 0 and 1. Also called *binary*.

base address Starting location for a consecutive string of memory or I/O addresses/ports.

base memory The amount of memory available to the operating system or application programs within the first megabyte, accessible in the processor's real mode.

base pointer (BP/EBP/RPB) A 16/32/64-bit Intel architecture processor register pointing to data in a stack segment.

baseband transmission The transmission of digital signals over a limited distance. ARCnet and Ethernet local area networks use baseband signaling. Contrasts with broadband transmission, which refers to the transmission of analog signals over a greater distance.

BASIC (Beginner's All-purpose Symbolic Instruction Code) A popular computer programming language originally developed by John Kemeny and Thomas Kurtz in the mid-1960s at Dartmouth College. Normally, BASIC is an interpretive language, meaning that each statement is translated and executed as it is encountered, but it can be a compiled language, in which all the program statements are compiled before execution. Microsoft Visual Basic, a popular development environment for Windows, is not related to BASIC.

batch file A set of commands stored in a disk file for execution by the operating system. A special batch file called `AUTOEXEC.BAT` is executed by DOS each time the system is started. All DOS and Windows batch files have a `.BAT` file extension.

baud A unit of signaling speed denoting the number of discrete signal elements that can be transmitted per second. The word *baud* is derived from the name of J.M.E. Baudot (1845–1903), a French pioneer in the field of printing telegraphy and the inventor of Baudot code. Although technically inaccurate, baud rate commonly is used to mean bit rate. Because each signal element or baud can translate into many individual bits, bits per second (bps) usually differs from baud rate. A rate of 2,400 baud means that 2,400 frequency or signal changes per second are being sent, but each frequency change can signal several bits of information. For example, 33.6Kbps modems actually transmit at only 2,400 baud.

Baudot code A 5-bit code used in many types of data communications, including teletype (TTY), radio teletype (RTTY), and telecommunications devices for the deaf (TDD). Baudot code has been revised and extended several times. See also *baud*.

bay An opening in a computer case or chassis that holds disk drives.

BBS (bulletin board system) A computer that operates with a program and a modem to enable other computers with modems to communicate with it, often on a round-the-clock basis. Although BBSs were once the primary means of distributing information and software, the Internet has almost completely replaced BBSs.

benchmark A test or set of tests designed to compare the performance of hardware or software. A popular set of benchmarks for PC hardware are the SYSmark, MobileMark and WebMark series, available from BAPCO (Business Applications Performance Corporation—www.bapco.com).

bezel A cosmetic panel that covers the face of a drive or some other device.

Bézier curve A mathematical method for describing a curve, often used in illustration and CAD programs to draw complex shapes.

BGA (ball grid array) A packaging technology used by Socket 478 Pentium 4 and Celeron processors, as well as many recent motherboard chipsets and video card memory chips. BGA uses small solder balls instead of pin connectors to enable more signaling paths to exist in a smaller space and improve signal accuracy.

bidirectional 1) Refers to lines over which data can move in two directions, such as a data bus or telephone line. 2) Refers to the capability of a printer to print from right to left and from left to right alternately.

binary See *base-2*.

BIOS (basic input/output system) The part of an operating system that handles the communications between the computer and its peripherals. The BIOS is often burned into read-only memory (ROM) chips or rewritable flash (EEPROM) memory chips found on motherboards and expansion cards, such as video cards and SCSI and ATA/IDE host adapters. See also *firmware*.

bipolar A category of semiconductor circuit design that was used to create the first transistor and the first integrated circuit. Bipolar and CMOS are the two major transistor technologies. Almost all personal computers use CMOS technology chips. CMOS uses far less energy than bipolar.

bisynchronous (binary synchronous control) An earlier protocol developed by IBM for software applications and communicating devices operating in synchronous environments. The protocol defines operations at the link level of communications—for example, the format of data frames exchanged between modems over a phone line.

bit binary digit Represented logically by 0 or 1 and electrically by 0 volts and (typically) 5 volts. Other methods are used to represent binary digits physically (tones, different voltages, lights, and so on), but the logic is always the same.

bit density Expressed as bits per inch (bpi). Defines how many bits can be written onto one linear inch of a track. Sometimes also called *linear density*.

bit depth The number of bits used to describe the color of each pixel on a computer display. For example, a bit depth of two (2^2) means the monitor can display only black and white pixels; a bit depth of four (2^4) means the monitor can display 16 different colors; a bit depth of eight (2^8) allows for 256 colors; and so on.

bitmap A method of storing graphics information in memory, in which a bit devoted to each pixel (picture element) onscreen indicates whether that pixel is on or off. A bitmap contains a bit for each point or dot on a video display screen and enables fine resolution because any point or pixel onscreen can be addressed. A greater number of bits can be used to describe each pixel's color, intensity, and other display characteristics.

blade server A thin circuit board that contains processors, memory, and (often) storage and plugs into a special rack-mounted chassis. Multiple-blade servers can occupy a single chassis.

BladeCenter A blade server design developed by IBM that might become the basis for a de facto blade architecture standard.

blank or blanking interval A period in which no video signal is received by a monitor while the videodisc or digital video player searches for the next video segment or frame to display.

block A string of records, words, or characters formed for technical or logic reasons and to be treated as an entity.

block diagram The logical structure or layout of a system in graphics form. Does not necessarily match the physical layout and does not specify all the components and their interconnections.

Blu-ray Disc (BD) One of the two competing high-definition DVD format standards. Also see *High Density Digital Versatile Disc (HD-DVD)*.

Blue Book The standard for enhanced CDs (CD-E). CD-E media contains both music (for play on standard CD players) and computer content. Developed by Philips and Sony in 1995.

blue screen of death A system crash in Windows that replaces the normal desktop with a blue screen with white text reporting the problem and locks up the system. Also referred to as a BSOD, this condition can be triggered by defective memory, file system errors, and other system problems.

Bluetooth An emerging short-range networking standard, Bluetooth is designed to enable PCs, mobile phones, input devices, and PDAs to exchange data with each other. Bluetooth uses the same 2.4GHz frequency range used by some types of wireless phones and by the IEEE 802.11b Wi-Fi wireless Ethernet network. Bluetooth has a speed of 1Mbps or 2Mbps, depending on the version.

BMP A Windows graphics format that can be device dependent or independent. Device-independent BMP files (DIB) are coded for translation to a wide variety of displays and printers.

BNC (Bayonet-Neill-Concelman) Also known as British-Naval-Connector, Baby-N-Connector, or Bayonet-Nut-Coupler, this bayonet-locking connector is noted for its excellent shielding and impedance-matching characteristics, resulting in low noise and minimal signal loss at any frequency up to 4GHz. It is used in Ethernet 10BASE-2 networks (also known as *IEEE 802.3* or *Thinnet*) to terminate coaxial cables. It is also used for some high-end video monitors. BNC is named for its connection type (bayonet) and its co-developers.

bonding In ISDN, joining two 64Kbps B-channels to achieve 128Kbps speed. Bonding can also be used with analog modems that use the Multilink Point-to-Point protocol, which is supported by Windows 98 and newer versions but by only a few ISPs.

Boolean operation Any operation in which each of the operands and the result take one of two values. A Boolean search can be performed with many search engines used on websites and help files using operators such as AND, OR, and NOT.

boot To load a program into the computer. The term comes from the phrase "pulling a boot on by the bootstrap."

boot manager A program that enables you to select which active partition to boot from. Often supplied with aftermarket disk-partitioning programs, such as PartitionMagic, or installed by default when you install a Windows upgrade into a separate disk partition instead of replacing your old version. See also *active partition*.

boot record The first sector on a disk or partition that contains disk parameter information for the BIOS and operating system as well as bootstrap loader code that instructs the system how to load the operating system files into memory, thus beginning the initial boot sequence to boot the machine.

boot sector See *boot record*.

boot sector virus A virus designed to occupy the boot sector of a disk. Any attempt to start or boot a system from this disk transfers the virus to the hard disk, after which it subsequently is loaded every time the system is started. Many older PC viruses, particularly those spread by infected floppy disks, are boot sector viruses.

bootstrap A technique or device designed to bring itself into a desired state by means of its own action. The term is used to describe the process by which a device such as a PC goes from its initial power-on condition to a running condition without human intervention. See also *boot*.

boule Purified, cylindrical silicon crystals from which semiconducting electronic chips, including microprocessors, memory, and other chips, in a PC are manufactured. Also called an *ingot*.

bps (bits per second) The number of binary digits, or bits, transmitted per second. Sometimes confused with baud.

branch prediction A feature of fifth-generation (Pentium and higher) processors that attempts to predict whether a program branch will be taken and then fetches the appropriate following instructions.

BRI Short for *basic rate interface*, it's a form of ISDN used in home and small business applications. A 2B+1D BRI service has two B channels and a single D channel for signaling and control uses.

bridge In local area networks, an interconnection between two similar networks. Also the hardware equipment used to establish such an interconnection.

broadband transmission A term used to describe analog transmission. Requires modems for connecting terminals and computers to the network. Using frequency division multiplexing, many signals or sets of data can be transmitted simultaneously. The alternative transmission scheme is baseband, or digital, transmission.

brownout An AC supply voltage drop in which the power does not shut off entirely but continues to be supplied at lower-than-normal levels.

BSOD See *blue screen of death*.

BTX Short for *Balanced Technology Extended*, this is a PC and server architecture introduced by Intel in September 2003. BTX is designed to improve internal cooling by placing memory and processors in line with cooling fans.

bubble memory A special type of nonvolatile read/write memory introduced by Intel in which magnetic regions are suspended in crystal film and data is maintained when the power is off. A typical bubble memory chip contains about 512KB, or more than four million bubbles. Bubble memory failed to catch on because of slow access times measured in several milliseconds. It has, however, found a niche use as solid-state "disk" emulators in environments in which conventional drives are unacceptable, such as in military or factory use.

buffer A block of memory used as a holding tank to store data temporarily. Often positioned between a slower peripheral device and the faster computer. All data moving between the peripheral and the computer passes through the buffer. A buffer enables the data to be read from or written to the peripheral in larger chunks, which improves performance. A buffer that is *x* bytes in size usually holds the last *x* bytes of data that moved between the peripheral and CPU. This method contrasts with that of a cache, which adds intelligence to the buffer so that the most often accessed data, rather than the last accessed data, remains in the buffer (cache). A cache can improve performance greatly over a plain buffer.

bug An error or a defect in a program; it can be corrected through program patches (for applications or operating systems) or firmware updates (for BIOS chips).

burn-in The operation of a circuit or equipment to establish that its components are stable and to screen out defective parts or assemblies.

BURN-Proof Short for *buffer underrun error-proof*, it's a technology developed by Sanyo to prevent buffer underruns during the creation of CD-Rs. BURN-Proof, which has been licensed to many CD-RW drive makers, enables a drive to pause the burning process and continue after sufficient data is available in the drive's buffer. The drive and CD-mastering software must both support BURN-Proof for this feature to work. Ricoh's JustLink works in a similar fashion. See also *lossless linking*.

burst mode A memory-cycling technology that takes advantage of the fact that most memory accesses are consecutive in nature. After the row and column addresses for a given access are set up, burst mode can then access the next three adjacent addresses with no additional latency.

Burst Static RAMs (BSRAMs) Short for *Pipeline Burst SRAM*, BSRAMs are a common type of static RAM chip used for memory caches where access to subsequent memory locations after the first byte is accessed takes fewer machine cycles.

bus A linear electrical signal pathway over which power, data, and other signals travel. It is capable of connecting to three or more attachments. A bus is generally considered to be distinct from radial or point-to-point signal connections. The term comes from the Latin *omnibus*, meaning "for all." When used to describe a topology, *bus* always implies a linear structure.

bus mouse An obsolete type of mouse used in the 1980s that plugs into a special mouse expansion board (occasionally incorporated into a video card) instead of a serial port or motherboard mouse port. The bus mouse connector looks similar to a motherboard mouse (sometimes called PS/2 mouse) connector, but the pin configurations are different and not compatible.

busmaster An intelligent device that, when attached to the Micro Channel, EISA, VLB, or PCI bus, can bid for and gain control of the bus to perform its specific task without processor intervention. Most recent motherboards incorporate busmastering ATA/IDE host adapters, but this feature must be enabled in both the BIOS and through the installation of Windows drivers to be effective.

byte A collection of bits that makes up a character or other designation. Generally, a byte is 8 data bits. When referring to system RAM, an additional parity (error-checking) bit is also stored (see *parity*), making the total 9 bits.

C A high-level computer programming language. A programming language frequently used on mainframes, minis, and PC computer systems. C++ is a popular variant.

C3 A Socket 370-compatible processor developed by VIA Technology from the Cyrix "Joshua" after VIA purchased Cyrix from National Semiconductor. The C3 is noted for its very small die size and cool operation, making it a suitable choice for portable computers and embedded computers.

CAB file Short for *cabinet file*, this is the archive file type used by Microsoft to distribute recent versions of Windows and applications. Newer versions of WinZip and 7-Zip can be used to manually extract files from a CAB file; you can also open CAB files within Windows Explorer with Windows 98 after you install the Windows 98 Plus! package and with Windows Explorer in Windows 2000 and later.

cable modem A broadband Internet device that receives data through the cable TV system. The cable modem can be a one-way device (using a conventional analog modem for dialing and uploading) or a two-way device.

CableLabs Certified Cable Modem A cable modem that meets the Data or Cable Service Interface Specifications (DOCSIS) standards for modulation and protocols. Various brands and models of modems meet this standard on cable networks that also meet this standard. DOCSIS/CableLabs Certified Cable Modems can be purchased as well as leased.

cache An intelligent buffer. By using an intelligent algorithm, a cache contains the data accessed most often between a slower peripheral device and the faster CPU. See also *L1 cache*, *L2 cache*, and *disk cache*.

cache coherency A method of managing processor caches in multiprocessor systems to ensure that data is not lost when it is moved from cache to main memory.

caddy A cartridge designed to hold a CD or DVD disc. Some CD drives use caddies, particularly in harsh or industrial environments. DVD-RAM drives also use a caddy to protect the disc.

CAM (Common Access Method) A committee formed in 1988 that consists of several computer peripheral suppliers and is dedicated to developing standards for a common software interface between SCSI peripherals and host adapters.

candela Abbreviated *cd*, a candela is the standard unit of measurement for luminosity. The brightness of LCDs and other types of displays is sometimes measured in cd units.

capacitor A device consisting of two plates separated by insulating material and designed to store an electrical charge.

card A printed circuit board containing electronic components that form an entire circuit, usually designed to plug into a connector or slot. Sometimes also called an *adapter*.

card edge connector See *edge connector*.

CardBus A PC Card (PCMCIA) specification for a 32-bit interface that runs at 33MHz and provides 32-bit data paths to the computer's I/O and memory systems, as well as a new shielded connector that prevents CardBus devices from being inserted into slots that do not support the latest version of the PC Card (PCMCIA) standard. CardBus slots can also be used with normal 16-bit PC Card (PCMCIA) devices.

carpal tunnel syndrome A painful hand injury that gets its name from the narrow tunnel in the wrist that connects ligament and bone. When undue pressure is put on the tendons, they can

swell and compress the median nerve, which carries impulses from the brain to the hand, causing numbness, weakness, tingling, and burning in the fingers and hands. Computer users get carpal tunnel syndrome primarily from improper keyboard ergonomics that result in undue strain on the wrist and hand.

carrier A continuous frequency signal capable of being either modulated or impressed with another information-carrying signal. The reference signal used for the transmission or reception of data. The most common use of this signal with computers involves modem communications over phone lines. The carrier is used as a signal on which the information is superimposed.

carrier detect signal A modem interface signal that indicates to the attached data terminal equipment (DTE) that it is receiving a signal from the distant modem. Defined in the RS-232 specification. Same as the received line-signal detector.

CAT Short for *category*, CAT describes the ANSI/EIA 568 wiring standards used for data transmission. The most common CAT standards include CAT 3 (16Mbps maximum data rate, suitable for 10BASE-T Ethernet) and CAT 5 (used for 100BASE-T Fast Ethernet or 1000BASE-T Gigabit Ethernet).

cathode ray tube (CRT) A device that contains electrodes surrounded by a glass sphere or cylinder and displays information by creating a beam of electrons that strike a phosphor coating inside the display unit. This device is most commonly used in computer monitors and terminals.

CAV (constant angular velocity) An optical disk recording format in which the data is recorded on the disk in concentric circles. CAV disks are rotated at a constant speed. This is similar to the recording technique used on floppy disk drives. CAV limits the total recorded capacity compared to CLV (constant linear velocity), which also is used in optical recording. See also *CLV*.

CCITT An acronym for the Comité Consultatif International de Télégraphique et Téléphonique (in English, the International Telegraph and Telephone Consultative Committee or the Consultative Committee for International Telegraph and Telephone). Renamed ITU (International Telecommunications Union). See also *ITU*.

CCS (common command set) A set of SCSI commands specified in the ANSI SCSI-1 Standard X3.131-1986 Addendum 4.B. All SCSI devices must be capable of using the CCS to be fully compatible with the ANSI SCSI-1 standard.

CD (compact disc or compact audio disc) A 4.75" (12cm) optical disc that contains information encoded digitally in the constant linear velocity (CLV) format. This popular format for high-fidelity music offers 90 decibels signal/noise ratio, 74 minutes of digital sound, and no degradation of quality from playback. The standards for this format (developed by NV Philips and Sony Corporation) are known as the Red Book. The official (and rarely used) designation for the audio-only format is CD-DA (compact disc-digital audio). The simple audio format is also known as CD-A (compact disc-audio). A smaller (3") version of the CD is known as CD-3.

CD burner Refers to either a CD-R or CD-RW drive. See also *DVD burner*.

CD+G (Compact Disc+Graphics) A CD format that includes extended graphics capabilities as written into the original CD-ROM specifications. Includes limited video graphics encoded into the CD subcode area. Originally developed and marketed by Warner New Media (later Time Warner Interactive), it's a popular choice for self-contained karaoke systems.

CD-I (Compact Disc-Interactive) A compact disc format released in October 1991 that provides audio, digital data, still graphics, and motion video. The standards for this format (developed by NV Philips and Sony Corporation) are known as the Green Book. CD-I did not catch on with consumers and is now considered obsolete.

CD+MIDI (Compact Disc+Musical Instrument Digital Interface) A CD format that adds to the CD+G format digital audio, graphics information, and musical instrument digital interface (MIDI) specifications and capabilities. Originally developed and marketed by Warner New Media (later Time Warner Interactive).

CD-R (Compact Disc-Recordable, sometimes called CD-writable) CD-R discs are compact discs that can be recorded and read as many times as desired. CD-R is part of the Orange Book standard defined by ISO. CD-R technology is used for

mass production of multimedia applications. CD-R discs can be compatible with CD-ROM, CD-ROM XA, and CD audio. Orange Book specifies multisession capabilities, which enable data recording on the disc at various times in several recording sessions. Multisession capability enables data such as digital photos, digital music, or other types of data files to be added to a single disc on different occasions. The original capacity of CD-R media was 650MB (74 minutes), but most recent CD-ROM and compatible optical drives support the larger 700MB (80-minute) media.

CD-ROM (compact disc-read-only memory) A 4.75" laser-encoded optical memory storage medium with the same constant linear velocity (CLV) spiral format as audio CDs and some videodiscs. CD-ROMs can hold about 650MB of data and require more error-correction information than the standard prerecorded compact audio discs. The standards for this format (developed by NV Philips and Sony Corporation) are known as the Yellow Book. See also *CD-ROM XA*.

CD-ROM drive A device that retrieves data from a CD-ROM disc; it differs from a standard audio CD player by the incorporation of additional error-correction circuitry. CD-ROM drives usually can also play music from audio CDs.

CD-ROM XA (compact disc-read-only memory extended architecture) The XA standard was developed jointly by Sony, Philips, and Microsoft in 1988 and is now part of the Yellow Book standard. XA is a built-in feature of newer CD-ROM drives and supports simultaneous sound playback with data transfer. Non-XA drives support either sound playback or data transfer, but not both simultaneously. XA also enables data compression right on the disk, which also can increase data transfer rates.

CD-RW (compact disc-rewritable) A type of rewritable CD-ROM technology defined in Part III of the Orange Book standard that uses a different type of disc, which the drive can rewrite at least 1,000 times. CD-RW drives also can be used to write CD-R discs, and they can read CD-ROMs. CD-RWs have a lower reflectivity than standard CD-ROMs, and CD-ROM drives must be of the newer multiread variety to read them. CD-RW was initially known as *CD-E* (for CD-erasable).

CD Video A CD format introduced in 1987 that combines 20 minutes of digital audio and 6 minutes of analog video on a standard 4.75" CD. Upon introduction, many firms renamed 8" and 12" videodiscs CDV in an attempt to capitalize on the consumer popularity of the audio CD. The term fell out of use in 1990 and was replaced in some part by "laser disc" and, more recently, "DVD." See also *video-on-CD or video CD*.

CD-WO (compact disc-write once) A variant on CD-ROM that can be written to once and read many times; developed by NV Philips and Sony Corporation. Also known as CD-WORM (CD-write once/read many), CD-recordable, or CD-writable. Standards for this format are known as the Orange Book.

CD-WORM See *CD-WO*.

CDMA Short for *code division multiple access*, a popular family of wireless protocols used in cellular phones for Internet and email access.

CEB Short for *Compact Electronics Bay*, this is an SSI form factor for rack-mounted servers. See also *Server System Infrastructure (SSI)*.

Celeron A family of processors that are low-cost versions of the Pentium II, Pentium III, and Pentium 4 processors. The major differences include a smaller amount of L2 cache and lower clock speeds.

Centronics connector Refers to one of two types of cable connectors used with either parallel (36-pin edge connector) or SCSI (50-pin edge connector) devices.

ceramic substrate A thin, flat, fired-ceramic part used to hold an IC chip (usually made of beryllium oxide or aluminum oxide).

CERN (Conseil Européen pour la Recherche Nucléaire; The European Laboratory for Particle Physics) The site in Geneva where the World Wide Web was created in 1989.

CGA (color graphics adapter) A type of PC video display adapter introduced by IBM on August 12, 1981, which supports text and graphics. Text is supported at a maximum resolution of 80×25 characters in 16 colors with a character box of 8×8 pixels. Graphics are supported at a maximum

resolution of 320×200 pixels in 16 colors or 640×200 pixels in two colors. The CGA outputs a TTL (digital) signal with a horizontal scanning frequency of 15.75KHz and supports TTL color or NTSC composite displays.

channel 1) Any path along which signals can be sent. 2) In ISDN, data bandwidth is divided into two B-channels that bear data and one D-channel that carries information about the call.

character A representation—coded in binary digits—of a letter, number, or other symbol.

character set All the letters, numbers, and characters a computer can use to represent data. The ASCII standard has 256 characters, each represented by a binary number from 1 to 256. The ASCII set includes all the letters in the alphabet, numbers, most punctuation marks, some mathematical symbols, and other characters.

charge coupled device A light-sensing and storage device used in scanners and digital cameras to capture the pixels.

chassis The case used by a desktop PC or server. A server platform includes a chassis, a motherboard, processor(s), and other components.

check bit See *parity*.

checksum Short for *summation check*, a technique for determining whether a package of data is valid. The package, a string of binary digits, is added up and compared with the expected number.

chip Another name for an IC, or integrated circuit. Housed in a plastic or ceramic carrier device with pins for making electrical connections.

chip carrier A ceramic or plastic package that carries an integrated circuit.

chipkill An advanced form of ECC memory correction that can correct multiple-bit failures in a single memory module. Also known as *Advanced ECC*. See also *ECC*.

chipset A single chip or pair of chips that integrates into the clock generator, bus controller, system timer, interrupt controller, DMA controller, CMOS RAM/clock, and keyboard controller. See also *North Bridge* and *South Bridge*.

CHS (cylinder head sector) The term used to describe the nontranslating scheme used by the BIOS to access IDE drives that are less than or equal to 528MB in capacity. See also *LBA*.

CIF (common image format) The standard sample structure that represents the picture information of a single frame in digital HDTV, independent of frame rate and sync/blank structure. The uncompressed bit rate for transmitting CIF at 29.97 frames/sec is 36.45Mbps.

CIOB One of a series of I/O bridge chips used by the Broadcom ServerWorks series of server chipsets.

circuit A complete electronic path.

circuit board The collection of circuits gathered on a sheet of plastic, usually with all contacts made through a strip of pins. The circuit board usually is made by chemically etching metal-coated plastic.

CISC (complex instruction set computer) Refers to traditional computers that operate with large sets of processor instructions. Most modern computers, including the Intel 80xxx processors, are in this category. CISC processors have expanded instruction sets that are complex in nature and require several to many execution cycles to complete. This structure contrasts with RISC (reduced instruction set computer) processors, which have far fewer instructions that execute quickly.

clean room 1) A dust-free room in which certain electronic components (such as chips or hard disk drives) must be manufactured and serviced to prevent contamination. Rooms are rated by Class numbers. A Class 100 clean room must have fewer than 100 particles larger than 0.5 microns per cubic foot of space. 2) A legal approach to copying software or hardware in which one team analyzes the product and writes a detailed description, followed by a second team that reads the description written by the first and then develops a compatible version of the product. When done correctly, such a design methodology will survive a legal attack.

client/server A type of network in which every computer is either a server with a defined role of sharing resources with clients or a client that can access the resources on the server.

clock (CLK) The source of a computer's timing signals. It synchronizes every operation of the CPU.

clock multiplier A processor feature where the internal core runs at a higher speed than the motherboard or processor bus. See also *overclocking*.

clock speed A measurement of the rate at which the clock signal for a device oscillates, usually expressed in millions of cycles per second (MHz).

clone Originally referred to an IBM-compatible computer system that physically as well as electrically emulates the design of one of IBM's personal computer systems. More currently, it refers to any PC system running an Intel or compatible processor in the 80x86 family.

cluster Also called *allocation unit*. A group of one or more sectors on a disk that forms a fundamental unit of storage to the operating system. Cluster, or allocation unit, size is determined by the operating system when the disk is formatted. Larger clusters generally offer faster system performance but waste disk space.

CLV (constant linear velocity) An optical recording format in which the spacing of data is consistent throughout the disk and the rotational speed of the disk varies depending on which track is being read. Additionally, more sectors of data are placed on the outer tracks compared to the inner tracks of the disk, which is similar to zone recording on hard drives. CLV drives adjust the rotational speed to maintain a constant track velocity as the diameter of the track changes. CLV drives also rotate more quickly near the center of the disk and more slowly toward the edge. Rotational adjustment maximizes the amount of data that can be stored on a disk. CD audio and CD-ROM use CLV recording. See also *CAV*.

CMOS (complementary metal-oxide semiconductor) A type of chip design that requires little power to operate. In PCs, a battery-powered CMOS memory and clock chip is used to store and maintain the clock setting and system configuration information.

CMYK (cyan magenta yellow black) The standard four-color model used for printing.

CNR Short for *Communications and Networking Riser*, CNR was developed by Intel as a replacement for the AMR. It enables motherboard makers to offer low-cost modem, networking, and audio features through a special expansion slot. Unlike AMR, a CNR slot can be built as a shared slot with a PCI slot. See also *AMR*.

coated media Hard disk platters coated with a reddish iron-oxide medium on which data is recorded.

coaxial cable Also called *coax cable*. A data-transmission medium noted for its wide bandwidth, immunity to interference, and high cost compared to other types of cable. Signals are transmitted inside a fully shielded environment, in which an inner conductor is surrounded by a solid insulating material and then an outer conductor or shield. Used in many local area network systems, such as Ethernet and ARCnet.

COBOL (Common Business-Oriented Language) A high-level computer programming language used primarily by some larger companies. It has never achieved popularity on personal and small business computers.

code page A table used in DOS 3.3 and later that sets up the keyboard and display characters for various foreign languages.

code page switching A DOS feature in versions 3.3 and later that changes the characters displayed onscreen or printed on an output device. Primarily used to support foreign-language characters. Requires an EGA or better video system and an IBM-compatible graphics printer.

CODEC (coder-decoder) A device that converts voice signals from their analog form to digital signals acceptable to more modern digital PBXs and digital transmission systems. It then converts those digital signals back to analog so you can hear and understand what the other party is saying. Also refers to compression/decompression software used in the creation of digital audio and video files, such as MP3 and MPEG, and for videophone programs.

coercivity A measurement in units of oersteds of the amount of magnetic energy to switch or "coerce" the flux change in the magnetic recording media. High-coercivity disk media require a stronger write current.

cold boot The act of starting or restarting a computer from a powered-off state. If the system is on, this requires cycling the power off and then back on. A cold boot causes all RAM to be forcibly cleared. See also *warm boot*.

collision In a LAN, if two computers transmit a packet of data at the same time on the network, the data can become garbled, which is known as a collision.

collision detection/avoidance A process used on a LAN to prevent data packets from interfering with each other and to determine whether data packets have encountered a collision and initiate a resend of the affected packets.

color graphics adapter See *CGA*.

color palette The colors available to a graphics adapter for display.

COM port A serial port on a PC that conforms to the RS-232 standard. See also *RS-232*.

COMDEX The largest international computer trade show and conference in the world, managed by MediaLive International, Inc. See www.comdex.com for the latest information.

command An instruction that tells the computer to start, stop, or continue an operation.

`COMMAND.COM` An operating system file that is loaded last when the computer is booted. This is the command interpreter or user interface and program-loader portion of DOS.

command interpreter The operating system program that controls a computer's shell or user interface. The command interpreter for MS-DOS (and the command-line sessions in Windows 9x/Me) is `COMMAND.COM`; the command interpreter for the graphical shell in Windows versions through 9x/Me is `WIN.COM`; the command interpreter for NT-based versions of Windows (including Windows 2000 and later) is `CMD.COM`.

common The ground or return path for an electrical signal. If it's a wire, it usually is colored black.

common mode noise Noise or electrical disturbances that can be measured between a current- or signal-carrying line and its associated ground. Common mode noise is frequently introduced to signals between separate computer equipment components through the power distribution circuits. It can be a problem when single-ended signals are used to connect different equipment or components that are powered by different circuits.

CompactFlash An ATA flash memory card physical format approximately one third the size of a standard PC Card. Often abbreviated CF or CF+, CompactFlash cards are identical in function to standard ATA Flash PC Cards (PCMCIA) but use 50 pin connectors instead of 68. ATA flash cards contain built-in disk controller circuitry to enable the card to function as a solid-state disk drive. CF cards can plug into a CompactFlash socket or with an adapter into a standard Type I or II PC Card (PCMCIA) slot. CF cards are used by many types of digital cameras.

CompactPCI The PICMG standard for PCI-based industrial computers, CompactPCI boards plug into a 220-pin IEC-1076 bus.

compatible 1) In the early days of the PC industry when IBM dominated the market, a term used to refer to computers from other manufacturers that had the same features as a given IBM model. 2) In general, software or hardware that conforms to industry standards or other de facto standards so that it can be used in conjunction with or in lieu of other versions of software or hardware from other vendors in a like manner.

compiler A program that translates a program written in a high-level language into its equivalent machine language. The output from a compiler is called an *object program*.

complete backup A backup of all information on a hard disk, including the directory tree structure.

composite video Television picture information and sync pulses combined. The complete wave form of the color video signal composed of chrominance and luminance picture information; blanking pedestal; field, line, and color-sync pulses; and field-equalizing pulses. Some video cards have an RCA jack that outputs a composite video signal. See also *RGB*.

compressed file A file that has been reduced in size via one or more compression techniques. See also *archive file*.

computer A device capable of accepting data, applying prescribed processes to this data, and displaying the results or information produced.

computer-based training (CBT) The use of a computer to deliver instruction or training; also known as computer-aided (or assisted) instruction (CAI), computer-aided learning (CAL), computer-based instruction (CBI), and computer-based learning (CBL).

CONFIG.SYS A file that can be created to tell DOS how to configure itself when the machine starts up. It can load device drivers, set the number of DOS buffers, and so on.

configuration file A file kept by application software to record various aspects of the software's configuration, such as the printer it uses. Windows uses `.INI` files and the Windows Registry to control its configuration.

console The unit, such as a terminal or a keyboard, in your system with which you communicate with the computer.

contiguous Touching or joined at the edge or boundary, in one piece.

continuity In electronics, an unbroken pathway. Testing for continuity usually means testing to determine whether a wire or other conductor is complete and unbroken (by measuring 0 ohms). A broken wire shows infinite resistance (or infinite ohms).

Continuity Rambus Inline Memory Module (CRIMM) A blank memory module used to fill empty sockets in Rambus memory installations.

control cable The wider of the two cables that connect an ST-506/412 or ESDI hard disk drive to a controller card. A 34-pin cable that carries commands and acknowledgments between the drive and controller.

controller The electronics that control a device, such as a hard disk drive, and intermediate the passage of data between the device and computer.

controller card An adapter holding the control electronics for one or more devices, such as hard disks. Ordinarily occupies one of the computer's slots.

conventional memory The first megabyte or first 640KB of system memory accessible by an Intel processor in real mode. Sometimes called *base memory*.

convergence Describes the capability of a color monitor to focus the three colored electron beams on a single point. Poor convergence causes the characters onscreen to appear fuzzy and can cause headaches and eyestrain.

coprocessor An additional computer processing unit designed to handle specific tasks in conjunction with the main or central processing unit.

copy protection A hardware or software scheme to prohibit making illegal copies of a program.

core An old-fashioned term for computer memory. Also the name given to the internal microarchitecture as well as the brand of a family of Intel multi-core processors first introduced in July 2006.

core speed The internal speed of a processor. With all modern processors, this speed is faster than the system bus speed, and that speed relationship is regulated by the clock multiplier in the processor.

CP/M (Control Program for Microcomputers, originally Control Program/Monitor) An operating system created by Gary Kildall, the founder of Digital Research. Created for the old 8-bit microcomputers that used the 8080, 8085, and Z-80 microprocessors. It was the dominant operating system in the late 1970s and early 1980s for small computers used in business environments.

cps (characters per second) A data transfer rate generally estimated from the bit rate and character length. At 2,400 bps, for example, 8-bit characters with start and stop bits (for a total of 10 bits per character) are transmitted at a rate of approximately 240 cps. Some protocols, such as V.42 and MNP, employ advanced techniques such as longer transmission frames and data compression to increase characters per second.

CPU (central processing unit) The computer's microprocessor chip—the brains of the outfit. Typically, an integrated circuit using VLSI (very-large-scale integration) technology to pack several functions into a tiny area. The most common electronic device in the CPU is the transistor, of which several thousand to several million or more are found.

crash A malfunction that brings work to a halt. A system crash usually is caused by a software malfunction, and ordinarily you can restart the system by rebooting the machine. A head crash, however, entails physical damage to a disk and probable data loss.

CRC (cyclic redundancy checking) An error-detection technique consisting of a cyclic algorithm performed on each block or frame of data by both sending and receiving modems. The sending modem inserts the results of its computation in each data block in the form of a CRC code. The receiving modem compares its results with the received CRC code and responds with either a positive or negative acknowledgment. In the ARQ protocol implemented in high-speed modems, the receiving modem accepts no more data until a defective block is received correctly.

crossbar A type of memory controller that interchanges data between different memory paths. It's used in some server chipsets and advanced graphics processors.

crosstalk The electromagnetic coupling of a signal on one line with another nearby signal line. Crosstalk is caused by electromagnetic induction, where a signal traveling through a wire creates a magnetic field that induces a current in other nearby wires. Various methods, including twisting wire pairs and placing ground wires between data wires, are used to combat crosstalk and create more reliable data communications.

CRT (cathode-ray tube) A term used to describe a television or monitor screen tube.

current The flow of electrons, measured in amperes, or amps.

cursor The small, flashing underline or I-beam character that appears onscreen to indicate the point at which any input from the keyboard will be placed.

cycle The time for a signal to transition from one leading edge to the next leading edge.

cyclic redundancy checking See *CRC*.

cylinder The set of tracks on a disk that are on each side of all the disk platters in a stack and are the same distance from the center of the disk. A given cylinder contains all of the tracks that can be read without moving the heads. A floppy drive with two heads usually has 160 tracks, which are accessible as 80 cylinders. A typical 120GB hard disk will physically have about 56,000 cylinders, six heads (three platters), and an average of about 700 sectors per track, for a total of about 235,200,000 sectors (120.4GB).

Cyrix Originally a Texas-based maker of Intel-compatible math coprocessor chips, Cyrix later developed low-cost, plug-compatible 6x86 and 6x86MX Pentium-class processors that were manufactured by IBM and other fabricators. Cyrix also developed the first chipsets with integrated audio and video (the MediaGX series). Cyrix was later absorbed into National Semiconductor, which retained the MediaGX technology when it sold Cyrix to VIA Technologies. VIA formerly developed and sold the VIA Cyrix MII, a low-cost Super Socket 7 processor, and currently sells and develops the C3, developed from the Cyrix "Joshua" processor. See also *C3* and *VIA Technologies*.

D/A converter (DAC) A device that converts digital signals to analog form. See also *RAMDAC*.

D-channel In ISDN, a 16Kbps channel used to transmit control data about a connection.

daisy-chain Stringing up components in such a manner that the signals move serially from one to the other. Most microcomputer multiple disk drive systems are daisy-chained. The SCSI bus system is a daisy-chain arrangement, in which the signals move from computer to disk drives to tape units, and so on. USB and IEEE-1394 devices also use the daisy-chain arrangement when hubs are used.

daisywheel printer An impact printer that prints fully formed characters one at a time by rotating a circular print element composed of a series of individual spokes, each containing two characters that radiate from a center hub. Produces letter-quality output but has long been replaced by laser and LED printers.

DAT (digital audio tape) A small cassette containing 4mm-wide tape used for storing large amounts of digital information. DAT technology emerged in Europe and Japan in 1986 as a way to produce high-quality, digital audio recordings and was modified in 1988 to conform to the digital data storage (DDS) standard for storing computer data.

Raw/2:1 compressed capacities for a single tape are 2/4GB for DDS, 4/8GB for DDS-2, 12/24GB for DDS-3, 20/40GB for DDS-4, and 36/72GB for DAT 72 (the latest standard).

data 1) Groups of facts processed into information. A graphic or textural representation of facts, concepts, numbers, letters, symbols, or instructions used for communication or processing. 2) An android from the twenty-fourth century with a processing speed of 60 trillion operations per second and a storage capacity of 800 quadrillion bits, and who serves on the USS Enterprise NCC-1701-D with the rank of lieutenant commander.

data bus The connection that transmits data between the processor and the rest of the system. The width of the data bus defines the number of data bits that can be moved into or out of the processor in one cycle.

data cable Generically, a cable that carries data. Specific to HD connections, the narrower (20-pin) of two cables that connects an ST-506/412 or ESDI hard disk drive to a controller card.

data communications A type of communication in which computers and terminals can exchange data over an electronic medium.

data compression A technique in which mathematical algorithms are applied to the data in a file to eliminate redundancies and thus reduce the size of the file. See also *lossless compression* and *lossy compression*.

Data Link Layer In networking, the layer of the OSI reference model that controls how the electrical impulses enter or leave the network cable. Ethernet and Token-Ring are the two most common examples of Data Link Layer protocols. See also *OSI*.

data separator A device that separates data and clock signals from a single encoded signal pattern. Usually, the same device performs both data separation and combination and is sometimes called an *endec*, or encoder/decoder.

data transfer rate The maximum rate at which data can be transferred from one device to another.

daughterboard Add-on board to increase functionality and/or memory. Attaches to the existing board.

DB-9 A 9-pin D-shell connector, primarily used for PC serial ports.

DB-25 A 25-pin D-shell connector, primarily used for PC parallel ports.

DC Direct current, such as that provided by a power supply or batteries.

DC-600 (Data Cartridge 600) A data-storage medium invented by 3M in 1971 that uses a 1/4"-wide tape 600 feet in length.

DCE (data communications equipment) The hardware that performs communication—usually a dialup modem that establishes and controls the data link through the telephone network. See also *DTE*.

DDE (dynamic data exchange) A form of interprocess communications used by Microsoft Windows to support the exchange of commands and data between two applications running simultaneously. This capability has been enhanced further with object linking and embedding (OLE).

DDoS (distributed denial of service) Refers to a type of denial-of-service attack that uses multiple computers that have been taken over by an intruder to attack a targeted system. See also *DoS*.

DDR (double data rate) A type of SDRAM that allows two accesses per clock cycle, doubling the effective speed of the memory. The most common types of DDR include PC2100 (also known as DDR 266MHz), PC2700 (also known as DDR 333MHz) and PC3200 (also known as DDR 400MHz). See also *SDRAM*.

DDR2 (double data rate 2) A type of SDRAM that enables two accesses per clock cycle, doubling the effective speed of the memory. DDR2 has more robust signaling allowing for higher speeds than conventional DDR. See also *DDR* and *SDRAM*.

DDR3 (double data rate 3) A type of SDRAM that enables two accesses per clock cycle, doubling the effective speed of the memory. DDR3 has more robust signaling allowing for higher speeds than DDR2. See also *DDR*, *DDR2* and *SDRAM*.

de facto standard A software or hardware technology not officially made a standard by any recognized standards organization but that is used as a reference for consumers and vendors because of its dominance in the marketplace.

DEBUG The name of a utility program included with DOS and used for specialized purposes, such as altering memory locations, tracing program execution, patching programs and disk sectors, and performing other low-level tasks.

decibel (dB) A logarithmic measure of the ratio between two powers, voltages, currents, sound intensities, and so on. Signal-to-noise ratios are expressed in decibels.

dedicated line A user-installed telephone line that connects a specified number of computers or terminals within a limited area, such as a single building. The line is a cable rather than a public-access telephone line. The communications channel also can be referred to as nonswitched because calls do not go through telephone company switching equipment.

dedicated servo surface In voice-coil-actuated hard disk drives, this is one side of one platter given over to servo data that is used to guide and position the read/write heads.

default Any setting assumed at startup or reset by the computer's software and attached devices that is operational until changed by the user. An assumption the computer makes when no other parameters are specified. When you type `DIR` without specifying the drive to search, for example, the computer assumes you want it to search the default drive. The term *default* is used in software to describe any action the computer or program takes on its own with embedded values.

defect map A list of unusable sectors and tracks coded onto a drive during the low-level format process.

defragmentation The process of rearranging disk sectors so files are stored on consecutive sectors in adjacent tracks.

degauss 1) To remove magnetic charges or to erase magnetic images. Normal applications include CRT monitors and disks or tapes. Most monitors incorporate a degaussing coil, which surrounds the CRT, and automatically energize this coil for a few seconds when powered up to remove color or image-distorting magnetic fields from the metal mask inside the tube. Some monitors include a button or control that can be used for additional applications of this coil to remove more stubborn magnetic traces. 2) The act of erasing or demagnetizing a magnetic disk or tape using a special tool called a degaussing coil.

density The amount of data that can be packed into a certain area on a specific storage media.

desktop A personal computer that sits on a desk.

device driver Originally, a memory-resident program loaded by `CONFIG.SYS` that controls an unusual device, such as an expanded memory board. Windows also uses device drivers, but they are loaded through the Windows Registry or `.INI` files.

DHCP (Dynamic Host Configuration Protocol) A protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. Routers, gateways, and broadband modems can function as DHCP hosts to provide IP addresses to other computers and devices on the network.

Dhrystone A benchmark program used as a standard figure of merit indicating aspects of a computer system's performance in areas other than floating-point math performance. Because the program does not use any floating-point operations, performs no I/O, and makes no operating system calls, it is most useful for measuring the processor performance of a system. The original Dhrystone program was developed in 1984 and was written in Ada, although the C and Pascal versions became more popular by 1989.

DHTML (Dynamic HTML) A collective term for cascading style sheets, layering, dynamic fonts, and other features encompassed in standard HTML 4.0, Netscape Navigator 4.x and above, and Internet Explorer 4.x and above. Because of differences in how browsers interpret particular DHTML features, many developers incorporate browser-checking code into their web pages to enable or disable certain features depending on the browser being used to view the page.

diagnostics Programs used to check the operation of a computer system. These programs enable the operator to check the entire system for any problems and indicate in which area the problems lie.

dialup adapter In Windows, a software program that uses a modem to emulate a network interface card for networking. Most commonly used to connect to an Internet service provider or a dialup server for remote access to a LAN.

die An individual chip (processor, RAM, or other integrated circuit) cut from a finished silicon chip wafer and built into the physical package that connects it to the rest of the PC or a circuit board.

differential An electrical signaling method in which a pair of lines are used for each signal in "push-pull" fashion. In most cases, differential signals are balanced so that the same current flows on each line in opposite directions. This is unlike single-ended signals, which use only one line per signal referenced to a single ground. Differential signals have a large tolerance for common-mode noise and little crosstalk when used with twisted-pair wires even in long cables. Differential signaling is expensive because two pins are required for each signal.

digital camera A type of camera that uses a sensor and internal or removable flash memory in place of film to record still images. Digital cameras' picture quality is usually rated in megapixels. See also *megapixel*.

digital loopback A test that checks the modem's RS-232 interface and the cable that connects the terminal or computer and the modem. The modem receives data (in the form of digital signals) from the computer or terminal and immediately returns the data to the screen for verification.

digital noise reduction (DNR) Reduces audio or video noise by the application of an algorithm on digital audio or video data.

digital signals Discrete, uniform signals. In this book, the term refers to the binary digits 0 and 1.

digital signature An electronic identifier used to authenticate a message or the contents of a file. Windows 98 and above are designed to prefer digitally signed device drivers (drivers approved by the Windows Hardware Quality Labs) and will warn you if you try to install an unsigned device driver.

digital-to-analog converter (DAC) A device for converting digital signals to analog signals. VGA-based displays are analog, so video cards that connect to them include a DAC to convert the signals to analog to drive the display.

digital video recorder (DVR) A video recorder (TiVo, for example) that stores the recording in a digital format, often used for time-shifting digital television programs.

digitize To transform an analog wave to a digital signal a computer can store. Conversion to digital data and back is performed by a D/A converter (DAC), often a single-chip device. How closely a digitized sample represents an analog wave depends on the number of times the amplitude of a wave is measured and recorded (the rate of digitization), as well as the number of levels that can be specified at each instance. The number of possible signal levels is dictated by the resolution in bits.

DIMM (dual inline memory module) A series of memory modules used in Pentium and newer PCs. They are available in many different versions, including those with SDRAM, DDR or DDR2, 3.3V, 2.5V or 1.8V, buffered, unbuffered or registered, and in 64-bit (non-ECC/parity) or 72-bit (ECC/parity) form. See also *DDR*, *DDR2*, and *SDRAM*.

DIP (dual inline package) A family of rectangular, integrated-circuit flat packages that have leads on the two longer sides. Package material is plastic or ceramic.

DIP switch A tiny switch (or group of switches) on a circuit board. Named for the form factor of the carrier device in which the switch is housed.

Direct Media Interface (DMI) A 2GBps high-speed bus used by Intel in its E7xxx server and 9xx desktop chipsets. Also known as Integrated Hub Architecture (IHA) 2.0.

direct memory access (DMA) A process by which data moves between a disk drive (or other device) and system memory without direct control of the central processing unit, thus freeing it up for other tasks.

Direct Rambus DRAM See *RDRAM*.

directory An area of a disk that stores the titles given to the files saved on the disk and serves as a table of contents for those files. Contains data that identifies the name of a file, the size, the attributes (system, hidden, read-only, and so on), the date

and time of creation, and a pointer to the location of the file. Each entry in a directory is 32 bytes long. Windows refers to subdirectories (directories beneath the root directory) as folders.

DirectX A set of graphics-related drivers and APIs that translates generic hardware commands into specific commands for particular pieces of hardware. Developed by Microsoft, DirectX lets graphical or multimedia applications take advantage of specific features supported by various graphics accelerators.

disc Flat, circular, rotating medium that can store various types of information, both analog and digital. *Disc* is often used in reference to optical storage media, whereas *disk* refers to magnetic storage media. *Disc* also is often used as a short form for videodisc or compact audio disc (CD).

Disk At Once (DAO) A method of burning CDs and DVDs where the entire disc is burned in a single session.

disk Alternative spelling for disc that generally refers to magnetic storage medium on which information can be accessed at random. Floppy disks and hard disks are examples.

disk access time See *access time*.

disk cache A portion of memory on the PC motherboard or on a drive interface card or controller used to store frequently accessed information from the drive (such as the file allocation table [FAT] or directory structure) to speed up disk access. With a larger disk cache, additional data from the data portion of a drive can be cached as well. See also *cache*, *L1 cache*, and *L2 cache*.

disk partition See *partition*.

display A device used for viewing information generated by a computer.

display adapter The interface between the computer and the monitor that transmits the signals which appear as images on the display. This can take the form of an expansion card or a chip built into the motherboard.

dithering The process of creating more colors and shades from a given color palette. In monochrome displays or printers, dithering varies the black-and-white dot patterns to simulate shades of gray. Grayscale dithering is used to produce different shades of gray when the device can produce only limited levels of black or white outputs. Color screens or printers use dithering to create additional colors by mixing and varying the dot sizing and spacing. For example, when converting from 24-bit color to 8-bit color (an 8-bit palette has only 256 colors compared to the 24-bit palette's millions), dithering adds pixels of different colors to simulate the original color. Error diffusion is a type of dithering best suited for photographs.

DLC (Data Link Control) Refers to the Data Link Layer in the OSI model. Every network interface card (NIC) has a unique DLC address or DLC identifier (DLCI) that identifies the node on the network. For Ethernet networks, the DLC address is usually called the Media Access Control (MAC) address.

DLL (Dynamic Link Library) An executable driver program module for Microsoft Windows that can be loaded on demand, linked in at runtime, and subsequently unloaded when the driver is no longer needed.

DLT (digital linear tape) A tape drive technology that writes data in multiple linear tracks as tape is wound forward and backward. Supports native/2:1 compressed capacities of up to 80/160GB. See also *Super DLT (SDLT)*.

DMA See *direct memory access*.

DMI (Desktop Management Interface) DMI is an operating-system– and protocol-independent standard developed by the Desktop Management Task Force (DMTF) for managing desktop systems and servers. DMI provides a bidirectional path to interrogate all the hardware and software components within a PC, enabling hardware and software configurations to be monitored from a central station in a network.

DNS (domain name system or service) An Internet service that translates domain names into numeric IP addresses. Every time you use a domain name, a DNS server must translate the name into the corresponding IP address.

docking station Equipment that enables a laptop or notebook computer to use peripherals and accessories normally associated with desktop systems.

DOCSIS See *CableLabs Certified Cable Modem*.

doping Adding chemical impurities to silicon (which is naturally a nonconductor) to create a material with semiconductor properties that is then used in the manufacturing of electronic chips.

DoS (denial of service) An Internet attack on a resource that prevents users from accessing email, websites, or other services. It usually exploits security shortcomings in email or web servers. See also *DDoS*.

DOS (Disk Operating System) A collection of programs stored on the DOS disk that contain routines enabling the system and user to manage information and the hardware resources of the computer. DOS must be loaded into the computer before other programs can be started.

dot pitch A measurement of the width of the dots that make up a pixel. The smaller the dot pitch, the sharper the image.

dot-matrix printer An impact printer that prints characters composed of dots. Characters are printed one at a time by pressing the ends of selected wires against an inked ribbon and paper.

dots per inch (dpi) A measure of resolution used primarily for printers and scanners.

double-conversion online UPS An advanced UPS design that converts AC power to DC for UPS battery charging and then back to AC. This type of UPS provides excellent power conditioning and supports long run times and multiple servers with a single unit.

double density (DD) An indication of the storage capacity of a floppy drive or disk in which eight or nine sectors per track are recorded using MFM encoding. See also *MFM encoding*.

download The process of receiving files from another computer.

downtime Operating time lost because of a computer malfunction.

DPMI (DOS Protected Mode Interface) An industry-standard interface that allows DOS applications to execute program code in the protected mode of the 286 or later Intel processor. The DPMI specification is available from Intel.

DPMS (Display Power Management Signaling) A VESA standard for signaling a monitor or display to switch into energy conservation mode. DPMS provides for two low-energy modes: standby and suspend.

DRAM (dynamic random access memory) The most common type of computer memory, DRAM can be manufactured very inexpensively compared to other types of memory. DRAM chips are small and inexpensive because they normally require only one transistor and a capacitor to represent each bit. The capacitors must be energized every 15ms or so (hundreds of times per second) to maintain their charges. DRAM is volatile, meaning it loses data with no power or without regular refresh cycles.

drive A mechanical device that manipulates data storage media.

driver A program designed to interface a particular piece of hardware to an operating system or other standard software.

drum The cylindrical photoreceptor in a laser printer that receives the document image from the laser and applies it to the page as it slowly rotates.

DSL (digital subscriber line) A high-speed digital modem technology. DSL is either symmetric or asymmetric. Asymmetric provides faster downstream speeds, which is suited for Internet usage and video on demand. Symmetric provides the same rate coming and going. See also *ADSL*.

DSM (digital storage media) A digital storage or transmission device or system.

DSP (digital signal processor) Dedicated, limited-function processor often found in modems, sound cards, cellular phones, and so on.

DTE (data terminal [or terminating] equipment) The device, usually a computer or terminal, that generates or is the final destination of data. See also *DCE*.

dual cavity pin grid array Chip packaging designed by Intel for use with the Pentium Pro processor that houses the processor die in one cavity of the package and the L2 cache memory in a second cavity within the same package.

dual-core processor A processor that contains two distinct physical processor cores in a single package. This type of processor provides most of the benefits of dual processor designs at a lower cost.

dual independent bus (DIB) architecture A processor technology with the existence of two independent buses on the processor—the L2 cache bus and the processor-to-main memory system bus. The processor can use both buses simultaneously, thus getting as much as two times more data into and out of the processor than a single bus architecture processor. The Intel Pentium Pro, Pentium II, and newer processors from Intel and AMD (such as the AMD Athlon and Duron) have DIB architecture.

dual scan display A lower-quality but economical type of LCD color display that has an array of transistors running down the x and y axes of two sides of the screen. The number of transistors determines the screen's resolution.

dumb terminal A screen and keyboard device with no inherent processing power connected to a computer that is usually remotely located.

duplex Indicates a communications channel capable of carrying signals in both directions.

Duron A low-cost version of the Athlon processor with less L2 cache. Available in the Socket A (462-pin) chip package.

DVD (digital versatile disc) Originally called digital video disc, DVD is a type of high-capacity CD-ROM disc and drive format with up to 28 times the capacity of a standard CD-ROM. The disc is the same diameter as a CD-ROM but can be recorded on both sides and on two layers for each side. Each side holds 4.7GB on a single layer disc, whereas dual-layer versions hold 8.5GB per side, for a maximum of 17GB total if both sides and both layers are used, which is the equivalent of 28 CD-ROMs. DVD drives can read standard audio CDs and CD-ROMs.

DVD burner Popular term for a rewritable DVD drive, particularly one that uses DVD-R/RW or DVD+R/RW media.

DVD-A A DVD format designed to support high-quality music and audio. DVD-A uses 24-bit sampling at 96KHz, significantly better than CD audio (16-bit at 44.1KHz). Unlike DVD, DVD-A discs can be played on conventional CD players but produce the highest quality only when played on DVD-A players.

DVD-R A writeable DVD format compatible with standalone DVD players and DVD-ROM drives. DVD-R was introduced by Pioneer and was released to the DVD Forum (www.dvdforum.org) in July 1997. It uses a wobbled-groove recording process to store 4.7GB of data and is optimized for sequential data access. See also *DVD-RW*.

DVD-R DL A dual-layer DVD format based on DVD-R that supports up to 8.5GB of data. See also *DVD-R*.

DVD+R A writeable DVD format compatible with standalone DVD players and DVD-ROM drives. DVD+R was developed by the DVD+RW Alliance (www.dvdrw.com), whose members include Microsoft, Sony, HP, and Dell. In addition, it is supported by second-generation DVD+RW drives and holds 4.7GB of data. DVD+R/RW are the most compatible, fastest, most capable, and most popular of all the recordable DVD formats. See also *DVD+RW*.

DVD+R DL A dual-layer DVD format based on DVD+R that supports up to 8.5GB of data. See also *DVD+R*.

DVD-RAM A rewritable DVD format developed by Panasonic, Toshiba, and Hitachi and supported by the DVD Forum. DVD-RAM is the oldest DVD rewritable format, but because the media uses a caddy and has a lower reflectivity than normal DVD media, DVD-RAM discs are not compatible with other types of DVD drives or with standalone DVD players. Older DVD-RAM drives use media in caddies, but newer drives do not use caddies.

DVD-RW A rewritable DVD format developed by Pioneer and released to the DVD Forum in November 1999. It uses a phase-change technology similar to CD-RW. As with most CD-RW media and drives, the entire disc must be formatted before it can be used. Its write speed is also lower than DVD+RW, and the entire disc must be erased before it can be used to store new data. See also *DVD-R*.

DVD+RW A rewritable DVD format developed by the DVD+RW Alliance; the first DVD+RW drives were released in 2001. DVD+RW uses a phase-change technology similar to CD-RW and DVD-RW.

DVD+R/RW are the most compatible, fastest, most capable, and most popular of all the recordable DVD formats. See also *DVD+R*.

DVD±RW A DVD drive capable of reading and writing to both DVD+R/RW and DVD-R/RW media. Some of these drives also support some or all of these media types: DVD+R DL, DVD-R DL, and DVD-RAM.

DVI (Digital Video Interactive) A standard that was originally developed at RCA Laboratories and sold to Intel in 1988. DVI integrates digital motion, still video, sound, graphics, and special effects in a compressed format. DVI is a highly sophisticated hardware compression technique used in interactive multimedia applications.

DVI (Digital Visual Interface) The current de facto standard for LCD displays developed by the Digital Display Working Group in April 1999. DVI-D provides digital signals only, whereas DVI-I (which is more common) provides both digital and analog signals. A DVI-I connector can be converted to VGA with an external adapter.

Dvorak keyboard A keyboard design by August Dvorak that was patented in 1936 and approved by ANSI in 1982. Provides increased speed and comfort and reduces the rate of errors by placing the most frequently used letters in the center for use by the strongest fingers. Finger motions and awkward strokes are reduced by more than 90% in comparison with the familiar QWERTY keyboard. The Dvorak keyboard has the five vowel keys (A, O, E, U, I) together under the left hand in the center row and the five most frequently used consonants (D, H, T, N, S) under the fingers of the right hand.

dynamic execution A processing technique that enables the processor to dynamically predict the order of instructions and execute them out of order internally if necessary for an improvement in speed. Uses these three techniques: Multiple Branch Prediction, Data Flow Analysis, and Speculative Execution.

E2000 Also called Energy 2000, this is a Swiss-developed standard for power management that calls for computer monitors to use only 5 watts of power when in standby mode.

EBCDIC (Extended Binary Coded Decimal Interchange Code) An IBM-developed, 8-bit code for the representation of characters. It allows 256 possible character combinations within a single byte. EBCDIC is the standard code on IBM minicomputers and mainframes, but not on the IBM microcomputers, where ASCII is used instead.

ECC (error correcting code) A type of system memory or cache that is capable of detecting and correcting some types of memory errors without interrupting processing.

ECP (enhanced capabilities port) A type of high-speed parallel port jointly developed by Microsoft and Hewlett-Packard that offers improved performance for the parallel port and requires special hardware logic. ECP ports use both an IRQ and a DMA channel. See also *IEEE 1284*.

edge connector The part of a circuit board containing a series of printed contacts that is inserted into an expansion slot or a connector.

EDO (extended data out) RAM A type of RAM chip that enables a timing overlap between successive accesses, thus improving memory cycle time.

EEB Entry-Level Electronics Bay is a specification for pedestal servers developed by SSI. See also *Server System Infrastructure (SSI)*.

EEPROM (electrically erasable programmable read-only memory) A type of nonvolatile memory chip used to store semipermanent information in a computer, such as the BIOS. An EEPROM can be erased and reprogrammed directly in the host system without special equipment. This is used so manufacturers can upgrade the ROM code in a system by supplying a special program that erases and reprograms the EEPROM chip with the new code. Also called *flash ROM*.

EGA (enhanced graphics adapter) A type of PC video display adapter first introduced by IBM on September 10, 1984, that supports text and graphics. Text is supported at a maximum resolution of 80×25 characters in 16 colors with a character box of 8×14 pixels. Graphics are supported at a maximum resolution of 640×350 pixels in 16 (from

a palette of 64) colors. The EGA outputs a TTL (digital) signal with a horizontal scanning frequency of 15.75KHz, 18.432KHz, or 21.85KHz, and it supports TTL color or TTL monochrome displays.

EIA (Electronic Industries Association) An organization that defines electronic standards in the United States.

EIDE (Enhanced Integrated Drive Electronics) A specific Western Digital implementation of the ATA-2 specification. See also *ATA-2*.

eight-way server A server containing eight processors.

EISA (Extended Industry Standard Architecture) An extension of the Industry Standard Architecture (ISA) bus developed by IBM for the AT. The EISA design was led by Compaq Corporation. Later, eight other manufacturers (AST, Epson, Hewlett-Packard, NEC, Olivetti, Tandy, Wyse, and Zenith) joined Compaq in a consortium founded September 13, 1988. This group became known as the "gang of nine." The EISA design was patterned largely after IBM's Micro Channel Architecture (MCA) in the PS/2 systems, but unlike MCA, EISA enables backward compatibility with older plug-in adapters. EISA products became obsolete after the development of the PCI slot architecture. See also *PCI*.

electromagnetic pulse (EMP) An intense pulse of electromagnetic radiation, often from a nuclear explosion.

electronic mail (email) A method of transferring messages from one computer to another.

electrostatic discharge (ESD) The grounding of static electricity. A sudden flow of electricity between two objects at different electrical potentials. ESD is a primary cause of integrated circuit damage or failure.

ELF (extremely low frequency) A very low-frequency electromagnetic radiation generated by common electrical appliances, including computer monitors. The Swedish MPR II standard governs this and other emissions. Also called *VLF (very low frequency)*.

EM64T Intel's implementation of the AMD64 64-bit processor architecture. See also *AMD64*.

embedded controller In disk drives, this is a controller built into the same physical unit that houses the drive rather than on a separate adapter card. IDE and SCSI drives both use embedded controllers.

embedded servo data Magnetic markings embedded between or inside tracks on disk drives that use voice-coil actuators. These markings enable the actuator to fine-tune the position of the read/write heads.

EMM (expanded memory manager) A driver that provides a software interface to expanded memory. EMMs were originally created for expanded memory boards but also can use the memory management capabilities of the 386 or later processors to emulate an expanded memory board. `EMM386.EXE` is an example of an EMM that comes with DOS and Windows 9x.

EMS (Expanded Memory Specification) Sometimes also called the LIM spec because it was developed by Lotus, Intel, and Microsoft. Provides a way for microcomputers running under DOS to access additional memory. EMS memory management provides access to a maximum of 32MB of expanded memory through a small (usually 64KB) window in conventional memory. EMS is a cumbersome access scheme designed primarily for pre-286 systems that could not access extended memory.

emulator A piece of test apparatus that emulates or imitates the function of a particular chip.

encoding The protocol by which data is carried or stored by a medium.

encryption The translation of data into unreadable codes to maintain security.

End User License Agreement (EULA) A type of license or legal contract used for most software, the application of which often depends on simply opening the package.

endec (encoder/decoder) A device that takes data and clock signals and combines (or encodes) them using a particular encoding scheme into a single signal for transmission or storage. The same device also later separates (or decodes) the data and clock signals during a receive or read operation. Sometimes called a data separator.

Energy Star A certification program started by the Environmental Protection Agency. Energy Star–certified computers and peripherals are designed to draw less than 30 watts of electrical energy from a standard 110-volt AC outlet during periods of inactivity. Also called Green PCs. See also *E2000*.

Enhanced CD (CD-E) See *Blue Book*.

enhanced graphics adapter See *EGA*.

enhanced small device interface See *ESDI*.

e-PCI-X The PICMG 1.2 embedded PCI-X specification for passive backplane computers. See also *PICMG*.

EPIC Short for *Explicitly Parallel Instruction Computing*; the RISC-based 64-bit processor architecture used by the Intel Itanium and Itanium 2 processors. EPIC is not the same architecture as AMD64 or EM64T. See also *RISC*.

EPP (enhanced parallel port) A type of parallel port developed by Intel, Xircom, and Zenith Data Systems that operates at almost ISA bus speed and offers a tenfold increase in the raw throughput capability over a conventional parallel port. EPP is especially designed for parallel port peripherals, such as LAN adapters, disk drives, and tape backups. See also *IEEE 1284*.

EPROM (erasable programmable read-only memory) A type of read-only memory (ROM) in which the data pattern can be erased to allow a new pattern. EPROM usually is erased by ultraviolet light and recorded by a higher-than-normal voltage programming signal.

equalization A compensation circuit designed into modems to counteract certain distortions introduced by the telephone channel. Two types are used: fixed (compromise) equalizers and those that adapt to channel conditions (adaptive). Good-quality modems use adaptive equalization.

error control Various techniques that check the reliability of characters (parity) or blocks of data. V.42, MNP, and HST error-control protocols use error detection (CRC) and retransmission of error frames (ARQ).

error message A word or combination of words to indicate to the user that an error has occurred somewhere in the program.

ESCD (extended system configuration data) An area in CMOS or flash/NVRAM where plug-and-play information is stored.

ESDI (Enhanced Small Device Interface) A hardware standard developed by Maxtor and standardized by a consortium of 22 disk drive manufacturers on January 26, 1983. A group of 27 manufacturers formed the ESDI steering committee on September 15, 1986, to enhance and improve the specification. A high-performance interface used primarily with hard disks, ESDI enables a maximum data transfer rate to and from a hard disk of between 10Mbps and 24Mbps. ESDI was replaced by IDE and SCSI interfaces. ESDI drives use the same 34-pin and 20-pin cables used by ST412/ST506 drives.

Ethernet A type of network protocol developed in the late 1970s by Bob Metcalf at Xerox Corporation and endorsed by the IEEE. One of the oldest LAN communications protocols in the personal computing industry, Ethernet networks use a collision-detection protocol to manage contention. Ethernet is defined by the IEEE 802.3 standard. See also *10BASE-T*.

expanded memory Otherwise known as *EMS memory*, this is memory that conforms to the EMS specification. Requires a special device driver and conforms to a standard developed by Lotus, Intel, and Microsoft.

expansion card An integrated circuit card that plugs into an expansion slot on a motherboard to provide access to additional peripherals or features not built into the motherboard. Also called an *add-in board*.

expansion slot A slot on the motherboard that physically and electrically connects an expansion card to the motherboard and the system buses.

extended graphics array See *XGA*.

extended memory Direct processor-addressable memory addressed by an Intel (or compatible) 286 or more advanced processor in the region beyond the first megabyte. Addressable only in the processor's protected mode of operation.

extended partition A nonbootable DOS partition (also supported by Windows) containing DOS volumes. Starting with DOS v3.3, the FDISK program can create two partitions that serve DOS: an ordinary, bootable partition (called the primary partition) and an extended partition, which can contain as many as 23 volumes from D: to Z:.

external device A peripheral installed outside the system case.

extra-high density (ED) An indication of the storage capacity of a floppy drive or disk in which 36 sectors per track are recorded using a vertical recording technique with MFM encoding.

FAQ (frequently asked questions) Name for a list of popular questions and answers covering any particular subject.

Fast Ethernet Popular term for 100BASE-T and other 100Mbps versions of Ethernet. Fast Ethernet uses CAT 5 cable.

Fast Page Mode RAM A type of RAM that improves on standard DRAM speed by enabling faster access to all the data within a given row of memory by keeping the row address the same and changing only the column.

Fast-ATA (fast AT attachment interface) Also called *Fast ATA-2*, these are specific Seagate and Quantum implementations of the ATA-2 interface. See also *ATA-2*.

FAT (file allocation table) A table held near the outer edge of a disk that tells which sectors are allocated to each file and in what order.

FAT32 A disk file allocation system from Microsoft that uses 32-bit values for FAT entries instead of the 16-bit values used by the original FAT system, enabling partition sizes up to 2TB (terabytes). Although the entries are 32 bits, 4 bits are reserved and only 28 bits are used. FAT32 first appeared in Windows 95B and is also supported by Windows 98 and later.

fault tolerance The capability of a computer to withstand a failure. Many levels of fault tolerance exist, and fault tolerance can be applied to several components or systems in the computer. For example, ECC (error correcting code) memory is considered fault tolerant because it is typically capable of automatically identifying and correcting single bit errors.

fax/modem A peripheral that integrates the capabilities of a fax machine and a modem in one expansion card or external unit. Almost all 14.4Kbps and faster modems sold for use in desktop or portable PCs include fax capabilities.

FCC Part 15 The section of the FCC regulations governing emissions from electronics devices. FCC Part 15 Class A devices are suitable for business but not residential use because they emit more interference than FCC Part 15 Class B devices (which are safe in residential areas). Most server components are FCC Part 15 Class A devices.

FC-PGA (flip-chip pin grid array) A type of chip packaging first used in the Socket PGA370 version of the Pentium III where the raw processor die has bumped contacts spaced on the face of the die and is mounted facedown to a pin grid array carrier. The heatsink is then directly attached to the back of the raw silicon die surface.

FDISK The name of the disk-partitioning program under several operating systems, including DOS and Windows 9x/Me, used to create the master boot record and allocate partitions for the operating system's use.

feature connector On a video adapter, a connector that enables an additional video feature card, such as a separate 3D accelerator, video capture card, or MPEG decoder, to be connected to the main video adapter and display.

ferro-resonant UPS A type of UPS design noted for excellent power conditioning, but also for its bulk and inefficient use of power. It has been largely replaced by double-conversion online UPS units. See also *double-conversion online UPS*.

fiber optic A type of cable or connection using strands or threads of glass to guide a beam of modulated light. Allows for very high-speed signaling and multiplexing as well as the combining of many data streams along a single cable.

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

file A collection of information kept somewhere other than in random-access memory.

file attribute Information held in the attribute byte of a file's directory entry.

file compression See *compressed file*.

filename The name given to the disk file. For DOS, it must be from one to eight characters long and can be followed by a filename extension, which can be from one to three characters long. Windows 9x and above ease these constraints by allowing filenames of up to 255 characters, including the directory path.

firewall A hardware or software system designed to prevent unauthorized access to or from a private network.

FireWire Also called *IEEE 1394* or *i.Link*. A serial I/O interface standard that is extremely fast, with data transfer rates up to 400MBps, 800MBps, or 3.2GBps, depending on the version of standard used. Most current implementations use the 400MBps IEEE 1394a version.

firmware Software contained in a read-only memory (ROM) device. A cross between hardware and software, firmware can be easily updated if stored in an EEPROM or flash ROM chip. See also *EEPROM* and *flash ROM*.

fixed disk Also called a *hard disk*, it's a disk that can't be removed from its controlling hardware or housing. Made of rigid material with a magnetic coating and used for the mass storage and retrieval of data.

flash ROM A type of EEPROM developed by Intel that can be erased and reprogrammed in the host system. See also *EEPROM*.

flat panel display (FPD) A type of display that is thinner and lighter than traditional CRTs, usually based on LCD, plasma, or LED technology.

flicker A monitor condition caused by refresh rates that are too low, in which the display flashes visibly. This can cause eyestrain or more severe physical problems.

floating-point unit (FPU) Sometimes called the *math coprocessor*; handles the more complex calculations of the processing cycle.

floppy disk A removable disk using flexible magnetic media enclosed in a semirigid or rigid plastic case.

floppy disk drive (FDD) A type of magnetic media storage where data is stored on flexible mylar disks with a magnetic coating. A popular form of storage used by personal computers during the 80s and 90s.

floppy disk controller The logic and interface that connects a floppy disk drive to the system.

floppy tape A tape standard that uses drives connecting to an ordinary floppy disk controller, such as QIC-80 or Travan-1.

floptical drive A special type of high-capacity removable disk drive that uses an optical mechanism to properly position the drive read/write heads over the data tracks on the disk. This enables more precise control of the read/write positioning and thus narrower track spacing and more data packed into a smaller area than traditional floppy disks. The LS-120 and LS-240 SuperDisk drives are recent examples of floptical drives.

flow control A mechanism that compensates for differences in the flow of data input to and output from a modem or other device.

FM encoding Frequency modulation encoding. An outdated method of encoding data on the disk surface that uses up half the disk space with timing signals.

FM synthesis An audio technology that uses one sine wave operator to modify another and create an artificial sound that mimics an instrument.

folder In a graphical user interface, a simulated file folder that holds documents (text, data, or graphics), applications, and other folders. A folder is similar to a DOS subdirectory.

footprint Describes the shape of something. See also *form factor*.

form factor The physical dimensions of a device. Two devices with the same form factor are physically interchangeable. The IBM PC, XT, and XT Model 286, for example, all use power supplies that are internally different but have exactly the same form factor.

FORMAT The DOS/Windows format program that performs both low- and high-level formatting on floppy disks but only high-level formatting on hard disks.

formatted capacity The total number of bytes of data that can fit on a formatted disk. The unformatted capacity is higher because space is lost defining the boundaries between sectors.

formatting Preparing a disk so the computer can read or write to it. The disk is checked for defects and an organizational system is constructed to manage information on the disk.

FORTRAN (formula translator) A high-level programming language developed in 1954 by John Backus at IBM primarily for programs dealing with mathematical formulas and expressions similar to algebra and used primarily in scientific and technical applications.

four-way server A server containing four processors.

fragmentation The state of having a file scattered around a disk in pieces rather than existing in one contiguous area of the disk. Fragmented files are slower to read than files stored in contiguous areas and can be more difficult to recover if the FAT or a directory becomes damaged.

frame 1) A data communications term for a block of data with header and trailer information attached. The added information usually includes a frame number, block size data, error-check codes, and start/end indicators. 2) A single, complete picture in a video or film recording. A video frame consists of two interlaced fields of either 525 lines (NTSC) or 625 lines (PAL/SECAM), running at 30 frames per second (NTSC) or 25 frames per second (PAL/SECAM).

frame buffer A memory device that stores, pixel by pixel, the contents of an image. Frame buffers are used to refresh a raster image. Sometimes they incorporate local processing capability. The "depth" of the frame buffer is the number of bits per pixel, which determines the number of colors or intensities that can be displayed.

frame rate The speed at which video frames are scanned or displayed: 30 frames per second for NTSC and 25 frames per second for PAL/SECAM.

frames per second (fps) The number of video frames displayed per second. See also *frame rate*.

FTP (File Transfer Protocol) A method of transferring files over the Internet. FTP can be used to transfer files between two machines on which the user has accounts. Anonymous FTP can be used to retrieve a file from a server without having an account on that server.

full duplex Signal flow in both directions at the same time. In microcomputer communications, it also can refer to the suppression of the online local echo. 100BASE-TX network cards capable of full-duplex operations can run at an effective speed of 200Mbps when full-duplex operation is enabled.

full-height drive A drive unit that is 3 1/4" high, 5 1/4" wide, and 8" deep. Equal to two half-height drive bays.

full-motion video A video sequence displayed at full television standard resolutions and frame rates. In the U.S., this equates to NTSC video at 30 frames per second.

function keys Special-purpose keys that can be programmed to perform various operations. They serve many functions, depending on the program being used.

G.lite A popular form of ADSL, G.lite can be self-installed by the user. Also referred to as the *G.992.2 standard*.

gas-plasma display Commonly used in portable systems, it's a type of display that operates by exciting a gas—usually neon or an argon-neon mixture—through the application of a voltage. When sufficient voltage is applied at the intersection of two electrodes, the gas glows an orange-red. Because gas-plasma displays generate light, they require no backlighting.

gateway Officially, an application-to-application conversion program or system. For example, an email gateway converts from SMTP (Internet) email format to MHS (Novell) email format. The term *gateway* is also used as a slang term for router. See also *router*.

GDDR (Graphics Double Data Rate) A type of DRAM memory similar to DDR but designed exclusively for graphics applications. A number of versions have been released including GDDR, GDDR2, GDDR3, etc.

gender When describing connectors for PCs, connectors are described as male if they have pins or female if they have receptacles designed to accept the pins of a male connector.

genlocking The process of aligning the data rate of a video image with that of a digital device to digitize the image and enter it into computer memory. The machine that performs this function is known as a *genlock*.

Ghost Popular utility program sold by Symantec that can be used to create a compressed version of a drive's contents, which is then cloned to one or more PCs over a network or via CD storage.

gibi A multiplier equal to 1,073,741,824.

gibibyte (Gi) A unit of information storage equal to 1,073,741,824 bytes (1,024×1,024×1,024 equals a Gi). Formerly known as a *binary gigabyte*. See also *gigabyte* and *kilobyte*.

GIF (Graphics Interchange Format) A popular raster graphics file format developed by CompuServe that handles 8-bit color (256 colors) and uses the LZW method to achieve compression ratios of approximately 1.5:1 to 2:1. You can reduce the size of a GIF file even more by dropping unused colors from the file.

giga A multiplier indicating one billion (1,000,000,000) of some unit. Abbreviated as g or G. The binary giga (1,073,741,824) is now referred to as a gibi. See also *gibi*.

gigabit (Gb) A unit of information storage equal to 1,000,000,000 bits. Usually used in relation to data transmission speeds, as in gigabit Ethernet, which transmits one gigabit per second.

gigabyte (GB) A unit of information storage equal to 1,000,000,000 bytes. The value formerly called a binary GB (1,073,741,824 bytes) is now called a gibibyte. See also *gibibyte*.

gigahertz GHz is used to measure the clock frequency of high-performance processors. The first 1GHz desktop processor was introduced by AMD (a 1GHz Athlon) in March 2000.

Global Positioning System (GPS) A network of satellites used by earthbound receivers to precisely determine geographical location.

Global System for Mobile communications (GSM) A popular digital cellular voice and data transmission system.

GPU (graphics processing unit) A 3D graphics chip that contains advanced 3D rendering features such as hardware, vertex, and pixel shaders. NVIDIA's GeForce 3 and GeForce 4 Ti series; the ATI Radeon 7xxx, 8xxx, and 9xxx series; and the Matrox Parhelia series are typical GPUs. See also *hardware shader*, *pixel shader*, and *vertex shader*.

graphics accelerator A video processor or chipset specially designed to speed the display and rendering of graphical objects onscreen. Originally, accelerators were optimized for 2D or 3D operations, but all current graphics accelerators, such as NVIDIA's GeForce and ATI's RADEON series, accelerate both types of data.

graphics adapter See *video adapter*.

Green Book The standard for Compact Disc-Interactive (CD-I). Philips developed CD-I technology for the consumer market to be connected to a television instead of a computer monitor. CD-I is not a computer system but a consumer device that made a small splash in the market and disappeared. CD-I discs require special code and are not compatible with standard CD-ROMs. A CD-ROM can't be played on the CD-I machine, but Red Book audio can be played on it.

GUI (graphical user interface) A type of program interface that enables users to choose commands and functions by pointing to a graphical icon using either a keyboard or pointing device, such as a mouse. Windows is the most popular GUI available for PC systems.

half duplex Signal flow in both directions but only one way at a time. In microcomputer communications, half duplex can refer to activation of the online local echo, which causes the modem to send a copy of the transmitted data to the screen of the sending computer.

half-height drive A drive unit that is 1.625" high, 5 1/4" wide, and 8" deep.

halftoning A process that uses dithering to simulate a continuous tone image, such as a photograph or shaded drawing, using various sizes of

dots. Newspapers, magazines, and many books use half-toning. The human eye merges the dots to give the impression of gray shades.

handshaking The process of exchanging information about speeds and protocols between analog modems to establish a dialup connection. If your modem volume is high enough, you can hear handshaking as a series of distinct tones at the start of a modem-to-modem call.

hard disk A high-capacity disk storage unit characterized by a normally nonremovable rigid substrate medium. The platters in a hard disk usually are constructed of aluminum or glass/ceramic. Also sometimes called a *fixed disk*.

hard error An error in reading or writing data caused by damaged hardware.

hard reset Resetting a system via the hardware, usually by pressing a dedicated reset button wired to the motherboard/processor reset circuitry. Does not clear memory like a cold boot does. See also *cold boot*.

hardware Physical components that make up a microcomputer, monitor, printer, and so on.

hardware shader A general term describing the processing of vertex or pixel shading in a GPU's hardware. GPUs such as the ATI 8xxx and 9xxx series or the NVIDIA GeForce 3 and GeForce 4 Ti-series GPU chips have hardware shaders compatible with DirectX 8 and above.

HDLC (High-Level Data Link Control) A standard protocol developed by the ISO for software applications and communicating devices operating in synchronous environments. Defines operations at the link level of communications—for example, the format of data frames exchanged between modems over a phone line.

head A small electromagnetic device inside a drive that reads, records, and erases data on the media.

head actuator The device that moves read/write heads across a disk drive's platters. Most drives use a stepper-motor or voice-coil actuator.

head crash A (usually) rare occurrence in which a read/write head strikes a platter surface with sufficient force to damage the magnetic medium.

head parking A procedure in which a disk drive's read/write heads are moved to an unused track so they will not damage data in the event of a head crash or other failure.

head seek The movement of a drive's read/write heads to a particular track.

heatsink A mass of metal attached to a chip carrier or socket for the purpose of dissipating heat. Some heatsinks are passive (relying on existing air currents only), but most heatsinks on processors are active (including a fan). Many video card accelerator chips and motherboard North Bridge chips are also fitted with heatsinks today.

helical scan A type of recording technology that has vastly increased the capacity of tape drives. Invented for use in broadcast systems and now used in VCRs. Conventional longitudinal recording records a track of data straight across the width of a single-track tape. Helical scan recording packs more data on the tape by positioning the tape at an angle to the recording heads. The heads spin to record diagonal stripes of information on the tape. Helical scan is used by DAT/DDS, Exabyte, and AIT drives.

hexadecimal number A number encoded in base-16, such that digits include the letters A–F and the numerals 0–9 (for example, 8BF3, which equals 35,827 in base-10).

hidden file A file not displayed in DOS directory listings because the file's attribute byte holds a special setting.

high density (HD) An indication of the storage capacity of a floppy drive or disk, in which 15 or 18 sectors per track are recorded using MFM encoding.

High Sierra format A standard format for placing files and directories on CD-ROMs, proposed by an ad hoc committee of computer vendors, software developers, and CD-ROM system integrators. (Work on the format proposal began at the High Sierra Hotel in Lake Tahoe, Nevada.) A revised version of the format was adopted by the ISO as ISO 9660. Use the ISO 9660 format to create cross-platform CD-R recordings.

high-definition television (HDTV) Video formats offering greater visual accuracy (or resolution) than current NTSC, PAL, or SECAM broadcast standards. HDTV formats generally range in resolution

from 655 to 2,125 scanning lines, having an aspect ratio of 5:3 (or 1.67:1) and a video bandwidth of 30MHz–50MHz (5+ times greater than the NTSC standard). Digital HDTV has a bandwidth of 300MHz. HDTV is subjectively comparable to 35mm film.

High Definition Multimedia Interface (HDMI) A digital audio/video interface supporting uncompressed data on a single cable.

High Density Digital Versatile Disc (HD-DVD) One of the two competing high-definition DVD format standards. Also see *Blu-ray Disc*.

high frequency (HF) The frequency band between 3 and 30MHz.

high-level formatting Formatting performed by the DOS FORMAT program. Among other things, it creates the root directory and FATs.

history file A file created by utility software to keep track of earlier use of the software. Many backup programs, for example, keep history files describing earlier backup sessions.

hit ratio In describing the efficiency of a disk or memory cache, the hit ratio is the ratio of the number of times the data is found in the cache to the total number of data requests. 1:1 is a perfect hit ratio, meaning that every data request was found in the cache. The closer to 1:1 the ratio is, the more efficient the cache.

HMA (high memory area) The first 64KB of extended memory, which typically is controlled by the `HIMEM.SYS` device driver. Real-mode programs can be loaded into the HMA to conserve conventional memory. Normally, DOS 5.0 and later use the HMA exclusively to reduce the DOS conventional memory footprint.

HomePNA A home networking standard using existing home or office telephone wiring to obtain speeds up to 11Mbps.

HomeRF A wireless home network using radio waves to obtain speeds up to 11Mbps.

horizontal scan rate In monitors, the speed at which the electron beam moves laterally across the screen. It's normally expressed as a frequency; typical monitors range from 31.5KHz to 90KHz, with the higher frequencies being more desirable.

host The main device when two or more devices are connected. When two or more systems are connected, the system that contains the data is typically called the host, whereas the other is called the guest or user.

host protected area A technique used in ATA-7 and newer ATA drive specifications for reducing the reported size of the hard disk. The space not reported is used to store system recovery data.

hotfix A software patch for a Microsoft application or operating system. Hotfixes can be downloaded individually from the Windows Update website or as a service pack. Microsoft also calls them quick fix engineering (QFE) files.

hot-plug RAID memory A memory technology used on servers to permit hot-swapping of defective memory modules without loss of memory contents. Memory modules form a RAID array similar in operation to a RAID 5 disk array.

HPT (high-pressure tin) A PLCC socket that promotes high forces between socket contacts and PLCC contacts for a good connection.

HST (High-Speed Technology) The now-obsolete U.S. Robotics proprietary high-speed modem-signaling scheme, developed as an interim protocol until the V.32 protocol could be implemented in a cost-effective manner.

HT technology See *hyper-threading technology*.

HTML (Hypertext Markup Language) A language used to describe and format plain-text files on the Web. HTML is based on pairs of tags that enable the user to mix graphics with text, change the appearance of text, and create hypertext documents with links to other documents. See also *DHTML*.

HTTP (Hypertext Transfer Protocol) The protocol that describes the rules a browser and server use to communicate over the World Wide Web. HTTP allows a web browser to request HTML documents from a web server. See also *hypertext*.

HTTPS (Hypertext Transfer Protocol Secure) An extension to the HTTP protocol that provides for sending data securely over the Internet.

hub A common connection point for multiple devices in a network. A hub contains a number of ports to connect several segments of a LAN together. When a packet arrives at one of the ports on the hub, it is copied to all the other ports so all the segments of the LAN can see all the packets. A hub can be passive, intelligent (allowing remote management, including traffic monitoring and port configuration), or switching. A switching hub is also called a switch. See also *switch*.

Huffman coding A technique that minimizes the average number of bytes required to represent the characters in a text. Huffman coding works for a given character distribution by assigning short codes to frequently occurring characters and longer codes to infrequently occurring characters.

hybrid fiber coaxial (HFC) A network (such as that used by digital cable TV and two-way cable modems) that uses fiber-optic cabling for its backbone with coaxial cable connections to each individual computer or TV.

hyper-threading technology A method (also called *HT technology*) developed by Intel for running two different instruction streams through a processor at the same time. Introduced in 2002, HT technology was first used in the Intel Xeon processor with hyper-threading technology, with speeds starting at 2.8GHz; the first HT technology–enabled desktop processor was the 3.06GHz Pentium 4.

hypertext A technology that enables quick and easy navigation between and within large documents. Hypertext links are pointers to other sections within the same document, other documents, or other resources, such as FTP sites, images, or sounds.

HyperTransport AMD's high-speed technology for connecting the North Bridge and South Bridge or equivalent chips on a motherboard. HyperTransport runs at six times the speed of the PCI bus (800MBps versus 133MBps for PCI). The original name was Lightning Data Transport (LDT). Several chipset makers, including AMD and NVIDIA, use HyperTransport.

Hz An abbreviation for hertz—a frequency measurement unit used internationally to indicate one cycle per second.

i.Link Sony's term for IEEE 1394/FireWire port. See also *FireWire*.

I/O (input/output) A circuit path that enables independent communication between the processor and external devices.

I/O controller hub See *ICH*.

I/O port (input/output port) Used to communicate to and from another device, such as a printer or disk.

IA-64 Intel's 64-bit processor architecture, first used in the Itanium processor for servers.

`IBMBIO.COM` One of the DOS system files required to boot the machine in older versions of PC-DOS (IBM's version of MS-DOS). The first file loaded from disk during the boot, it contains extensions to the ROM BIOS.

`IBMDOS.COM` One of the DOS system files required to boot the machine in older versions of PC-DOS (IBM's version of MS-DOS). Contains the primary DOS routines. Loaded by `IBMBIO.COM`, it in turn loads `COMMAND.COM`.

IC (integrated circuit) A complete electronic circuit contained on a single chip. It can consist of only a few or thousands of transistors, capacitors, diodes, or resistors, and it generally is classified according to the complexity of the circuitry and the approximate number of circuits on the chip. SSI (small-scale integration) equals 2–10 circuits; MSI (medium-scale integration) equals 10–100 circuits. LSI (large-scale integration) equals 100–1,000 circuits, and VLSI (very-large-scale integration) equals 1,000–10,000 circuits. Finally, ULSI (ultra-large-scale integration) equals more than 10,000 circuits.

ICH (I/O controller hub) Intel's term for the chip used in its 8xx chipsets to interface with lower-speed devices such as PCI slots, USB ports, ATA drives, and other devices traditionally controlled by the South Bridge chip. ICH chips connect with the memory controller hub (the 8xx chipsets' replacement for the North Bridge) through a high-speed hub interface. Current ICH chips used by Intel 8xx–series chipsets include the ICH2 and ICH4. See also *MCH*.

IDE (Integrated Drive Electronics) A hard disk with the disk controller circuitry integrated within it. The first IDE drives were called *hard cards*.

Also refers to the ATA interface standard—the standard for attaching hard disk drives to ISA bus IBM-compatible computers. IDE drives typically operate as though they are standard ST-506/412 drives. See also *ATA*.

IEEE 802.3 See *10BASE-2*.

IEEE 802.11 family A family of wireless network standards commonly known as *wireless Ethernet*, the most popular of which include 802.11a (54Mbps using 5GHz signaling), 802.11b (11Mbps using 2.4GHz signaling), 802.11g (54Mbps using 2.4GHz signaling), and 802.11n (540Mbps using 2.4GHz or 5GHz signaling). See also *Wi-Fi*.

IEEE 1284 A series of standards for parallel ports. IEEE 1284 includes EPP and ECP configurations as well as the older bidirectional and 4-bit compatible parallel port modes. Printer cables that can work with all modes are referred to as *IEEE 1284–compliant cables*. See also *EPP* and *ECP*.

IEEE 1394 See *FireWire*.

illegal operation A command sent to Windows or the processor that can't be performed. Illegal operations can be triggered by software bugs or conflicts between programs in memory; although the name is reminiscent of a penalty in football, an illegal operation is hardly ever caused by the computer user. In most cases, you can continue to work and might even be able to restart the program without rebooting.

impedance The total opposition a circuit offers to the flow of alternating current, measured in ohms.

incremental backup A backup of all the files that have changed since the last backup.

inductive A property in which energy can be transferred from one device to another via the magnetic field generated by the device, even though no direct electrical connection is established between the two.

`.INF` file A Windows driver and device information file used to install new drivers or services.

Information Technology (IT) Involves the managing and processing of information, especially in a company or organization.

ingot See *boule*.

initiator A device attached to the SCSI bus that sends a command to another device (the target) on the SCSI bus. The SCSI host adapter plugged into the system bus is an example of a SCSI initiator.

inkjet printer A type of printer that sprays one or more colors of ink on the paper; it can produce output with quality approaching that of a laser printer at a lower cost.

input Data sent to the computer from the keyboard, the telephone, a video camera, another computer, paddles, joysticks, and so on.

InstallShield A popular program used to create installation and uninstallation routines for Windows-based programs.

instruction A program step that tells the computer what to do for a single operation.

integrated circuit See *IC*.

interface A communications device or protocol that enables one device to communicate with another. Matches the output of one device to the input of the other device.

interlacing A method of scanning alternate lines of pixels on a display screen. The odd lines are scanned first from top to bottom and left to right. The electron gun goes back to the top and makes a second pass, scanning the even lines. Interlacing requires two scan passes to construct a single image. Because of this additional scanning, interlaced screens often seem to flicker unless a long-persistence phosphor is used in the display. Interlaced monitors were used with the IBM 8514/A display card but are now obsolete for desktop computers.

interleave ratio The number of sectors that pass beneath the read/write heads before the "next" numbered sector arrives. When the interleave ratio is 3:1, for example, a sector is read, two pass by, and then the next is read. A proper interleave ratio, laid down during low-level formatting, enables the disk to transfer information without excessive revolutions due to missed sectors. All modern IDE and SCSI drives have a 1:1 interleave ratio.

interleaved memory The process of alternating access between two banks of memory to overlap accesses, thus speeding up data retrieval. Systems that require only one memory module per bank to operate can work more quickly when two are installed if the system supports interleaved memory.

Inter-Module Bus (IMB) A proprietary high-speed bus used by the Broadcom ServerWorks chipsets. It runs at various speeds, depending on the chipset.

internal command In DOS, a command contained in `COMMAND.COM` so that no other file must be loaded to perform the command. `DIR` and `COPY` are two examples of internal commands. In Windows, a command contained in `CMD.EXE`.

internal device A peripheral device installed inside the main system case in either an expansion slot or a drive bay.

internal drive A disk or tape drive mounted inside one of a computer's disk drive bays (or a hard disk card, which is installed in one of the computer's slots).

Internet A computer network that joins many government, university, and private computers together. The Internet traces its origins to a network set up in 1969 by the Department of Defense. You can connect to the Internet through many online services, such as CompuServe and America Online, or you can connect through local Internet service providers (ISPs). Internet computers use the TCP/IP communications protocol. Several million hosts exist on the Internet; a host is a mainframe, mini, or workstation that directly supports the Internet protocol (the IP in TCP/IP).

Internet Corporation for Assigned Names and Numbers (ICANN) The non-profit organization having the responsibility for IP address and domain name assignments on the Internet.

Internet Explorer (IE) Microsoft's line of web browsers for Windows and Macintosh computers. Most websites are optimized to display best on systems running recent versions of IE.

interpreter A program for a high-level language that translates and executes the program at the same time. The program statements that are interpreted remain in their original source language, the way the programmer wrote them—that is, the program does not need to be compiled before execution. Interpreted programs run more slowly than compiled programs and always must be run with the interpreter loaded in memory.

interrupt A suspension of a process, such as the execution of a computer program, caused by an event external to that process and performed in such a way that the process can be resumed. An interrupt can be caused by internal or external conditions, such as a signal indicating that a device or program has completed a transfer of data. Hardware interrupts (also called IRQs) are used by devices, whereas software interrupts are used by programs. See also *IRQ*.

interrupt vector A pointer in a table that gives the location of a set of instructions the computer should execute when a particular interrupt occurs.

`IO.SYS` One of the DOS/Windows 9x system files required to boot the machine. The first file loaded from disk during the boot, it contains extensions to the ROM BIOS.

IP address An identifier for a computer or device on a TCP/IP network. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods, in which each number can be 0–255. The TCP/IP protocol routes messages based on the IP address of the destination.

IPv6 A new version of the IP protocol that expands the range of IP addresses from 32 bits to 128 bits, which relieves the strain on the current universe of IP addresses. IPv6 is backward compatible with IPv4 to allow its gradual adoption.

IPX (internetwork packet exchange) Novell NetWare's native LAN communications protocol (primarily in versions 4.x and earlier) used to move data between server and/or workstation programs running on different network nodes. IPX packets are encapsulated and carried by the packets used in Ethernet and the similar frames used in Token-Ring networks.

IrDA An infrared communications standard established by the Infrared Data Association in 1993. IrDA is currently used primarily for data transfer between portable computers or to allow portable computers to print to a printer with an IrDA port.

IRQ (interrupt request) Physical connections between external hardware devices and the interrupt controllers. When a device such as a floppy controller or a printer needs the attention of the CPU, an IRQ line is used to get the attention of the system to perform a task. On PC and XT IBM-compatible systems, eight IRQ lines are included, numbered IRQ0–IRQ7. On the AT and PS/2 systems, 16 IRQ lines are numbered IRQ0–IRQ15. IRQ lines must be used by only a single adapter in the ISA bus systems, but devices on Micro Channel Architecture (MCA), PCI (Peripheral Component Interconnect) and PCI Express buses can share interrupts. See also *virtual IRQ*.

ISA (Industry Standard Architecture) The bus architecture introduced as an 8-bit bus with the original IBM PC in 1981 and later expanded to 16 bits with the IBM PC/AT in 1984. ISA slots are occasionally found in PC systems today, but the latest chipsets have eliminated them.

ISA bus clock Clock that normally operates the ISA bus at 8.33MHz.

iSCSI Short for *Internet SCSI*, this is an implementation of SCSI that uses Ethernet networks using TCP/IP to transfer data in both directions between a server and a SCSI drive or drive array.

ISDN (Integrated Services Digital Network) An international telecommunications standard that enables a communications channel to carry digital data simultaneously with voice and video information.

ISO (International Standards Organization) The ISO, based in Paris, develops standards for international and national data communications. The U.S. representative to the ISO is the American National Standards Institute (ANSI). See also *High Sierra format*.

ISO 9660 An international standard that defines file systems for CD-ROM discs, independent of the operating system. ISO (International Standards Organization) 9660 has two levels. Level one provides for DOS file system compatibility, whereas level two allows filenames of up to 32 characters. See also *High Sierra format*.

ISP (Internet service provider) A company that provides Internet access to computer users. Most ISPs originally provided dialup analog modem service only, but many ISPs now provide various types of broadband support for DSL, cable modem, or fixed wireless Internet devices. Some ISPs, such as America Online (AOL), also provide proprietary content.

Itanium An Intel eighth-generation processor, codenamed Merced, it is the first 64-bit instruction PC processor from Intel. It features a new Explicitly Parallel Instruction Computing (EPIC) architecture for more performance when running optimized code. Also, it features internal L1/L2 and L3 error correcting code (ECC) caches to improve throughput and reliability. It was designed initially for the server or high-end workstation market. The improved Itanium 2 processor offers faster clock speeds and faster cache memory. See also *L3 cache*.

ITU (International Telecommunications Union) Formerly called CCITT. An international committee organized by the United Nations to set international communications recommendations—which frequently are adopted as standards—and to develop interface, modem, and data network recommendations. The Bell 212A standard for 1,200bps communication in North America, for example, is observed internationally as CCITT V.22. ITU standards for telecommunications used in PC based modems include V.22bis (2,400bps) through V.92 (56Kbps).

J-lead J-shaped leads on chip carriers, which can be surface-mounted on a PC board or plugged into a socket that then is mounted on a PC board, usually on .050" centers.

jabber An error condition on an Ethernet-based network in which a defective network card or outside interference is constantly sending data, preventing the rest of the network from working.

Java An object-oriented programming language and environment similar to C or C++. Java was developed by Sun Microsystems and is used to create network-based applications.

JavaScript A scripting language developed by Netscape for web browsers. JavaScript can perform calculations and mouse rollovers, but it doesn't require the web browser to download additional files, as with Java.

Jaz drive A proprietary type of removable media drive with a magnetic hard disk platter in a rigid plastic case. Developed by Iomega, Jaz drives were discontinued in 2002, but media is still available for both 1GB and 2GB versions of the drive.

JEDEC (Joint Electron Devices Engineering Council) A group that establishes standards for the electronics industry. JEDEC established the original PC66 SDRAM standard.

Joliet Microsoft extension of the ISO 9660 standard for recordable/rewritable CDs. Joliet is designed for use with 32-bit Windows versions that support long filenames, but it supports file/folder names up to 128 bytes (128 European or 64 Unicode characters) only. Some very long folder/filenames might need to be truncated when stored on a Joliet-format CD.

joule The standard unit of electrical energy, it's frequently used to measure the effectiveness of surge suppressors.

joystick An input device generally used for game software, usually consisting of a central upright stick that controls horizontal and vertical motion and one or more buttons to control discrete events, such as firing guns. More complex models can resemble flight yokes and steering wheels or incorporate tactile feedback.

JPEG (Joint Photographic Experts Group) The international consortium of hardware, software, and publishing interests which—under the auspices of the ISO—has defined a universal standard for digital compression and decompression of still images for use in computer systems. JPEG compresses at about a 20:1 ratio before visible image degradation occurs. A lossy data compression standard that was originally designed for still images but also can compress real-time video (30 frames per second) and animation. Lossy compression permanently discards unnecessary data, resulting in some loss of precision. Files stored in the JPEG format have the extension `.jpg` or `.jpeg`.

JScript Microsoft's equivalent to JavaScript. See also *JavaScript*.

jukebox A type of CD-ROM drive that enables several CD-ROM discs to be in the drive at the same time. The drive itself determines which disc is needed by the system and loads the discs into the reading mechanism as needed.

jumper block A small, plastic-covered metal clip that slips over two pins protruding from a circuit board. Sometimes also called a *shunt*. When in place, the jumper block connects the pins electrically and closes the circuit. By doing so, it connects the two terminals of a switch, turning it "on." Jumper blocks are commonly used to configure internal hard drives and motherboard settings.

Just a Bunch Of Disks (JBOD) A group of hard disk drives combined to act as a single volume. Similar to RAID 0, but the data is spanned and not striped.

K6 The popular line of Socket 7 and Super Socket 7 processors developed by AMD. Members included the K6, K6-2, and K6-III.

K56flex A proprietary standard for 56Kbps modem transmissions developed by Rockwell and implemented in modems from a variety of vendors. Superseded by the official V.90 standard for 56Kbps modems. See also *X2*, *V.90*, and *V.92*.

Kermit A protocol designed for transferring files between microcomputers and mainframes. Developed by Frank DaCruz and Bill Catchings at Columbia University (and named after the talking frog on *The Muppet Show*), Kermit was widely accepted in the academic world before the advent of the Internet.

kernel Operating system core component.

key disk In software copy protection schemes popular during the 1980s, a distribution floppy disk that must be present in a floppy disk drive for an application program to run.

keyboard The primary input device for most computers, consisting of keys with letters of the alphabet, digits, punctuation, and function control keys.

keyboard macro A series of keystrokes automatically input when a single key is pressed.

keychain drive A popular term for small solid-state devices using flash memory that connect to a PC through the USB port. Such devices are recognized as drive letters. Most have a fixed capacity, but some have provision for upgradeable memory with SD or other small-form-factor flash memory. Also known as *thumb drives*.

keylock Physical locking mechanism to prevent internal access to the system unit or peripherals.

kibi A multiplier indicating 1,024 of some unit. Abbreviated as Ki. See also *gibi*.

kilo A multiplier indicating one thousand (1,000) of some unit. Abbreviated as k or K. When used to indicate a number of bytes of memory storage, the multiplier definition changes to 1,024. One kilobit, for example, equals 1,000 bits, whereas one kilobyte equals 1,024 bytes.

kilobyte (KB) A unit of information storage equal to 1,000 bytes (decimal) or 1,024 bytes (binary). Binary KB are now called kibibytes. See also *kibi*.

kludge An inelegant but workable solution for a software or hardware problem.

KVM switch Short for *keyboard-video-mouse switch*, it's a device that permits a single keyboard, display, and mouse to control two or more PCs or servers.

L1 cache (level one) A first level processor memory cache built into the CPU core of 486 and later generation processors. See also *cache* and *disk cache*.

L2 cache (level two) A second-level processor memory cache, usually larger and sometimes slower than L1. Originally external to (and running significantly slower than) the processor, L2 was first integrated into the processor package in the Pentium Pro (November 1995), and later directly into the CPU die in the Mendocino core versions of the Celeron processor (August 1998). Since then virtually all new processors have included on-die L2 cache running at the full core speed of the processor. See also *SEC*, *cache*, and *disk cache*.

L3 cache (level three) A third-level processor memory cache rarely used in PC processors. See also *cache* and *disk cache*.

LAN Local area network; a network contained within a building. Both home and office networks are considered LANs. Ethernet, Fast Ethernet, Gigabit Ethernet, and Wireless Ethernet are used in office LANs, whereas home LANs might use Ethernet, Fast Ethernet, HomePNA, HomeRF, or Wi-Fi Wireless Ethernet.

landing zone An unused track on a disk surface on which the read/write heads can land when power is shut off. The place a parking program or a drive with an autopark mechanism parks the heads.

LAPM (link-access procedure for modems) An error-control protocol incorporated in CCITT Recommendation V.42. Similar to the MNP and HST protocols, it uses cyclic redundancy checking (CRC) and retransmission of corrupted data (ARQ) to ensure data reliability.

laptop computer A computer system smaller than a briefcase but larger than a notebook that usually has a clamshell design in which the keyboard and display are on separate halves of the system, which are hinged together. These systems normally run on battery power. Many vendors use the terms *notebook* and *laptop computer* interchangeably.

large mode A translation scheme used by the Award BIOS to translate the cylinder, head, and sector specifications of an IDE drive to those usable by an enhanced BIOS. It doesn't produce the same translated values as LBA mode and is not recommended because it is not supported by other BIOS vendors.

large-scale integration See *IC*.

laser printer A type of printer that is a combination of an electrostatic copying machine and a computer printer. The output data from the computer is converted by an interface into a raster feed, similar to the impulses a TV picture tube receives. The impulses cause the laser beam to scan a small drum that carries a positive electrical charge. Where the laser hits, the drum is discharged. A toner, which also carries a positive charge, is then applied to the drum. This toner—a fine, black powder—sticks to only the areas of the drum that have been discharged electrically. As it rotates, the drum deposits the toner on a negatively charged sheet of paper. Another roller then heats and bonds the toner to the page. See also *LED printer*.

latency 1) The amount of time required for a disk drive to rotate half a revolution. Represents the average amount of time to locate a specific sector after the heads have arrived at a specific track. Latency is part of the average access time for a drive. 2) The initial setup time required for a memory transfer in DRAM to select the row and column addresses for the memory to be read/written.

LBA (logical block addressing) A method used with SCSI and IDE drives to translate the cylinder, head, and sector specifications of the drive to those usable by an enhanced BIOS. LBA is used with drives that are larger than 528MB and causes the BIOS to translate the drive's logical parameters to those usable by the system BIOS.

LCC (leadless chip carrier) A type of integrated circuit package that has input and output pads rather than leads on its perimeter.

LCD (liquid crystal display) A display that uses liquid crystal sealed between two pieces of polarized glass. The polarity of the liquid crystal is changed by an electric current to vary the amount of light that can pass through. Because LCD displays do not generate light, they depend on the reflection of ambient light or backlighting the screen. The best type of LCD, the active-matrix or thin-film transistor (TFT) LCD, offers fast screen updates and true color capability.

LED (light-emitting diode) A semiconductor diode that emits light when a current is passed through it.

LED printer A printer that uses an LED instead of a laser beam to discharge the drum.

legacy port I/O ports used on systems before the development of the multipurpose USB port. Serial, parallel, keyboard, and PS/2 mouse ports are legacy ports.

letterbox Refers to how wide-screen movies are displayed on TV or monitor screens with normal aspect ratios of 4:3. Because wide-screen movies have aspect ratios as high as 16:9, the wide-screen image leaves blank areas at the top and bottom of the screen. See also *aspect ratio*.

LGA (land grid array) A type of chip socket that moves the pins from the processor to the motherboard. The pins (*lands*) connect to pads on the back side of the processor. The first LGA design is Socket 775.

LIF (low insertion force) A socket that requires only a minimum of force to insert a chip carrier.

light pen A handheld input device with a light-sensitive probe or stylus connected to the computer's graphics adapter board by a cable. Used for writing or sketching onscreen or as a pointing device for making selections. Unlike mice, it's not widely supported by software applications.

line-interactive UPS A UPS design that uses a two-way AC/DC inverter to charge the battery and provide power from the battery after AC power fails. It's the simplest type of UPS suitable for server use.

line voltage The AC voltage available at a standard wall outlet, nominally 110V–120V in North America and 220V–230V in Europe and Japan.

linear tape-open (LTO) A family of open standards for tape backups whose first products were introduced in mid-2000. LTO was jointly developed by Seagate, IBM, and Hewlett-Packard. Ultrium format products have capacities of up to 800GB (2:1 compression). The faster but smaller-capacity Accelis format was never manufactured. See also *Ultrium*.

lithium-ion A portable system battery type that is longer-lived than either NiCad or NiMH technologies, can't be overcharged, and holds a charge well when not in use. Lithium-ion batteries are also lighter weight than the NiCad and NiMH technologies. Because of these superior features, Li-ion batteries have come to be used in all but the very low end of the portable system market.

local area network (LAN) The connection of two or more computers, usually via a network adapter card or NIC.

local bus A generic term used to describe a bus directly attached to a processor that operates at the processor's speed and data-transfer width.

local echo A modem feature that enables the modem to send copies of keyboard commands and transmitted data to the screen. When the modem is in command mode (not online to another system), the local echo usually is invoked through an ATE1 command, which causes the modem to display the user's typed commands. When the modem is online to another system, the local echo is invoked by an ATF0 command, which causes the modem to display the data it transmits to the remote system.

logical drive A drive as named by a DOS drive specifier, such as C: or D:. Under DOS 3.3 or later, a single physical drive can act as several logical

drives, each with its own specifier. A primary partition can contain only one logical drive; an extended partition can contain one or more logical drives. See also *extended partition* and *primary partition*.

logical unit number See *LUN*.

lossless compression A compression technique that preserves all the original information in an image or other data structures. PKZIP and Microsoft CAB files are popular applications of lossless compression.

lossless linking A technique used by DVD+RW drives to enable the DVD+RW video-writing process to pause and continue as data is available. Lossless linking enables DVD+RW video media to be read by standalone DVD video players and DVD-ROM drives.

lossy compression A compression technique that achieves optimal data reduction by discarding redundant and unnecessary information in an image. MP3, MPEG, and JPEG are popular examples of lossy compression.

lost clusters Clusters that have been marked accidentally as "unavailable" in the FAT even though they don't belong to any file listed in a directory. See also *cluster*.

low-level formatting Formatting that divides tracks into sectors on the platter surfaces. Places sector-identifying information before and after each sector and fills each sector with null data (usually hex F6). Specifies the sector interleave and marks defective tracks by placing invalid checksum figures in each sector on a defective track.

LPT port Line printer port, a common system abbreviation for a parallel printer port. Common LPT port numbers range from LPT1 to LPT3.

LPX A semiproprietary motherboard design used in many Low Profile or Slimline case systems. Because no formal standard exists, these typically are not interchangeable between vendors and are often difficult to find replacement parts for or upgrade.

luminance Measure of brightness usually used in specifying monitor brightness.

LUN (logical unit number) A number given to a device (a logical unit) attached to a SCSI physical unit and not directly to the SCSI bus. Although as many as eight logical units can be attached to a single physical unit, a single logical unit typically is a built-in part of a single physical unit. A SCSI hard disk, for example, has a built-in SCSI bus adapter that is assigned a physical unit number or SCSI ID, and the controller and drive portions of the hard disk are assigned a LUN (usually 0). See also *PUN*.

LZW (Lempel Zev Welch) A lossless compression scheme used in the GIF and TIFF graphic formats, named after its co-creators, Abraham Lempel, Jacob Zev, and Terry Welch.

MAC address Short for *Media Access Control address*, this is a unique hardware number assigned to network hardware, such as NICs and routers. The MAC address assigned to the WAN side of some broadband Internet routers can be changed to equal the MAC address of the NIC previously used to attach to a broadband device, such as a cable modem.

machine address A hexadecimal (hex) location in memory.

machine language Hexadecimal program code a computer can understand and execute. It can be output from the assembler or compiler.

macro A series of commands in an application that can be stored and played back on demand. Many applications from various vendors support Microsoft Visual Basic for Applications as their macro language.

macro virus A computer virus that uses a scripting language to infect Microsoft Word document templates or email systems.

magnetic domain A tiny segment of a track just large enough to hold one of the magnetic flux reversals that encode data on a disk surface.

magneto-optical recording An erasable optical disk recording technique that uses a laser beam to heat pits on the disk surface to the point at which a magnet can make flux changes.

magneto-resistive A technology originally developed by IBM and commonly used for the read element of a read/write head on a high-density magnetic disk. Based on the principle that the

resistance to electricity changes in a material when brought into contact with a magnetic field (in this case, the read element material and the magnetic bit). Such drives use a magneto-resistive read sensor for reading and a standard inductive element for writing. A magneto-resistive read head is more sensitive to magnetic fields than inductive read heads. Giant magneto-resistive heads are an improved version that store more data in the same space.

mainframe A somewhat vague distinction that identifies any large computer system normally capable of supporting many users and programs simultaneously.

mask A photographic map of the circuits for a particular layer of a semiconductor chip used in manufacturing the chip.

master boot record (MBR) On hard disks, a one-sector-long record that contains the master boot program as well as the master partition table containing up to four partition entries. The master boot program reads the master partition table to determine which of the four entries is active (bootable) and then loads the first sector of that partition, called the volume boot record. The master boot program tests the volume boot record for a 55AAh signature at offset 510; if it's present, program execution is transferred to the volume boot sector, which typically contains a program designed to load the operating system files. The MBR is always the first physical sector of the disk, at Cylinder 0, Head 0, Sector 1. Also called *master boot sector*.

math coprocessor A processing chip designed to quickly handle complex arithmetic computations involving floating-point arithmetic, offloading these from the main processor. Originally contained in a separate coprocessor chip, starting with the 486 family of processors. Intel now has incorporated the math coprocessor into the main processors in what is called the *floating-point unit*.

Maximum Transmission Unit (MTU) The largest packet that a network can transmit, usually measured in bytes.

MCA (Micro Channel Architecture) Developed by IBM for the PS/2 line of computers and introduced on April 2, 1987. Features include a 16- or 32-bit bus width and multiple master control. By allowing several processors to arbitrate for resources on a single bus, the MCA is optimized for multitasking, multiprocessor systems. Offers switchless configuration of adapters, which eliminates one of the biggest headaches of installing older adapters. MCA systems became obsolete after the development of the PCI bus.

MCGA (multicolor graphics array) A type of PC video display circuit introduced by IBM on April 2, 1987, which supports text and graphics. Text is supported at a maximum resolution of 80×25 characters in 16 colors with a character box of 8×16 pixels. Graphics are supported at a maximum resolution of 320×200 pixels in 256 (from a palette of 262,144) colors or 640×480 pixels in two colors. The MCGA outputs an analog signal with a horizontal scanning frequency of 31.5KHz and supports analog color or analog monochrome displays.

MCH (memory controller hub) Intel's term for the chip used in its 8xx-series chipsets to connect the processor with high-bandwidth devices such as memory, video, and the system bus, replacing the North Bridge chip. MCH chips connect with the I/O controller hub (the 8xx chipsets' replacement for the South Bridge) through a high-speed hub interface. See also *ICH*.

MCI (media control interface) A device-independent specification for controlling multimedia devices and files. MCI is a part of the multimedia extensions and offers a standard interface set of device control commands. MCI commands are used for audio recording and playback and animation playback. Device types include CD audio, digital audio tape players, scanners, MIDI sequencers, videotape players or recorders, and audio devices that play digitized waveform files.

MDA (monochrome display adapter; also, MGA [mono graphics adapter]) A type of PC video display adapter introduced by IBM on August 12, 1981, that supports text only. Text is supported at a maximum resolution of 80×25 characters in four colors with a character box of 9×14 pixels. Colors, in this case, indicate black, white, bright white, and underlined. Graphics modes are not supported. The MDA outputs a digital signal with a horizontal scanning frequency of 18.432KHz and supports TTL monochrome displays. The IBM MDA card also includes a parallel printer port.

mean time between failure See *MTBF*.

mean time to repair See *MTTR*.

MEB Stands for *Mid-Level Electronics Bay*, an SSI form factor originally developed for use with slot-based server processors, now used for four-way and larger designs. Sometimes erroneously referred to as *EEB 3.5*.

mebi A multiplier indicating 1,048,576 of a unit of measurement.

mebibyte (Mi) A unit of information storage equal to 1,048,576 bytes (1,024×1,024 equals 1Mi). This value was previously called a binary megabyte. See also *megabyte* and *kilobyte*.

medium The magnetic coating or plating that covers a disk or tape.

mega A multiplier indicating one million (1,000,000) of some unit. Abbreviated as m or M. Traditionally, mega has also been defined as 1,048,576 (1,024 kilobytes, where kilobyte equals 1,024) in applications such as memory sizing and disk storage (as defined by many BIOSs and by FDISK and other disk preparation programs). The term *mebi* is now used for 1,048,576. See also *mebi*.

megabyte (MB) A unit of information storage equal to 1,000,000 bytes. Also called a *decimal megabyte*. The value 1,048,576 bytes has been called a binary megabyte but is now known as a mebibyte. See also *mebibyte*.

megapixel A unit of digital camera resolution equal to approximately 1,000,000 pixels. A 1-megapixel camera has a resolution of approximately 1,152×864; a 2-megapixel camera has a resolution of approximately 1,760×1,168. Finally, a 3-megapixel camera has a resolution of approximately 2,160×1,440. One-megapixel or lower-resolution cameras are suitable for 4"×6" or smaller snapshots only, whereas 2-megapixel cameras produce excellent 5"×7" enlargements and acceptable 8"×10" enlargements. Three-megapixel or higher-resolution cameras produce excellent 8"×10" and 11"×14" enlargements. The higher the megapixel rating, the more flash memory space is used by each picture and the longer it takes each picture to be recorded to flash memory.

memory Any component in a computer system that stores information for future use.

memory caching A service provided by extremely fast memory chips that keeps copies of the most recent memory accesses. When the CPU makes a subsequent access, the value is supplied by the fast memory rather than by the relatively slow system memory. L1 and L2 caches are memory caches found on most recent processors. See also *L1 cache*, *L2 cache*, and *L3 cache*.

memory scrubbing A task performed by many servers that repeatedly reads memory contents during idle time and corrects errors when possible. Noncorrectable errors are reported to the server management software so the defective module can be replaced.

Memory Stick A Sony-developed flash memory device that's about the size of a stick of gum. It is used by digital cameras, camcorders, digital music players, and voice recorders—primarily those made by Sony.

memory-resident program A program that remains in memory after it has been loaded, consuming memory that otherwise might be used by application software.

menu software Utility software that makes a computer running DOS easier to use by replacing DOS commands with a series of menu selections.

MESI Short for *modified exclusive shared invalid*, it's a cache coherency protocol used by Intel processors.

MFM encoding (modified frequency modulation encoding) A method of encoding data on the surface of a disk. The coding of a bit of data varies by the coding of the preceding bit to preserve clocking information. Used only by floppy drives today because it stores less data than other types of encoding, such as RLL. See also *RLL*.

MHz An abbreviation for *megahertz*, a unit of measurement indicating the frequency of one million cycles per second. One hertz (Hz) is equal to one cycle per second. Named after Heinrich R. Hertz, a German physicist who first detected electromagnetic waves in 1883.

MI/MIC (mode indicate/mode indicate common) Also called *forced* or *manual originate*. Provided for installations in which equipment other than the modem does the dialing. In such

installations, the modem operates in dumb mode (no auto-dial capability), yet must go off-hook in originate mode to connect with answering modems.

micro (μ) A prefix indicating one millionth (1/1,000,000 or .000001) of some unit.

micron A unit of measurement equaling one millionth of a meter. Often used in measuring the size of circuits in chip manufacturing processes. Current state-of-the-art chip fabrication builds chips with 0.13 to 0.15-micron circuits.

microprocessor A solid-state central processing unit much like a computer on a chip. An integrated circuit that accepts coded instructions for execution.

microsecond (μs) A unit of time equal to one millionth (1/1,000,000 or .000001) of a second.

MIDI (musical instrument digital interface) An interface and file format standard for connecting a musical instrument to a microcomputer and storing musical instrument data. Multiple musical instruments can be daisy-chained and played simultaneously with the help of the computer and related software. The various operations of the instruments can be captured, saved, edited, and played back. A MIDI file contains note information, timing (how long a note is held), volume, and instrument type for as many as 16 channels. Sequencer programs are used to control MIDI functions such as recording, playback, and editing. MIDI files store only note instructions and not actual sound data. MIDI files can be played back by virtually all sound cards, but old sound cards might use FM synthesis to imitate the musical instruments called for in the MIDI file. Recent sound cards use stored musical instrument samples for more realistic MIDI playback.

MII A Socket 7–compatible processor originally developed by Cyrix and now sold by VIA Technologies as the VIA Cyrix MII.

milli (m) A prefix indicating one thousandth (1/1,000 or .001) of some unit.

milliampere per hour (mAh) A current of one milliampere flowing for one hour. Often used to indicate the storage capacity of a rechargeable battery.

millivolt (mV) A unit of voltage equal to one thousandth of a volt.

millisecond (ms) A unit of time equal to one thousandth (1/1,000 or .001) of a second.

MIME (Multipurpose Internet Mail Extensions) Allows Internet and email services to exchange binary files and select the proper program to open the file after it's received.

minitower A type of PC system case that is shorter than a full- or mid-sized tower. Most low-cost computers sold at retail stores use the minitower case combined with a Micro-ATX motherboard.

MIPS (million instructions per second) Refers to the average number of machine-language instructions a computer can perform or execute in 1 second. Because various processors can perform different functions in a single instruction, MIPS should be used only as a general measure of performance among various types of computers.

MMX An Intel processor enhancement that adds 57 new instructions designed to improve multimedia performance. MMX also implies a doubling of the internal L1 processor cache on Pentium MMX processors compared to non-MMX Pentium processors. Later processors also include MMX along with other multimedia instructions.

mnemonic An abbreviated name for something used in a manner similar to an acronym. Computer processor instructions are often abbreviated with a mnemonic, such as JMP (jump), CLR (clear), STO (store), and INIT (initialize). A mnemonic name for an instruction or an operation makes it easy to remember and convenient to use.

MNP (Microcom Networking Protocol) Asynchronous error-control and data-compression protocols developed by Microcom, Inc., and now in the public domain. They ensure error-free transmission through error detection (CRC) and retransmission of erred frames. MNP Levels 1–4 cover error control and have been incorporated into CCITT Recommendation V.42. MNP Level 5 includes data compression but is eclipsed in superiority by V.42bis—an international standard that is more efficient. Most high-speed modems connect with MNP Level 5 if V.42bis is unavailable. MNP Level 10 provides error correction for impaired lines and

adjusts to the fastest possible speed during connection. MNP Level 10EC is an improved version of MNP Level 10, adding more reliability and support for cellular phone hand-offs.

MO (magneto-optical) MO drives use both magnetic and optical storage properties. MO technology is erasable and recordable, as opposed to CD-ROM (read-only) and WORM (write-once) drives. MO uses laser and magnetic field technology to record and erase data.

mobile module (MMO) A type of processor packing from Intel for mobile computers consisting of a Pentium or newer processor mounted on a small daughterboard along with the processor voltage regulator, the system's L2 cache memory, and the North Bridge part of the motherboard chipset.

modem (modulator/demodulator) A device that converts electrical signals from a computer into an audio form transmittable over telephone lines, or vice versa. It modulates, or transforms, digital signals from a computer into the analog form that can be carried successfully on a phone line; it also demodulates signals received from the phone line back to digital signals before passing them to the receiving computer. To avoid confusion with other types of Internet connection devices such as cable modems, modems are often called *analog modems* or *dialup modems*.

modulation The process of modifying some characteristic of a carrier wave or signal so that it varies in step with the changes of another signal, thus carrying the information of the other signal.

module An assembly that contains a complete circuit or subcircuit.

MOESI Short for *modified owned exclusive shared invalid*, it's a cache coherency protocol used by AMD Opteron processors.

monitor See *display*.

monochrome display adapter See *MDA*.

MOS (metal-oxide semiconductor) Refers to the three layers used in forming the gate structure of a field-effect transistor (FET). MOS circuits offer low-power dissipation and enable transistors to be jammed closely together before a critical heat problem arises. PMOS, the oldest type of MOS circuit, is a silicon-gate P-channel MOS process that uses currents made up of positive charges. NMOS is a silicon-gate N-channel MOS process that uses currents made up of negative charges and is at least twice as fast as PMOS. CMOS, complementary MOS, is nearly immune to noise, runs off almost any power supply, and is an extremely low-power circuit technique.

motherboard The main circuit board in the computer. Also called planar, system board, or backplane.

Mount Rainier (Mt. Rainier) A standard developed by Philips for CD-RW and DVD+RW drives that provides for native operating system support of rewriteable media. Drives and operating systems (such as Windows Vista) that support the Mount Rainier standard can read or write Mount Rainier–formatted CD-R/RW or DVD+R/RW media without the need for proprietary packet-reading software such as Roxio's UDF Volume Reader for DirectCD-formatted media (www.roxio.com). Mount Rainier compliant drives may carry the Philips EasyWrite marketing name and logo.

mouse An input device invented by Douglas Engelbart of Stanford Research Center in 1963 and popularized by Xerox in the 1970s. A mechanical mouse consists of a roller ball and a tracking mechanism on the underside that relays the mouse's horizontal and vertical position to the computer, allowing precise control of the pointer location onscreen. The top side features two or three buttons and possibly a small wheel used to select or click items onscreen. Old-style optical mice sold in the 1980s used a single optical sensor and a grid-marked pad as an alternative to the roller ball. The latest optical mice use two optical sensors and can be moved across virtually any nonmirrored surface.

MPC A trademarked abbreviation for *Multimedia Personal Computer*. The original MPC specification was developed by Tandy Corporation and Microsoft as the minimum platform capable of running multimedia software. In the summer of 1995, the MPC Marketing Council introduced an upgraded MPC 3 standard. The MPC 1 Specification defines the following minimum standard requirements: a 386SX or 486 CPU, 2MB RAM, 30MB hard disk, VGA video display, 8-bit digital audio subsystem, CD-ROM drive, and systems software compatible with the applications programming interfaces (APIs) of Microsoft Windows version 3.1 or later. The MPC 2

specification defines the following minimum standard requirements: 25MHz 486SX with 4MB RAM, 160MB hard disk, 16-bit sound card,; 65,536-color video display, double-speed CD-ROM drive, and systems software compatible with the APIs of Microsoft Windows version 3.1 or later. The MPC 3 specification defines the following minimum standard requirements: 75MHz Pentium with 8MB RAM, 540MB hard disk, 16-bit sound card, 65,536-color video display, quad-speed CD-ROM drive, OM-1–compliant MPEG-1 video, and systems software compatible with the APIs of Microsoft Windows version 3.1 and DOS 6.0 or later. Virtually all computers sold since 1995 exceed MPC 3 standards.

MPEG (Motion Picture Experts Group) A working ISO committee that has defined standards for lossy digital compression and decompression of motion video/audio for use in computer systems. The MPEG-1 standard delivers decompression data at 1.2MBps–1.5MBps, enabling CD players to play full-motion color movies at 30 frames per second. MPEG-1 compresses at about a 50:1 ratio before image degradation occurs, but compression ratios as high as 200:1 are attainable. MPEG-2 extends to the higher data rates (2Mbps–15Mbps) necessary for signals delivered from remote sources (such as broadcast, cable, or satellite). MPEG-2 is designed to support a range of picture aspect ratios, including 4:3 and 16:9. MPEG compression produces about a 50% volume reduction in file size. MP3 (the audio layer portion of the MPEG-1 standard) provides a wide range of compression ratios and file sizes for digital music storage, making it the de facto standard for exchanging digital music through sites such as Napster and its many rivals. See also *lossy compression*.

MPR The Swedish government standard for maximum video terminal radiation. The current version is called MPR II, but most monitors also comply with the newer and more restrictive TCO standards. See also *TCO*.

`MSDOS.SYS` One of the DOS/Windows 9x system files required to boot the machine. Contains the primary DOS routines. Loaded by `IO.SYS`, it in turn loads `COMMAND.COM`.

MTBF (mean time between failure) A statistically derived measure of the probable time a device will continue to operate before a hardware failure occurs, usually given in hours. Because no standard technique exists for measuring MTBF, a device from one manufacturer can be significantly more or significantly less reliable than a device with the same MTBF rating from another manufacturer.

MTTR (mean time to repair) A measure of the probable time it will take a technician to service or repair a specific device, usually given in hours.

Multichannel Multipoint Distribution Service (MMDS) The most common form of so-called "wireless cable TV," MMDS is also used for two-way wireless Internet service. One of the leading MMDS technology manufacturers is Navini Networks (www.navini.com).

multicolor graphics array See *MCGA*.

multimedia The integration of sound, graphic images, animation, motion video, and text in one environment on a computer. It is a set of hardware and software technologies that is rapidly changing and enhancing the computing environment.

multisession A term used in CD-ROM recording to describe a recording event. Multisession capabilities allow data recording on the disk at various times in several recording sessions. Kodak's Photo CD is an example of multisession CD-R technology. See also *session (single or multisession)*.

multitask To run several programs simultaneously.

multithread To concurrently process more than one message by an application program. OS/2 and 32-bit versions of Windows are examples of multithreaded operating systems. Each program can start two or more threads, which carry out various interrelated tasks with less overhead than two separate programs would require.

multiuser system A system in which several computer terminals share the same central processing unit (CPU).

nano (n) A prefix indicating one billionth (1/1,000,000,000 or .000000001) of some unit.

nanosecond (ns) A unit of time equal to one billionth (1/1,000,000,000 or .000000001) of a second.

National Institute of Standards and Technology (NIST) A nonregulatory federal agency within the U.S. Commerce Department's Technology Administration. Founded in 1901, NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology.

NetBEUI (NetBIOS Extended User Interface) A network protocol used primarily by Windows NT and Windows 9x and most suitable for small peer-to-peer networks. NetBEUI is not supported by Microsoft in Windows XP and above but can still be manually installed for use in troubleshooting computers.

NetBIOS (Network Basic Input/Output System) A commonly used network protocol originally developed by IBM and Sytek for PC local area networks. NetBIOS provides session and transport services (Layers 4 and 5 of the OSI model).

NetWare Novell's server-based network for large businesses. NetWare 5 and NetWare 6 are designed to work well with IP-based networks.

network A system in which several independent computers are linked to share data and peripherals, such as hard disks and printers.

Network Address Translation (NAT) An Internet standard allowing a router on a local area network to use one set of IP addresses internally, while using a second set of addresses for external traffic.

network attached storage (NAS) A hard disk-based storage device or array that plugs into the network and has its own IP address.

network interface card (NIC) An adapter that connects a PC to a network.

Network Layer In the OSI reference model, the layer that switches and routes the packets as necessary to get them to their destinations. This layer is responsible for addressing and delivering message packets. See also *OSI*.

Network Time Protocol (NTP) A standard Internet protocol allowing for the accurate synchronization of clocks on a network.

NiCad The oldest of the three battery technologies used in portable systems, nickel cadmium batteries are rarely used in portable systems today because of their shorter life and sensitivity to improper charging and discharging. See also *NiMH* and *lithium-ion*.

NiMH A battery technology used in portable systems. Nickel metal-hydride batteries have approximately a 30% longer life than NiCads, are less sensitive to the memory effect caused by improper charging and discharging, and do not use the environmentally dangerous substances found in NiCads. Newer lithium-ion (Li-ion) batteries are far superior. NiMH batteries can sometimes be used in place of NiCads.

NLX A new low-profile motherboard form factor standard that is basically an improved version of the semiproprietary LPX design. It's designed to accommodate larger processor and memory form factors and incorporate newer bus technologies, such as AGP and USB. Besides design improvements, it is fully standardized, which means you should be able to replace one NLX board with another from a different manufacturer—something that was not normally possible with LPX.

node A device on a network. Also any junction point at which two or more items meet.

noise Any unwanted disturbance in an electrical or mechanical system.

noninterlaced monitor A desirable monitor design in which the electron beam sweeps the screen in lines from top to bottom, one line after the other, completing the entire screen in one pass. Virtually all CRTs sold recently for desktop use are noninterlaced.

nonvolatile memory (NVRAM) Random-access memory whose data is retained when power is turned off. ROM/EPROM/EEPROM (flash) memory are examples of nonvolatile memory. Sometimes NVRAM is retained without any power whatsoever, as in EEPROM or flash memory devices. In other cases, the memory is maintained by a small battery. NVRAM that is battery maintained is sometimes also called CMOS memory (although CMOS RAM technically is volatile).

CMOS NVRAM is used in IBM-compatible systems to store configuration information. True NVRAM often is used in intelligent modems to store a user-defined default configuration loaded into normal modem RAM at power-up.

nonvolatile RAM disk A RAM disk powered by a battery supply so that it continues to hold its data during a power outage.

North Bridge The Intel term for the main portion of the motherboard chipset that incorporates the interface between the processor and the rest of the motherboard. The North Bridge contains the cache, main memory, and AGP controllers, as well as the interface between the high-speed (normally 66MHz or 100MHz) processor bus and the 33MHz PCI (peripheral component interconnect) or 66MHz AGP (accelerated graphics port) buses. The functional equivalent of the North Bridge on the latest 8xx-series chipsets from Intel is the MCH. See also *chipset*, *ICH*, *MCH*, and *South Bridge*.

notebook computer A very small personal computer approximately the size of a notebook.

NTSC The National Television Standards Committee, which governs the standard for television and video playback and recording in the United States. The NTSC was originally organized in 1941 when TV broadcasting first began on a wide scale in black and white, and the format was revised in 1953 for color. The NTSC format has 525 scan lines, a field frequency of 60Hz, a broadcast bandwidth of 4MHz, a line frequency of 15.75KHz, a frame frequency of 1/30 of a second, and a color subcarrier frequency of 3.58MHz. It is an interlaced signal, which means it scans every other line each time the screen is refreshed. The signal is generated as a composite of red, green, and blue signals for color and includes an FM frequency for audio and a signal for stereo. See also *PAL* and *SECAM*, which are incompatible systems used in Europe. NTSC is also called composite video.

null modem A serial cable wired so that two data terminal equipment (DTE) devices, such as personal computers, or two data communication equipment (DCE) devices, such as modems or mice, can be connected. Also sometimes called a *modem-eliminator* or a *LapLink cable*. To make a null-modem cable with DB-25 connectors, you wire these pins together: 1-1, 2-3, 3-2, 4-5, 5-4, 6-8-20, 20-8-6, and 7-7.

numeric coprocessor See *math coprocessor*.

NVRAM (nonvolatile random access memory) See *nonvolatile memory (NVRAM)*.

object hierarchy Occurs in a graphical program when two or more objects are linked and one object's movement is dependent on the other object. This is known as a *parent-child hierarchy*. In an example using a human figure, the fingers would be child objects to the hand, which is a child object to the arm, which is a child to the shoulder, and so on. Object hierarchy provides much control for an animator in moving complex figures.

OC (optical carrier) rates Various data rates for optical fiber used in Internet backbones, based on the OC-1 rate of 51.84Mbps. Multiply the OC rate by 51.84Mbps to derive the data rate. For example, OC-12 is 622.08Mbps (51.84×12).

Occam's Razor Also spelled Ockham's Razor; popular name for the principle that the simplest explanation is usually the correct one—a very useful principle in computer troubleshooting.

OCR (optical character recognition) An information-processing technology that converts human-readable text into computer data. Usually a scanner is used to read the text on a page, and OCR software converts the images to characters. Advanced OCR programs, such as OmniPage, can also match fonts, re-create page layouts, and scan graphics into machine-readable form.

ODI (Open Data-link Interface) A device driver standard from Novell that enables multiple protocols to run on the same network adapter card. ODI adds functionality to Novell's NetWare and network computing environments by supporting multiple protocols and drivers.

OEM (original equipment manufacturer) Any manufacturer who sells its product to a reseller. Usually refers to the original manufacturer of a particular device or component. Most HP hard disks, for example, are made by Seagate Technologies, who is considered the OEM. OEM products often differ in features from retail products and can have very short warranty periods if purchased separately from their intended use.

OLE (object linking and embedding) An enhancement to the original Dynamic Data Exchange (DDE) protocol that enables the user to embed or link data created in one application to a document created in another application and subsequently edit that data directly from the final document.

On-Board Diagnostics (OBD) A term that refers to the self-diagnostic and reporting technology and capability found in 1980s and newer automobiles with computer controlled engines.

online fallback A feature that enables high-speed error-control modems to monitor line quality and fall back to the next lower speed if line quality degrades. Some modems fall forward as line quality improves.

open architecture A system design in which the specifications are made public to encourage third-party vendors to develop add-on products. The PC is a true open architecture system, but the Macintosh is proprietary.

operating system (OS) A collection of programs for operating the computer. Operating systems perform housekeeping tasks, such as input and output between the computer and peripherals and accepting and interpreting information from the keyboard. Windows XP and Vista are examples of popular OSs used in PCs.

Opteron An AMD single-core and multi-core processor built for workstation and server tasks. Opteron supports AMD64 64-bit extensions. See also *AMD64*.

Optical Character Recognition (OCR) A system for optically scanning text from documents, then translating the text into digital character data that can be stored and searched via a computer.

optical disk A disk that encodes data as a series of reflective pits that are read (and sometimes written) by a laser beam.

Orange Book The standards for recordable (CD-R) and rewritable (CD-RW) compact discs.

originate mode A state in which the modem transmits at the predefined low frequency of the communications channel and receives at the high frequency. The transmit/receive frequencies are the reverse of the called modem, which is in answer mode. See also *answer mode*.

OS/2 An operating system originally developed through a joint effort by IBM and Microsoft Corporation and later by IBM alone. Originally released in 1987, OS/2 is a 32-bit operating system designed to run on computers using the Intel 386 or later microprocessors. The OS/2 Workplace Shell, an integral part of the system, is a graphical interface similar to Microsoft Windows and the Apple Macintosh system. OS/2 Warp 4 is the most recent version and is used primarily as a server or in back-office functions today.

OSI (Open Systems Interconnection) A reference model developed by the International Organization for Standardization (ISO) in the 1980s, the OSI model splits a computer's networking stack into seven discrete layers. Each layer provides specific services to the layers above and below it. From the top down, the Application Layer is responsible for program-to-program communication; the Presentation Layer manages data representation conversions. Next, the Session Layer is responsible for establishing and maintaining communications channels, and the Transport Layer is responsible for the integrity of data transmission. The Network Layer routes data from one node to another, the Data Link Layer is responsible for physically passing data from one node to another, and finally, the Physical Layer is responsible for moving data on and off the network media.

output Information processed by the computer or the act of sending that information to a mass storage device, such as a video display, printer, or modem.

overclocking The process of running a processor or video card at a speed faster than the officially marked speed by using a higher clock multiplier, faster bus speed, or faster core clock speed. Not recommended or endorsed by processor or video card manufacturers. See also *clock multiplier*.

OverDrive An Intel trademark name for its line of upgrade processors for 486, Pentium, and Pentium Pro systems. Although Intel no longer sells OverDrive processors, similar products are available from Evergreen Technologies and PowerLeap Products, Inc., for these processors plus Pentium II, Pentium III, Pentium 4, and Celeron-based systems.

overlay Part of a program loaded into memory only when it is required.

overrun A situation in which data moves from one device more quickly than a second device can accept it.

overscanning A technique used in consumer display products that extends the deflection of a CRT's electron beam beyond the physical boundaries of the screen to ensure that images always fill the display area.

overwrite To write data on top of existing data, thus erasing the existing data.

package A device that includes a chip mounted on and sealed inside a carrier.

packet A message sent over a network that contains data and a destination address.

packet writing A recording technique that sends data to a CD-R or CD-RW disc in multiple blocks, enabling normal writing processes in Windows Explorer to be used instead of a CD-mastering program. Compatible packet-reading software, such as Roxio's UDF Reader for DirectCD, must be used on systems that don't have a CD-R or CD-RW drive to enable the media to be read. See also *Mt. Rainier*.

pairing Combining processor instructions for optimal execution on superscalar processors.

PAL 1) Phase Alternating Line system. Invented in 1961, a system of TV broadcasting used in England and other European countries (except France). PAL's image format is 4:3, 625 lines, 50Hz, and 4MHz video bandwidth with a total 8MHz of video channel width. With its 625-line picture delivered at 25 frames per second, PAL provides a better image and an improved color transmission over the NTSC system used in North America. As a consequence, PAL and NTSC video tapes aren't interchangeable. 2) Programmable array logic, a type of chip that has logic gates specified by a device programmer.

palmtop computer A computer system smaller than a notebook that is designed so it can be held in one hand while being operated by the other. Many are now called *PDAs* or *personal digital assistants*.

parallel A method of transferring data characters in which the bits travel down parallel electrical paths simultaneously—for example, eight paths for 8-bit characters. Data is stored in computers in parallel form but can be converted to serial form for certain operations.

parity A method of error checking in which an extra bit is sent to the receiving device to indicate whether an even or odd number of binary 1 bits was transmitted. The receiving unit compares the received information with this bit and can obtain a reasonable judgment about the validity of the character. The same type of parity (even or odd) must be used by two communicating computers, or both may omit parity. When parity is used, a parity bit is added to each transmitted character. The bit's value is 0 or 1, to make the total number of 1s in the character even or odd, depending on which type of parity is used. Parity checking isn't widely supported on recent systems, but memory with parity bits can be used as ECC memory on systems with ECC-compatible chipsets. See also *ECC*.

park program A program that executes a seek to the highest cylinder or just past the highest cylinder of a drive so the potential of data loss is minimized if the drive is moved. Park programs are not interchangeable between drives and are no longer required on most drives 40MB and above because these drives self-park their heads for safety.

partition A section of a hard disk devoted to a particular operating system. Most hard disks have only one partition, devoted to DOS. A hard disk can have as many as four partitions, each occupied by a different operating system. DOS v3.3 or later can occupy two of these four partitions. A boot manager enables you to select the partition occupied by the operating system you want to start if you have multiple operating systems installed in different partitions. See also *boot manager*.

Pascal A high-level programming language named for the French mathematician Blaise Pascal (1623–1662). Developed in the early 1970s by Niklaus Wirth for teaching programming and designed to support the concepts of structured programming.

passive heatsink A heatsink that does not include a fan. Passive heatsinks used on processors are usually larger than active heatsinks and rely on case fans to dissipate heat. Many North Bridge or memory control hubs on recent motherboards also use passive heatsinks.

passive matrix Another name for dual-scan, display-type LCDs.

PC Card (PCMCIA—Personal Computer Memory Card International Association) A credit card–sized expansion adapter for notebook and laptop PCs. PC Card is the official PCMCIA trademark; however, both PC Card and PCMCIA card are used to refer to these standards. PCMCIA cards are removable modules that can hold numerous types of devices, including memory, modems, fax/modems, radio transceivers, network adapters, solid state disks, hard disks, and flash memory adapters.

PCI (Peripheral Component Interconnect) A standard bus specification initially developed by Intel in 1992 that bypasses the standard ISA I/O bus and uses the system bus to increase the bus clock speed and take full advantage of the CPU's data path. The most common form of PCI is 32 bits wide running at 33MHz, but 66MHz and 64-bit wide versions of PCI are frequently used on servers.

PCI Express A high-speed serial I/O interconnect standard being developed by the PCI-SIG (www.pcisig.com) as an eventual replacement for the original PCI standard. The initial version of PCI Express supports 0.8V signaling at 2.5GHz, while version 2 and later support 5GHz, allowing for 250MBps or 500MBps bandwidth per lane, respectively. Connectors featuring 1, 2, 4, 8, and 16 lanes are used in PCs, with up to 32 lanes possible.

PCI-X (Peripheral Component Interconnect Extended) A faster 64-bit version of PCI with speeds up to 133MHz. PCI-X is backward-compatible with PCI but also supports fault-tolerant features such as automatic reinitializing and disabling of faulty add-on cards.

PCL (Printer Control Language) Developed by Hewlett-Packard in 1984 as a language for the HP LaserJet printer. PCL is now the de facto industry standard for PC printing. PCL defines a standard set of commands, enabling applications to communicate with HP or HP-compatible printers and is supported by virtually all printer manufacturers. Various levels of PCL are supported by HP and other brands of laser and inkjet printers.

PCM (pulse code modulation) A technique for digitizing analog signals by sampling the signal and converting each sample into a binary number. Also stands for powertrain control module, which is what the computer in most modern automobiles is called.

PDA (personal digital assistant) A handheld, palm-sized computer that functions primarily as a personal organizer and can be combined with a cellular phone or pager. Leading examples include the Palm series, Windows–based PalmPCs, and the Handspring (which also runs the Palm OS).

PDF (portable document format) Files with this extension can be read with the Adobe Acrobat Reader. See also *Acrobat*.

pedestal A server chassis that resembles a tower chassis but is wider, taller, and deeper to permit the use of larger motherboards. Some pedestal server chassis include wheels, and some can be converted to a rack-mount form factor.

peer-to-peer A type of network in which any computer can act as both a server (by providing access to its resources to other computers) and a client (by accessing shared resources from other computers).

pel See *pixel*.

Pentium An Intel microprocessor with 32-bit registers, a 64-bit data bus, and a 32-bit address bus. The Pentium has a built-in L1 cache segmented into a separate 8KB cache for code and another 8KB cache for data. The Pentium includes an FPU or math coprocessor. It is backward compatible with the 486 and can operate in real, protected virtual, and virtual real modes. The MMX Pentium has a 16KB cache for code, has a 16KB cache for data, and adds the MMX instruction set.

Pentium 4 The first Intel seventh-generation processor, it's based on a new 32-bit microarchitecture that operates at higher clock speeds because of hyper pipelined technology, a rapid execution engine, a 400MHz system bus (later boosted to 533MHz and 800MHz), and an execution trace cache. The system bus runs at four times the processor bus speed. The floating-point and

multimedia units have been improved by making the registers 128 bits wide and adding a separate register for data movement. Finally, SSE2 adds 144 new instructions for double-precision floating-point, SIMD integer, and memory management. The original Socket 423 version (Willamette) was later replaced by Socket 478 (Northwood) and finally by Socket 775 (Prescott) running at up to 3.6GHz. 800MHz system bus versions also support HT Technology.

Pentium 4 Extreme Edition A high-speed version of the Pentium 4 that includes 2MB of L3 cache. The original versions ran at 3.46GHZ and were made in Socket 478 and Socket 775. Later versions boosted the system bus from 800MHz to 1066MHz, used the Prescott core, and ran at 3.73MHz. It has been replaced by the Pentium Extreme Edition.

Pentium D An Intel seventh-generation processor (code named Smithfield and Presler) that includes two Pentium 4 Prescott or Cedar Mill processor cores in the same processor die. The Pentium D fits into Socket 775 and was the first dual-core PC processor, introduced in May 2005. The Pentium D includes EM64T architecture. See also *EM64T* and *AMD64*.

Pentium Extreme Edition A seventh-generation EM64T-compatible dual-core processor based on the Pentium D, but with HT Technology enabled. Dual-processor–enabled operating systems treat this chip as having four logical processors. Requires a different chipset from the Pentium D. See also *Pentium D*, *EM64T*, and *AMD64*.

Pentium II An Intel sixth-generation processor similar to the Pentium Pro but with MMX capabilities and SEC cartridge packaging technology. Includes L2 cache running at half-core speed.

Pentium III An Intel sixth-generation processor similar to the Pentium II but with SSE (Streaming SIMD Extensions) added. Later PIII models (code-named Coppermine) include on-die L2 cache running at full core speed. It's available in both cartridge (Slot 1) and chip package (Socket 370) versions.

Pentium Pro An Intel sixth-generation (P6) processor with 32-bit registers, a 64-bit data bus, and a 36-bit address bus. The Pentium Pro has the same segmented Level 1 cache as the Pentium but also includes a 256KB, 512KB, or 1MB of L2 cache on a separate die inside the processor package. The Pentium Pro includes an FPU or math coprocessor. It is backward compatible with the Pentium and can operate in real, protected, and virtual real modes. The Pentium Pro fits into Socket 8.

peripheral Any piece of equipment used in computer systems that is an attachment to the computer. Disk drives, terminals, and printers are all examples of peripherals.

persistence In a monitor, the quality of the phosphor chemical that indicates how long the glow caused by the electrons striking the phosphor will remain onscreen.

personal computer (PC) Generically any small computer that can be used by an individual; more specifically, a type of personal computer that is based on the original IBM PC introduced in 1981.

Personal Video Recorder (PVR) See *Digital Video Recorder (DVR)*.

petabyte (P) A measure of disk capacity equaling 1,000,000,000,000,000 bytes.

PGA 1) Pin grid array. A chip package that has a large number of pins on the bottom designed for socket mounting. 2) Professional graphics adapter. A limited-production, high-resolution graphics card for XT and AT systems from IBM.

phosphor A layer of electroluminescent material applied to the inside face of a cathode-ray tube (CRT). When bombarded by electrons, the material fluoresces, and after the bombardment stops it phosphoresces.

phosphorescence The emission of light from a substance after the source of excitation has been removed.

Photo CD A technology developed by Eastman Kodak and Philips that stores photographic images on a CD-R recordable compact disc. Images stored on the Photo CD can have resolutions as high as 2,048×3,072 pixels. Up to 100 true-color images (24-bit color) can be stored on one disc. Photo CD images are created by scanning film and digitally recording the images on compact discs. The digitized images are indexed (given a 4-digit code), and

thumbnails of each image on the disc are shown on the front of the case along with its index number. Multisession capability enables several rolls of film to be added to a single disc on different occasions.

photolithography The photographic process used in electronic chip manufacturing that creates transistors and circuit and signal pathways in semiconductors by depositing different layers of various materials on the chip.

photoresist A chemical used to coat a silicon wafer in the semiconductor manufacturing process that makes the silicon sensitive to light for photolithography.

physical drive A single disk drive. DOS defines logical drives, which are given a specifier, such as C: or D:. A single physical drive can be divided into multiple logical drives. Conversely, special software can span a single logical drive across two physical drives.

Physical Layer See *OSI*.

physical unit number See *PUN*.

PICMG The PCI Industrial Computers Manufacturers Group is a trade association that develops standards for single-board and industrial computers. Its standards include AdvancedTCA, CompactPCI, and others. See also *AdvancedTCA* and *CompactPCI*.

Picture CD A simplified version of Photo CD that stores scanned images from a single roll of film on a CD-R disc. Images on Picture CDs, unlike those on Photo CDs, are stored in the industry-standard JPEG file format and can be opened with most photo-editing programs.

PIF (program information file) A file that contains information about a non-Windows application specifying optimum settings for running the program under Windows 3.x. These are called property sheets in 32-bit Windows.

PIN (Personal Identification Number) A personal numeric password used for identification purposes.

pin The lead on a connector, chip, module, or device.

pin compatible Chips having the same pinout functions. For example, a VIA C3 processor is pin compatible with an Intel Celeron (Socket 370 version).

pinout A listing of which pins have which functions on a chip, socket, slot, or other connector.

PIO mode (programmed input/output mode) The standard data transfer modes used by IDE drives that use the processor's registers for data transfer. This is in contrast with DMA modes, which transfer data directly between main memory and the device. The slowest PIO mode is 0, and the fastest PIO mode is mode 4 (16.66MBps). Faster modes use Ultra DMA transfers. See also *Ultra DMA*.

pipeline A path for instructions or data to follow.

pixel A mnemonic term meaning *picture element*. Any of the tiny elements that form a picture on a video display screen. Also called a *pel*.

pixels per inch (ppi) A measurement of resolution used primarily by video displays and monitors.

pixel shader A small program that controls the appearance of individual pixels in a 3D image. Most recent mid-range and high-end GPUs such as NVIDIA's GeForce 3 and GeForce 4 Ti series and the ATI 8xxx and 9xxx series have built-in pixel shaders. See also *GPU*, *hardware shader*, and *vertex shader*.

PKZIP The original ZIP-format compression/decompression program developed by the late Phil Katz. His company, PKWARE, continues to develop PKZIP for popular operating systems, including Windows.

planar board A term equivalent to motherboard, used by IBM in some of its literature.

plasma display A display technology that uses plasma (electrically charged gas) to illuminate each pixel.

plated media Hard disk platters plated with a form of thin metal film medium on which data is recorded.

platter A disk contained in a hard disk drive. Most drives have two or more platters, each with data recorded on both sides.

PLCC (plastic leaded-chip carrier) A chip-carrier package with J-leads around the perimeter of the package.

Plug and Play (PnP) A hardware and software specification developed by Intel that enables a PnP system and PnP adapter cards to automatically configure themselves. PnP cards are free from switches and jumpers and are configured via the PnP BIOS in the host system, or via supplied programs for non-PnP systems. PnP also allows the system to detect and configure external devices, such as monitors, modems, and devices attached to USB or IEEE-1394 ports. Windows 9x and later support PnP devices.

polling A communications technique that determines when a device is ready to send data. The system continually interrogates polled devices in a round-robin sequence. If a device has data to send, it sends back an acknowledgment and the transmission begins. This contrasts with interrupt-driven communications, in which the device generates a signal to interrupt the system when it has data to send. Polling enables two devices that would normally have an IRQ conflict to coexist because the IRQ is not used for flow control.

port A plug or socket that enables an external device, such as a printer, to be attached to the adapter card in the computer. Also a logical address used by a microprocessor for communication between it and various devices.

port address One of a system of addresses used by the computer to access devices such as disk drives or printer ports. You might need to specify an unused port address when installing any adapter boards in a system unit.

port replicator For mobile computers, a device that plugs into the laptop and provides all the ports for connecting external devices. The advantage of using a port replicator is that the external devices can be left connected to the replicator and the mobile computer can be connected to them all at once by connecting to the replicator, rather than connecting to each individual device. A port replicator differs from a docking station in that the latter can provide additional drive bays and expansion slots not found in port replicators. Traditionally, port replicators have plugged into a proprietary bus on the rear of a portable computer, but so-called universal models might attach to the PC Card (PCMCIA) slot or to a USB port.

portable computer A computer system smaller than a transportable system but larger than a laptop system. Very few systems in this form factor are sold today, but companies such as Dolch still produce them. Most portable systems conform to the lunchbox style popularized by Compaq or the briefcase style popularized by IBM, each with a fold-down (removable) keyboard and built-in display. These systems characteristically run on AC power and not on batteries, include several expansion slots, and can be as powerful as full desktop systems.

POS (Programmable Option Select) The Micro Channel Architecture's POS eliminates switches and jumpers from the system board and adapters by replacing them with programmable registers. Automatic configuration routines store the POS data in a battery-powered CMOS memory for system configuration and operations. The configuration utilities rely on adapter description files (ADF) that contain the setup data for each card.

POST (power-on self test) A series of tests run by the computer at power-on. Most computers scan and test many of their circuits and sound a beep from the internal speaker if this initial test indicates proper system performance.

PostScript A page-description language developed primarily by John Warnock of Adobe Systems for converting and moving data to the laser-printed page. Instead of using the standard method of transmitting graphics or character information to a printer and telling it where to place dots one by one on a page, PostScript provides a way for the laser printer to interpret mathematically a full page of shapes and curves. Adobe Acrobat converts PostScript output files into files that can be read by users with varying operating systems. See also *Acrobat*.

POTS (plain old telephone service) Standard analog telephone service.

power factor conversion (PFC) An expression of how efficient a power supply or UPS is at providing power. A device that provides 100% of its rated

output has a PFC of 1.0. In practice, high-quality power supplies and UPS units have PFCs in the 90%–97% range (.90–.97 PFC).

power management Systems used initially in mobile computers (and now also used in desktop systems) to decrease power consumption by turning off or slowing down devices during periods of inactivity. See also *APM*.

power supply An electrical/electronic circuit that supplies all operating voltage and current to the computer system.

PPGA (plastic pin grid array) A chip-packaging form factor used by Intel as an alternative to traditional ceramic packaging.

PPP (Point-to-Point Protocol) A protocol that enables a computer to use the Internet with a standard telephone line and high-speed modem. PPP has largely replaced the Serial Line Internet Protocol (SLIP) because it supports line sharing and error detection.

PPPoE (Point-to-Point Protocol over Ethernet) A specification for connecting to the Internet, used primarily on DSL connections.

precompensation A data write modification required by some older drives on the inner cylinders to compensate for the higher density of data on the (smaller) inner cylinders.

Presentation Layer See *OSI*.

primary partition An ordinary, single-volume bootable partition. See also *extended partition*.

printer A device that records information visually on paper or other material.

Private Branch Exchange (PBX) A private telephone network used within an organization.

processor See *microprocessor*.

processor speed The clock rate at which a microprocessor processes data. A typical Pentium 4 processor, for example, operates at 2GHz (2 billion cycles per second).

program A set of instructions or steps telling the computer how to handle a problem or task.

Programmable Logic Controller (PLC) An electronic device that can be programmed to control a process or machine operation.

PROM (programmable read-only memory) A type of memory chip that can be programmed to store information permanently—information that can't be erased. Also referred to as OTP for *one-time programmable*.

proprietary Anything invented by one company and uses components available from only that one company. Especially applies to cases in which the inventing company goes to lengths to hide the specifications of the new invention or to prevent other manufacturers from making similar or compatible items. The opposite of standard or open architecture. Computers with nonstandard components that are available from only the original manufacturer, such as Apple Macintosh systems, are known as proprietary.

protected mode A mode available in all Intel and compatible processors except the first-generation 8086 and 8088. In this mode, memory addressing is extended beyond the 1MB limits of the 8088 and real mode and restricted protection levels can be set to trap software crashes and control the system.

protocol A system of rules and procedures governing communications between two or more devices. Protocols vary, but communicating devices must follow the same protocol to exchange data. The data format, readiness to receive or send, error detection, and error correction are some of the operations that can be defined in protocols.

proxy server A computer that acts as a gateway between the computers on a network and the Internet and also provides page caching and optional content filtering and firewall services to the network. Some home network software solutions for Internet sharing, such as WinProxy, use a proxy server.

PS/2 mouse A mouse designed to plug into a dedicated mouse port (a round, 6-pin DIN connector) on the motherboard, rather than plugging into a serial port. The name comes from the fact that this port was first introduced on the IBM PS/2 systems.

PUN (physical unit number) A term used to describe a device attached directly to the SCSI bus. Also known as a SCSI ID. As many as eight SCSI devices can be attached to a single SCSI bus, and each must have a unique PUN or ID assigned from 7 to 0. Normally, the SCSI host adapter is assigned the highest-priority ID, which is 7. A bootable hard disk is assigned an ID of 0, and other nonbootable drives are assigned higher priorities.

QAM (quadrature amplitude modulation) A modulation technique used by high-speed modems that combines both phase and amplitude modulation. This technique enables multiple bits to be encoded in a single time interval.

QDR (quad data rate) A high-speed SDRAM technology (www.qdrsram.com) that uses separate input and output ports with a DDR interface to enable four pieces of data to be processed at the same time. See also *DDR*.

QIC (Quarter-Inch Committee) An industry association that sets hardware and software standards for tape-backup units that use quarter-inch-wide tapes. QIC, QIC-Wide, Travan, and Travan NS drives are all based on QIC standards.

Quantum Formerly a major maker of hard disk drives and now a major maker of attached network storage devices. Quantum-brand disk drives are now sold and supported by Maxtor.

QuickTime An audio/video system and media player developed by Apple Computer.

QWERTY keyboard The standard typewriter or computer keyboard, with the characters Q, W, E, R, T, and Y on the top row of alpha keys. Because of the haphazard placement of characters, this keyboard can hinder fast typing.

RAID (redundant array of independent or inexpensive disks) A storage unit that employs two or more drives in combination for fault tolerance and greater performance, used mostly in file server applications. Originally used only with SCSI drives and host adapters, many motherboards now feature ATA/IDE or SATA RAID implementations.

RAID On Motherboard (ROMB) A RAID controller built into a motherboard.

rail A voltage tap or source inside of a power supply. Also a plastic or metal bracket attached to the sides of drives mounted in PCs. They fit into channels in the side of each disk drive bay position and might be held in position with screws or snap into place.

RAM (random-access memory) All memory accessible at any instant (randomly) by a microprocessor.

RAM disk A "phantom disk drive" in which a section of system memory (RAM) is set aside to hold data, just as though it were a number of disk sectors. To an operating system, a RAM disk looks and functions like any other drive.

RAMBUS Dynamic RAM See *RDRAM*.

RAMDAC (random-access memory digital-to-analog converter) A special type of DAC found on video cards. RAMDACs use a trio of DACs—one each for red, green, and yellow—to convert image data into a picture. RAMDACs were formerly separate chips but are now integrated into the 3D accelerator chips on most recent video cards.

random-access file A file in which all data elements (or records) are of equal length and written in the file end to end, without delimiting characters between. Any element (or record) in the file can be found directly by calculating the record's offset in the file.

random-access memory See *RAM*.

raster A pattern of horizontal scanning lines normally on a computer monitor. An electromagnetic field causes the beam of the monitor's tube to illuminate the correct dots to produce the required characters.

raster graphics A technique for representing a picture image as a matrix of dots. It is the digital counterpart of the analog method used in TV. Several raster graphics standards exist, including PCX, TIFF, BMP, JPEG, and GIF.

RCA jack Also called a *phono connector*, this is a plug and socket for a two-wire coaxial cable used to connect audio and video components. The plug is a 1/8"-thick prong that sticks out 5/16" from the middle of a cylinder.

RDRAM (Rambus DRAM) A proprietary high-speed dynamic RAM technology developed by Rambus, Inc., which was supported by some 8xx series Intel chipsets for Pentium III and early Pentium 4 systems from 1999 through 2001. Memory modules with RDRAM chips are called RIMMs (Rambus inline memory modules). Rambus licenses its technology to other semiconductor companies, who manufacture the chips and RIMMs.

read-only file A file whose attribute setting in the file's directory entry tells DOS not to allow software to write into or over the file.

read-only memory See *ROM*.

read/write head A tiny magnet that reads and writes data on a disk track.

RealAudio A system and player for streaming audio data over the Internet. Developed by RealNetworks.

real mode A mode available in all Intel 8086–compatible processors that enables compatibility with the original 8086. In this mode, memory addressing is limited to 1MB.

real-time The actual time in which a program or an event takes place. In computing, real-time refers to an operating mode under which data is received and processed and the results returned so quickly that the process appears instantaneous to the user. The term also is used to describe the process of simultaneous digitization and compression of audio and video information.

reboot The process of restarting a computer and reloading the operating system.

Red Book More commonly known as *Compact Disc-Digital Audio (CD-DA)*, this is one of four compact disc standards. Red Book got its name from the color of the manual used to describe the CD-Audio specifications. The Red Book audio standard requires that digital audio be sampled at a 44.1KHz sample rate using 16 bits for each sample. This is the standard used by audio CDs and many CD-ROMs.

redundant power supply (RPS) A power supply with two or more modules, one of which is in service at a time. If the primary module fails, another automatically takes its place. An RPS might be designed into a server or could be retrofitted later.

refresh cycle A cycle in which the computer accesses all memory locations stored by DRAM chips so that the information remains intact. DRAM chips must be accessed several times per second; otherwise, the information fades.

refresh rate Another term for the vertical scan frequency of monitors.

register Storage area in memory having a specified storage capacity—such as a bit, byte, or computer word—and intended for a special purpose.

Registry The system configuration files used by Windows 95 and later to store settings about installed hardware and drivers, user preferences, installed software, and other settings required to keep Windows running properly. Augments and replaces the `WIN.INI` and `SYSTEM.INI` files used in Windows 3.x and earlier. The Registry structure varies between Windows versions.

release candidate (RC) A final test release of a program during the beta test process, to help find and fix any bugs before the product is released to manufacturing for duplication.

remote digital loopback A test that checks the phone link and a remote modem's transmitter and receiver. Data entered from the keyboard is transmitted from the initiating modem, received by the remote modem's receiver, looped through its transmitter, and returned to the local screen for verification.

remote echo A copy of the data received by the remote system, returned to the sending system, and displayed onscreen. A function of the remote system.

rendering Generating a 3D image that incorporates the simulation of lighting effects, such as shadows and reflection.

resolution 1) A reference to the size of the pixels used in graphics. In medium-resolution graphics, pixels are large. In high-resolution graphics, pixels are small. 2) A measure of the number of horizontal and vertical pixels that can be displayed by a video adapter and monitor.

REV A proprietary hard-disk-based removable-media drive made by Iomega. REV has a native/2.6:1 compressed capacity of 35/90GB per cartridge. REV can be used for backup or primary storage. An autoloader is also available. See also *autoloader*.

revolutions per minute (RPM) A measurement of rotational speed.

reverse engineering The act of duplicating a hardware or software component by studying the functions of the component and designing a different one that has the same functions.

RFI (radio frequency interference) A high-frequency signal radiated by improperly shielded conductors, particularly when signal path lengths are comparable to or longer than the signal wavelengths. The FCC now regulates RFI in computer equipment sold in the U.S. under FCC Regulations, Part 15, Subpart J.

RGB (red green blue) A type of computer color display output signal composed of separately controllable red, green, and blue signals, as opposed to composite video, in which signals are combined prior to output. RGB monitors offer much higher resolution and sharper pictures than composite monitors.

ribbon cable Flat cable with wires running in parallel, such as those used for internal IDE or SCSI.

Rich Text Format (RTF) A universal file format suitable for exchanging formatted text files between different word processing and page layout programs.

RIMM (Rambus inline memory module) A type of memory module made using RDRAM chips. See also *RDRAM*.

RISC (reduced instruction set computer) Differentiated from CISC, the complex instruction set computer. RISC processors have simple instruction sets requiring only one or a few execution cycles. These simple instructions can be used more effectively than CISC systems with appropriately designed software, resulting in faster operations. See also *CISC*.

RJ-11 The standard two-wire connector type used for single-line telephone connections.

RJ-14 The standard four-wire connector type used for two-line telephone connections.

RJ-45 An informal designation used to describe the 8P8C (8-pin, 8-conductor) standard connector type used in networking with twisted-pair cabling. Resembles an RJ-11/14 telephone jack, but RJ-45 is larger with more wires.

RLL (run-length limited) A type of encoding that derives its name from the fact that the techniques used limit the distance (run length) between magnetic flux reversals on the disk platter. Several types of RLL encoding techniques exist, although only two are commonly used. (1,7) RLL encoding increases storage capacity by about 30% over MFM encoding and is most popular in the very highest capacity drives due to a better window margin, whereas (2,7) RLL encoding increases storage capacity by 50% over MFM encoding and is used in the majority of RLL implementations. Most IDE, ESDI, and SCSI hard disks use one of these forms of RLL encoding.

RMA number (return-merchandise authorization number) A number given to you by a vendor when you arrange to return an item for repairs. Used to track the item and the repair.

ROM (read-only memory) A type of memory that has values permanently or semipermanently burned in. These locations are used to hold important programs or data that must be available to the computer when the power initially is turned on.

ROM BIOS (read-only memory basic input/output system) A BIOS encoded in a form of read-only memory for protection.

root directory The main directory of any hard or floppy disk. It has a fixed size and location for a particular disk volume and can't be resized dynamically the way subdirectories can.

router A device that is used to connect various networks, intelligently routing information between them. It is used to internetwork similar and dissimilar networks and can select the most expedient route based on traffic load, line speeds, costs, and network failures. Routers use forwarding tables to determine which packets should be forwarded between the connected networks. A cable

or DSL modem is an example of a simple router that connects the Internet to your own network. Many routers include firewall capability to block suspect packets from being transmitted between networks.

routine Set of frequently used instructions. It can be considered as a subdivision of a program with two or more instructions that are related functionally.

RS-232 An interface introduced in August 1969 by the Electronic Industries Association. The RS-232 interface standard provides an electrical description for connecting peripheral devices to computers. Originally, RS-232 (serial) ports on computers used a 25-pin interface, but starting with the IBM AT, most use a 9-pin interface.

RTC (real-time clock) A battery-powered clock included on the motherboard of 286-class and newer computers. The contents of the RTC are read at startup time to provide the time display in the operating system's clock. It's often part of the NVRAM chip.

S/PDIF (Sony Philips Digital Interface) Provides digital I/O on high-end sound cards and multimedia-capable video cards. Might use either an RCA jack or optical jack; some devices support both types of S/PDIF connectors.

S-Video (Y/C) Type of video signal used in the Hi8 and S-VHS videotape formats in which the luminance and chrominance (Y/C) components are kept separate, providing greater control and quality of each image. S-video transmits luminance and color portions separately, thus avoiding the NTSC encoding process and its inevitable loss of picture quality.

SATA (Serial ATA) A high-speed serial interface designed to replace the current parallel ATA and UltraATA drive interface standards. Serial ATA 1.0 uses a seven-wire data/ground cable and supports direct point-to-point connections to host adapters at initial speeds of up to 150MBps, which is faster than UltraATA-133. SATA 3GB/sec hardware is now available. See also *Ultra DMA*.

scan codes The hexadecimal codes actually sent by the keyboard to the motherboard when a key is pressed.

scan lines The parallel lines across a video screen, along which the scanning spot travels in painting the video information that makes up a monitor picture. NTSC systems use 525 scan lines to a screen; PAL systems use 625.

ScanDisk The default disk drive testing program included with Windows 9x/Me; might be referred to as *error checking* in the Drive properties screen. Windows NT and later do not include ScanDisk, and instead use CHKDSK to test drives.

scanner A device that reads an image and converts it into computer data.

scanning frequency A monitor measurement that specifies how often the image is refreshed. See also *vertical scan frequency*.

scratch disk A disk that contains no useful information and can be used as a test disk. IBM has a routine on the Advanced Diagnostics disks that creates a specially formatted scratch disk to be used for testing floppy drives.

SCSI (small computer system interface) A standard originally developed by Shugart Associates (then called SASI for Shugart Associates System Interface) and later approved by ANSI in 1986. SCSI-2 (now called SPI-2) was approved in 1994, and Ultra3 SCSI (now called SPI-3) was approved in 2000. Ultra4 SCSI (now called SPI-4) was approved in 2002. Eight-bit (narrow) versions of SCSI typically use a 50-pin connector and permit multiple devices (up to eight including the host) to be connected in daisy-chain fashion. Some low-cost narrow SCSI devices might use a 25-pin connector. Wide and Ultra Wide versions of SCSI use a 68-pin connector and can support up to 16 devices, including the host. An 80-pin connector is used on hot-swap SCSI drives used in RAID arrays.

SDLC (Synchronous Data Link Control) A protocol developed by IBM for software applications and communicating devices operation in IBM's Systems Network Architecture (SNA). Defines operations at the link level of communications—for example, the format of data frames exchanged between modems over a phone line.

SDRAM (synchronous DRAM) RAM that runs at the same speed as the main system bus.

SEC (single edge contact) An Intel processor packaging design in which the processor and optional L2 cache chips are mounted on a small circuit board (much like an oversized memory SIMM), which might be sealed in a metal and plastic cartridge. The cartridge is then plugged into the motherboard through an edge connector called Slot 1 or Slot 2, which looks similar to an adapter card slot. Several variations to the SEC cartridge form factor exist: The single edge contact cartridge (SECC) has a cover and a thermal plate; the single edge contact cartridge 2 (SECC2) has a cover, but no thermal plate; and the single edge processor package (SEPP, which is used only with Celeron processors) has no cover or thermal plate. In implementations with no thermal plate, the heatsink is attached directly to the processor package or die.

SECAM Sequential Couleur A Mémoire (sequential color with memory), the French color TV system also adopted in Russia. The basis of operation is the sequential recording of primary colors in alternate lines. The image format is 4:3, 625 lines, 50Hz, and 6MHz video bandwidth with a total 8MHz of video channel width.

SECC (single edge contact cartridge) See *SEC*.

SECC2 (single edge contact cartridge 2) See *SEC*.

sector A section of one track defined with identification markings and an identification number. Most sectors hold 512 bytes of data.

security software Utility software that uses a system of passwords and other devices to restrict an individual's access to subdirectories and files.

seek time The amount of time required for a disk drive to move the heads across one-third of the total number of cylinders. Represents the average time it takes to move the heads from one cylinder to another randomly selected cylinder. Seek time is a part of the average access time for a drive.

self-extracting file An archive file that contains its own extraction program. Open it in a file manager, such as Windows Explorer, to uncompress the files it contains. Because all types of files, including Trojans, can be distributed as `.exe` files (the extension also used by self-extracting files), consider using a program such as WinZip to examine the contents of an `.exe` file before you open it.

semiconductor A substance, such as germanium or silicon, whose conductivity is poor at low temperatures but is improved by minute additions of certain substances or by the application of heat, light, or voltage. Depending on the temperature and pressure, a semiconductor can control a flow of electricity. Semiconductors are the basis of modern electronic-circuit technology.

SEPP (single edge processor package) See *SEC*.

sequencer A software program that controls MIDI file messages and keeps track of music timing. Because MIDI files store note instructions instead of actual sounds, a sequencer is needed to play, record, and edit MIDI sounds. Sequencer programs enable recording and playback of MIDI files by storing the instrument, note pitch (frequency), duration (in real-time) that each note is held, and loudness (amplitude) of each musical or sound-effect note.

sequential file A file in which varying-length data elements are recorded end to end, with delimiting characters placed between each element. To find a particular element, you must read the whole file up to that element.

serial The transfer of data characters one bit at a time, sequentially, using a single electrical path.

Serial ATA See *SATA*.

Serial Attached SCSI (SAS) A high-speed serial implementation of SCSI adopted in 2003, SAS combines backward compatibility with SATA drives, a current performance of 300MBps, and future improvements to data rates up to 1,200MBps.

serial mouse A mouse designed to connect to a computer's serial port.

serial port An I/O connector used to connect to serial devices. See also *RS-232*.

server A computer in a network that enables resources such as files and printers to be shared by multiple users.

Server System Infrastructure (SSI) A series of power supply, motherboard, and chassis standards developed by Intel for servers.

ServerWorks A major developer of server chipsets for use with Pentium III Xeon and Xeon/Xeon MP processors. Now owned by Broadcom.

Service Set Identifier (SSID) A unique identifier of up to 32 characters that serves to differentiate or "name" a wireless network.

servo The mechanism in a drive that enables the head positioner to adjust continuously so that it is precisely placed above a given cylinder in the drive.

servo data Magnetic markings written on disk platters to guide the read/write heads in drives that use voice-coil actuators.

session (single or multisession) A term used in CD-ROM recording to describe a recording event. In a single session, data is recorded on a CD-ROM and an index is created. If additional space is left on the disc, another session can be used to record additional files along with another index. Some older CD-ROM drives do not expect additional recording sessions and therefore are incapable of reading the additional session data on the disc. The advent of Kodak's Photo CD propelled the desire for multisession CD-ROM XA (extended architecture) drives.

Session Layer See *OSI*.

settling time The time required for read/write heads to stop vibrating after they have been moved to a new track.

shadow mask A thin screen full of holes that adheres to the inside of a color CRT. The electron beam is aimed through the holes in the mask onto the phosphor dots. See also *aperture grille*.

shadow RAM A copy of a system's slower-access ROM BIOS placed in faster-access RAM, usually during the startup or boot procedure. This setup enables the system to access BIOS code without the penalty of additional wait states required by the slower ROM chips. Also called *shadow ROM* or *ROM shadowing*.

shell The generic name of any user interface software. `COMMAND.COM` is the standard shell for DOS; 32-bit Windows uses the Windows Explorer as a graphical shell and either `COMMAND.COM` (Windows 9x/Me) or `CMD.EXE` (Windows NT and later) as the command-line shell.

shielded twisted-pair (STP) Unshielded twisted-pair (UTP) network cabling with a metal sheath or braid around it to reduce interference, usually used in Token-Ring networks.

shock rating A rating (usually expressed in G force units) of how much shock a disk drive can sustain without damage. Usually two specifications exist for a drive powered on or off.

signal-to-noise (S/N) ratio The strength of a video or an audio signal in relation to interference (noise). The higher the S/N ratio, the better the quality of the signal. The latest high-end sound cards have an S/N ratio of 100:1.

silicon The base material for computer chips. An element, silicon (symbol Si) is contained in the majority of rock and sand on earth and is the second most abundant element on the planet next to oxygen.

SIMD (single instruction multiple data) The term used to describe the MMX and SSE instructions added to the Intel processors. These instructions can process matrixes consisting of multiple data elements with only a single instruction, enabling more efficient processing of graphics and sound data.

SIMM (single inline memory module) An array of memory chips on a small PC board with a single row of I/O contacts. SIMMs commonly have 30 or 72 connectors.

Simple Mail Transfer Protocol (SMTP) A protocol for sending email messages between network servers.

single-ended An electrical signaling method in which a single line is referenced by a ground path common to other signals. In a single-ended bus intended for moderately long distances, commonly one ground line exists between groups of signal lines to provide some resistance to signal crosstalk. Single-ended signals require only one driver or receiver pin per signal, plus one ground pin per group of signals. Single-ended signals are vulnerable to common mode noise and crosstalk but are much less expensive than differential signaling methods.

SIP (single inline package) A DIP-like package with only one row of leads.

skinny dip Twenty-four-position and 28-position DIP devices with .300" row-to-row centerlines.

sleep See *suspend*.

SLIP (Serial Line Internet Protocol) An Internet protocol that is used to run the Internet Protocol (IP) over serial lines, such as telephone circuits. IP enables a packet to traverse multiple networks on the way to its final destination. Largely replaced by PPP. See also *PPP*.

slot A physical connector on a motherboard to hold an expansion card, SIMMs and DIMMs, or a processor card in place and make contact with the electrical connections.

Slot 1 The motherboard connector designed by Intel to accept its SEC cartridge processor design used by the Pentium II and early Celeron and Pentium III processors.

Slot 2 A motherboard connector for Pentium II and Pentium III Xeon processors intended mainly for file server applications. Slot 2 systems support up to four-way symmetric multiprocessing.

S.M.A.R.T. (self-monitoring analysis and reporting technology) An industry standard for advance reporting of imminent hard drive failure. When this feature is enabled in the BIOS and a S.M.A.R.T.-compliant hard drive is installed, detected problems can be reported to the computer. This enables the user to replace a drive before it fails. Programs such as Norton System Works and Norton Utilities are compatible with these status messages.

SMBIOS A BIOS that incorporates system management functions and reporting compatibility with the Desktop Management Interface (DMI).

SMPTE time code An 80-bit standardized edit time code adopted by SMPTE, the Society of Motion Picture and Television Engineers. The SMPTE time code is a standard used to identify individual video frames in the video-editing process. SMPTE time code controls such functions as play, record, rewind, and forward of video tapes. SMPTE time code displays video in terms of hours, minutes, seconds, and frames for accurate video editing.

snow A flurry of bright dots that can appear anywhere onscreen on a monitor.

SO-J (small outline J-lead) A small DIP package with J-shaped leads for surface mounting or socketing.

socket A receptacle, usually on a motherboard although sometimes also found on expansion cards, into which processors or chips can be plugged.

Socket 1–8 The Intel specifications for eight different sockets to accept various Intel processors in the 486, Pentium, and Pentium Pro families.

Socket 370 A 370-pin socket used by socketed versions of the Celeron and Pentium III and the VIA C3 processors.

Socket 423 The socket used by the initial versions of the Pentium 4.

Socket 462 See *Socket A*.

Socket 478 A 478-pin socket used by the Northwood versions of the Pentium 4.

Socket 603 A 603-pin socket used by Intel Xeon processors based on the Pentium 4 design.

Socket 604 A 604-pin socket used by Intel Xeon processors based on the Pentium 4 design. It is backward compatible with Socket 603 processors.

Socket 754 A 754-pin socket used by the AMD Athlon 64 and some versions of the Sempron.

Socket 775 A 775-land socket used by the latest Intel Pentium 4 processors as well as the Pentium 4 Extreme Edition, Pentium D, and Pentium Extreme Edition.

Socket 939 A 939-pin socket used by recent versions of the Athlon 64 FX and all Athlon 64 X2 processors.

Socket 940 A 940-pin socket used by the AMD Opteron processor and early versions of the Athlon 64 FX processor.

Socket A A 462-pin socket used by socketed versions of the AMD Athlon; all AMD Athlon MP, Athlon XP, Duron; and most versions of the AMD Sempron.

Socket AM2 A 940-pin socket used by many versions of the AMD Athlon 64, 64 X2, 64 FX, Opteron, and Sempron processors.

Socket F A 1207-pin socket used by AMD Quad FX platform processors to allow two dual-core processors to work together in a quad-core platform. Also called Socket 1207 FX by AMD and Socket L1 by NVIDIA.

Socket T Early name for Socket 775. See also *Socket 775*.

SODIMM (small outline dual inline memory module) An industry-standard 144-pin memory module designed for use primarily in laptop and portable computers.

soft error An error in reading or writing data that occurs sporadically, usually because of a transient problem, such as a power fluctuation.

software A series of instructions loaded in the computer's memory that instructs the computer in how to accomplish a problem or task.

sound card An adapter card with sound-generating capabilities.

South Bridge The Intel term for the lower-speed component in the chipset that has always been a single individual chip; it has been replaced in the 8xx-series chipsets by the ICH. The South Bridge connects to the 33MHz PCI bus and contains the IDE interface ports and the interface to the 8MHz ISA bus (when present). It also typically contains the USB interface and even the CMOS RAM and real-time clock functions. The South Bridge contains all the components that make up the ISA bus, including the interrupt and DMA controllers. See also *chipset*, *ICH*, *MCH*, and *North Bridge*.

SPI (SCSI parallel interface) Alternative name for common SCSI standards. See also *SCSI*.

spindle The central post on which a disk drive's platters are mounted.

spindle count In notebook and laptop computers with interchangeable drives, spindle count refers to how many drives can be installed and used at the same time.

splitter Used in DSL and cable modem service to separate Internet signals from those used by the existing telephone (DSL) or cable TV service.

SRAM (static random access memory) A form of high-speed memory. SRAM chips do not require a refresh cycle like DRAM chips and can be made to operate at very high access speeds. SRAM chips are very expensive because they normally require six transistors per bit. This also makes the chips larger than conventional DRAM chips. SRAM is volatile, meaning it will lose data with no power. SRAMs are often used for cache memory.

SSE (streaming SIMD extensions) The name given by Intel for the 70 new MMX-type instructions added to the Pentium III processor when it was introduced. See also *MMX* and *SIMD*.

ST-506/412 A hard disk interface invented by Seagate Technology and introduced in 1980 with the ST-506 5MB hard drive. IDE drives emulate this disk interface.

stack An area of memory storage for temporary values that normally are read in the reverse order from which they are written. Also called last-in, first-out (LIFO).

stackable hub or switch A hub or switch that can be connected to another hub or switch to increase its capacity. The uplink port on the existing hub or switch is used to connect the new hub or switch.

stair-stepping Jagged raster representation of diagonals or curves; corrected by antialiasing.

standby Defines an optional operating state of minimal power reduction with the shortest recovery time.

standby UPS A UPS that quickly switches into operation during a power outage.

standoffs In a motherboard and case design, small nonconductive spacers (usually plastic or nylon) used to keep the underside of the motherboard from contacting the metallic case, thus preventing short circuits of the motherboard.

start/stop bits The signaling bits attached to a character before and after the character is transmitted during asynchronous transmission.

starting cluster The number of the first cluster occupied by a file. Listed in the directory entry of every file.

Stateful Packet Inspection (SPI) A technology used in firewalls to ensure that all incoming packets are the result of an outbound request.

stepper motor actuator An assembly that moves disk drive read/write heads across platters by a sequence of small partial turns of a stepper motor. Once common on low-cost hard disk drives of 40MB or less, stepper motor actuators are now confined to floppy disk drives.

stepping The code used to identify the revision of a processor. New masks are introduced to build each successive stepping, incorporating any changes necessary to fix known bugs in prior steppings.

storage A device or medium on or in which data can be entered or held and retrieved at a later time. Synonymous with memory.

storage area network (SAN) A network of high-speed storage devices accessible by network servers.

streaming In tape backup, a condition in which data is transferred from the hard disk as quickly as the tape drive can record the data so the drive does not start and stop or waste tape.

string A sequence of characters.

subdirectory A directory listed in another directory. Subdirectories themselves exist as files.

subroutine A segment of a program that can be executed by a single call. Also called *program module*.

Super DLT (SDLT) An enhanced version of the DLT tape standard that supports faster data transfer and native/2:1 compressed capacities up to 300/600GB.

superscalar execution The capability of a processor to execute more than one instruction at a time.

surface mount Chip carriers and sockets designed to mount to the surface of a PC board.

surge protector A device in the power line that feeds the computer and provides protection against voltage spikes and other transients.

suspend Refers to a level of power management in which substantial power reduction is achieved by the display or other components. The components can have a longer recovery time from this state than from the standby state.

SVGA (Super VGA) Refers to a video adapter or monitor capable of 800×600 resolution.

SWEDAC (Swedish Board for Technical Accreditation) Regulatory agency establishing standards such as MPR1 and MPR2, which specify maximum values for both alternating electric fields and magnetic fields and provide monitor manufacturers with guidelines in creating low-emission monitors.

switch Also called a *switching hub*, it's a type of hub that reads the destination address of each packet and then forwards the packet to only the correct port, minimizing traffic on other parts of the network. Unlike a regular hub, which wastes network bandwidth by copying packets to all ports, a switch forwards packets to only their intended recipients, immediately reducing network traffic jams and improving overall efficiency for the entire network. Many switches also support full-duplex service, effectively doubling the speed of full-duplex network cards attached to the switch. See also *hub*.

SXGA (Super XGA) Refers to a video adapter or monitor capable of 1280×1024 or greater resolution.

synchronous communication A form of communication in which blocks of data are sent at strictly timed intervals. Because the timing is uniform, no start or stop bits are required. Compare this with asynchronous communication. Some mainframes support only synchronous communication unless a synchronous adapter and appropriate software have been installed. See also *asynchronous communication*.

system crash A situation in which the computer freezes up and refuses to proceed without rebooting. Usually caused by faulty software, it's unlike a hard disk crash—no permanent physical damage occurs.

system files Files with the system attribute. Usually, the hidden files that are used to boot the operating system. The MS-DOS and Windows 9x system files include `IO.SYS` and `MSDOS.SYS`; the IBM DOS system files are `IBMBIO.COM` and `IBMDOS.COM`.

System Management Mode (SMM) Circuitry integrated into Intel processors that operates independently to control the processor's power use based on its activity level. It enables the user to specify time intervals after which the CPU will be powered down partially or fully and also supports the suspend/resume feature that enables instant power-on and power-off.

T13 The T13 Technical Committee (www.t13.org) is responsible for developing ATA and SATA standards.

tape drive Any data storage drive that uses tape as the storage medium.

tape library An array of tape drives that can be partitioned into multiple logical libraries. Tape libraries incorporate autoloaders. See also *autoloader*.

target A device attached to a SCSI bus that receives and processes commands sent from another device (the initiator) on the SCSI bus. A SCSI hard disk is an example of a target.

TCM (Trellis-coded modulation) An error-detection and correction technique employed by high-speed modems to enable higher-speed transmissions that are more resistant to line impairments.

TCO 1) Refers to the Swedish Confederation of Professional Employees, which has set stringent standards for devices that emit radiation. See also *MPR*. 2) Total cost of ownership. The cost of using a computer. It includes the cost of the hardware, software, and upgrades as well as the cost of the in-house staff and consultants who provide training and technical support.

TCP (tape carrier package) A method of packaging processors for use in portable systems that reduces the size, power consumed, and heat generated by the chip. A processor in the TCP form factor is essentially a raw die encased in an oversized piece of polyamide film. The film is laminated with copper foil that is etched to form the leads that will connect the processor to the motherboard.

TCP port number Logical port numbers used by TCP to communicate between computers—for example, web browsing (http://) uses TCP port 80. POP3 email uses TCP port 110. Some firewalls require you to manually configure open TCP port numbers to allow certain processes and programs to work.

TCP/IP (Transmission Control Protocol/Internet Protocol) A set of protocols developed by the U.S. Department of Defense (DoD) to link dissimilar computers across many types of networks. This is the primary protocol used by the Internet.

TEB Thin Electronics Bay is an SSI-developed standard for rack-mounted servers.

Temporal Key Integrity Protocol (TKIP) A technique for scrambling encryption keys and changing the keys over time.

temporary backup A second copy of a work file, usually having the extension `.BAK`. Created by application software so you easily can return to a previous version of your work.

temporary file A file temporarily (and usually invisibly) created by a program for its own use.

tera A multiplier indicating one trillion (1,000,000,000,000) of some unit. Abbreviated as t or T. A binary tera (now called a tebi) is 1,099,511,627,776.

terabyte (T) A unit of information storage equal to 1,000,000,000,000 bytes.

terminal A device whose keyboard and display are used for sending and receiving data over a communications link. Differs from a microcomputer in that it has no internal processing capabilities. Used to enter data into or retrieve processed data from a system or network.

terminal mode An operational mode required for microcomputers to transmit data. In terminal mode, the computer acts as though it were a standard terminal, such as a teletypewriter, rather than a data processor. Keyboard entries go directly to the modem, whether the entry is a modem command or data to be transmitted over the phone lines. Received data is output directly to the screen. The more popular communications software products

control terminal mode and enable more complex operations, including file transmission and saving received files.

terminator Hardware or circuits that must be attached to or enabled at both ends of an electrical bus. A terminator prevents the reflection or echoing of signals that reach the ends of the bus and ensures that the correct impedance load is placed on the driver circuits on the bus. Most commonly used with the SCSI bus and Thin Ethernet.

TFT (thin-film transistor) The highest quality and brightest LCD color display type. A method for packaging one–four transistors per pixel within a flexible material that is the same size and shape as the LCD display, which enables the transistors for each pixel to lie directly behind the liquid crystal cells they control.

thick Ethernet See *10BASE-5*.

thin Ethernet See *10BASE-2*.

thin-film media Hard disk platters that have a thin film (usually three-millionths of an inch) of medium deposited on the aluminum substrate through a sputtering or plating process.

Thinnet See *10BASE-2*.

through-hole Chip carriers and sockets equipped with leads that extend through holes in a PC board.

throughput The amount of user data transmitted per second without the overhead of protocol information, such as start and stop bits or frame headers and trailers.

thumb drive See *keychain drive*.

TIFF (tagged image file format) A way of storing and exchanging digital image data. Developed by Aldus Corporation, Microsoft Corporation, and major scanner vendors to help link scanned images with the popular desktop publishing applications. Supports three main types of image data: black-and-white data, halftones or dithered data, and grayscale data. Compressed TIFF files are stored using lossless compression.

time code A frame-by-frame address code time reference recorded on the spare track of a videotape or inserted in the vertical blanking interval. The time code is an eight-digit number encoding time in hours, minutes, seconds, and video frames.

Token-Ring A type of local area network in which the workstations relay a packet of data called a token in a logical ring configuration. When a station wants to transmit, it takes possession of the token, attaches its data, and then frees the token after the data has made a complete circuit of the electrical ring. It transmits at speeds of 4, 16Mbps or 100Mbps. Originally developed and supported by IBM, support is now provided by Madge Networks (www.madge.com).

toner The ultrafine, colored, plastic powder used in laser printers, LED printers, and photocopiers to produce the image on paper.

tower A personal computer that normally sits on the floor and is mounted vertically rather than horizontally.

TPI (tracks per inch) Used as a measurement of magnetic track density. Standard 5 1/4" 360KB floppy disks have a density of 48TPI, and the 1.2MB disks have a 96TPI density. All 3 1/2" disks have a 135.4667TPI density, and hard disks can have densities greater than 3,000TPI.

track One of the many concentric circles that holds data on a disk surface. Consists of a single line of magnetic flux changes and is divided into some number of 512-byte sectors.

track density Expressed as tracks per inch (TPI); defines how many tracks are recorded in 1" of space measured radially from the center of the disk. Sometimes also called *radial density*.

track-to-track seek time The time required for read/write heads to move between adjacent tracks.

transistor A semiconductor device invented in 1947 at Bell Labs (released in 1948) that is used to amplify a signal or open and close a circuit. In digital computers, it functions as an electronic switch. It is reduced to microscopic size in modern digital integrated circuits containing 100 million or more individual transistors.

Transport Layer In the OSI reference model, when more than one packet is in process at any time, such as when a large file must be split into multiple packets for transmission, this is the layer

that controls the sequencing of the message components and regulates inbound traffic flow. See also *OSI*.

transportable computer A computer system larger than a portable system and similar in size and shape to a portable sewing machine. Most transportables conform to a design similar to the original Compaq portable, with a built-in CRT display. These systems are characteristically very heavy and run on only AC power. Because of advances primarily in LCD and plasma-display technology, these systems are obsolete and have been replaced by portable systems.

troubleshooting The task of determining the cause of a problem.

true-color images Also called *24-bit color images* because each pixel is represented by 24 bits of data, allowing for 16.7 million colors. The number of colors possible is based on the number of bits used to represent the color. If 8 bits are used, 256 possible color values (28) exist. To obtain 16.7 million colors, each of the primary colors (red, green, and blue) is represented by 8 bits per pixel, which enables 256 possible shades for each of the primary red, green, and blue colors or 16.7 million total colors (256×256×256).

TrueType An Apple/Microsoft-developed scalable font technology designed to provide a high-performance alternative to PostScript Type 1 fonts. TrueType fonts are supported by both Windows and MacOS, but a particular TrueType font must either be made in both MacOS and Windows versions or support the cross-platform OpenType font format to be used on both platforms.

TSR (terminate-and-stay-resident) A program that remains in memory after being loaded. Because they remain in memory, TSR programs can be reactivated by a predefined keystroke sequence or other operation while another program is active. Usually called resident programs. TSR programs are often loaded from the `AUTOEXEC.BAT` file used at startup by DOS and Windows 9x.

TTL (transistor-to-transistor logic) Digital signals often are called TTL signals. A TTL display is a monitor that accepts digital input at standardized signal voltage levels.

TWAIN An imaging standard used to interface scanners and digital cameras to applications such as Photoshop and other image editors. TWAIN enables the user to scan or download pictures without exiting the image-editing program.

TweakUI An unsupported software utility provided by Microsoft for 32-bit Windows users. TweakUI allows users to change the user interface and adjust Registry settings without manual Registry editing.

twisted pair A type of wire in which two small, insulated copper wires are wrapped or twisted around each other to minimize interference from other wires in the cable. Two types of twisted-pair cables are available: unshielded and shielded. Unshielded twisted-pair (UTP) wiring commonly is used in telephone cables and 10BASE-T, 100BASE-TX, and 1000BASE-T networking and provides little protection against interference. Shielded twisted-pair (STP) wiring is used in some networks or any application in which immunity from electrical interference is more important. Twisted-pair wire is much easier to work with than coaxial cable and is cheaper as well.

two-way server A server with two separate processors. A server running a dual-core processor offers performance close to, but not quite matching, the performance of a two-way server.

typematic The keyboard repeatedly sending the keypress code to the motherboard for a key that is held down. The delay before the code begins to repeat and the speed at which it repeats are user-adjustable through `MODE` commands in DOS or the Windows Control Panel.

UART (Universal Asynchronous Receiver Transmitter) A chip device that controls the RS-232 serial port in a PC-compatible system. Originally developed by National Semiconductor, several UART versions are in PC-compatible systems: The 8250B is used in PC- and XT-class systems, and the 16450 and 16550 series are used in AT-class systems. The 16650 and higher UARTs are used for specialized high-speed serial communication cards.

UDF (Universal Disk Format) The disk format used by packet-writing software, such as Adaptec DirectCD. See also *Mt. Rainier* and *packet writing*.

Ultra DMA (UDMA or Ultra ATA) A protocol for transferring data to an ATA interface hard drive. The Ultra DMA/33 protocol transfers data in burst mode at a rate of 33MBps, whereas the even faster Ultra DMA/66 protocol transfers at 66MBps. Ultra DMA/66 also requires the use of a special 80-conductor cable for signal integrity. This cable also is recommended for Ultra DMA/33 and is backward compatible with standard ATA/IDE cables. The fastest UDMA modes are Ultra DMA/100 (supported by most recent chipsets) and Ultra DMA/133 (introduced in 2001).

Ultra High Frequency (UHF) The frequency band between 300 and 3,000MHz.

UltraXGA (UXGA) A screen resolution of 1,600×1,200.

Ultrium The high-capacity implementation of the Linear Tape Open (LTO) standard. LTO-3 Ultrium is the highest-capacity version currently available, with native/2:1 compressed capacity of 400/800GB.

UMB (upper memory block) A block of unused memory in the upper memory area (UMA), which is the 384KB region between 640KB and 1MB of memory space in the PC. BIOS chips and memory buffers on add-on cards must be configured to use empty areas of the UMB; otherwise, they will not work.

unformatted capacity The total number of bytes of data that can fit on a disk. The formatted capacity is lower because space is lost defining the boundaries between sectors. For example, some vendors have referred to the high-density 1.44MB floppy disk as a 2.0MB disk (2.0MB is the unformatted capacity). However, because most media is preformatted today, this issue is fading away.

Unicode A worldwide standard for displaying, interchanging, and processing all types of language texts, including both those based on letters (such as Western European languages) and pictographs (such as Chinese, Japanese, and Korean).

uninterruptible power supply (UPS) A device that supplies power to the computer from batteries so power will not stop, even momentarily, during a power outage. The batteries are recharged constantly from a wall socket.

Universal Asynchronous Receiver Transmitter See *UART*.

unzipping The process of extracting one or more files from a PKZIP or WinZip-compatible archive file.

UPC (universal product code) A 10-digit computer-readable bar code used in labeling retail products. The code in the form of vertical bars includes a five-digit manufacturer identification number and a five-digit product code number.

update To modify information already contained in a file or program with current information.

UPnP (universal plug and play) A distributed, open networking architecture standard created by the UpnP forum (www.upnp.org) that leverages TCP/IP to enable seamless peer-to-peer networking in addition to control and data transfer among networked devices in the home and office.

upper memory area (UMA) The 384KB of memory between 640KB and 1MB. See also *UMB*.

URL (uniform resource locator) The primary naming scheme used to identify a particular site or file on the World Wide Web. URLs combine information about the protocol being used, the address of the site where the resource is located, the subdirectory location at the site, and the name of the particular file (or page) in question.

USB (universal serial bus) USB version 1.1 is a 12Mbps (1.5MBps) interface over a simple four-wire connection. The bus supports up to 127 devices and uses a tiered star topology built on expansion hubs that can reside in the PC, any USB peripheral, or even standalone hub boxes. USB 2.0, also called High-Speed USB, runs at 480Mbps and handles multiple devices better than USB 1.1.

utility A program that carries out routine procedures to make computer use easier.

UTP (unshielded twisted pair) A type of wire often used indoors to connect telephones or computer devices. Comes with two or four wires twisted inside a flexible plastic sheath or conduit and uses modular plugs and phone jacks.

V.21 An ITU standard for modem communications at 300bps. Modems made in the U.S. or Canada follow the Bell 103 standard but can be set

to answer V.21 calls from overseas. The actual transmission rate is 300 baud and employs frequency shift keying (FSK) modulation, which encodes a single bit per baud.

V.22 An ITU standard for modem communications at 1,200bps, with an optional fallback to 600bps. V.22 is partially compatible with the Bell 212A standard observed in the U.S. and Canada. The actual transmission rate is 600 baud, using differential-phase shift keying (DPSK) to encode as much as 2 bits per baud.

V.22bis An ITU standard for modem communications at 2,400bps. Includes an automatic link-negotiation fallback to 1,200bps and compatibility with Bell 212A/V.22 modems. The actual transmission rate is 600 baud, using quadrature amplitude modulation (QAM) to encode as much as 4 bits per baud.

V.23 An ITU standard for modem communications at 1,200bps or 600bps with a 75bps back channel. Used in the United Kingdom for some videotext systems.

V.25 An ITU standard for modem communications that specifies an answer tone different from the Bell answer tone used in the U.S. and Canada. Most intelligent modems can be set with an ATB0 command so they use the V.25 2,100Hz tone when answering overseas calls.

V.32 An ITU standard for modem communications at 9,600bps and 4,800bps. V.32 modems fall back to 4,800bps when line quality is impaired and fall forward again to 9,600bps when line quality improves. The actual transmission rate is 2,400 baud using quadrature amplitude modulation (QAM) and optional trellis-coded modulation (TCM) to encode as much as 4 data bits per baud.

V.32bis An ITU standard that extends the standard V.32 connection range and supports 4,800bps, 7,200bps, 9,600bps, 12,000bps, and 14,400bps transmission rates. V.32bis modems fall back to the next lower speed when line quality is impaired, fall back further as necessary, and fall forward to the next higher speed when line quality improves. The actual transmission rate is 2,400 baud using quadrature amplitude modulation (QAM) and trellis-coded modulation (TCM) to encode as much as 6 data bits per baud.

V.32terbo A proprietary standard proposed by several modem manufacturers supporting transmission speeds of up to 18,800bps. Because it was not an ITU industry standard, it did not achieve widespread industry support.

V.34 An ITU standard that extends the standard V.32bis connection range, supporting 28,800bps transmission rates as well as all the functions and rates of V.32bis. This was called *V.32fast* or *V.fast* while under development.

V.34+ An ITU standard that extends the standard V.34 connection range, supporting 33,600bps transmission rates as well as all the functions and rates of V.34.

V.42 An ITU standard for modem communications that defines a two-stage process of detection and negotiation for LAPM error control. Also supports MNP error-control protocol, Levels 1–4.

V.42bis An extension of CCITT V.42 that defines a specific data-compression scheme for use with V.42 and MNP error control.

V.44 ITU-T designation for a faster data-compression scheme than V.42bis. V.44 can compress data up to 6:1. V.44 is included on most V.92-compliant modems. See also *V.92*.

V.90 ITU-T designation for defining the standard for 56Kbps communication. Supersedes the proprietary X2 schemes from U.S. Robotics (3Com) and K56flex from Rockwell.

V.92 ITU-T designation for an improved version of the V.90 protocol. V.92 allows faster uploading (up to 48Kbps), faster connections, and optional modem-on-hold (enabling you to take calls while online). Most V.92 modems also support V.44 compression. See also *V.44*.

V-Link A VIA Technologies high-speed (266MBps) bus between the North Bridge and South Bridge chips in VIA chipsets, such as the P4X266 (for Pentium 4) and KT266/266A (for Athlon/Duron). V-Link is twice as fast as the PCI bus and provides a dedicated pathway for data transfer.

vaccine A type of program used to locate and eradicate virus code from infected programs or systems.

vacuum tube A device used to amplify or control electronic signals, it contains two major components: a cathode (a filament used to generate electrons) and an anode (a plate that captures electron current after it flows through one or more grids). Largely replaced by the transistor and integrated circuit in most small electronics applications, vacuum tubes in the form of CRTs are still used to make conventional monitors. See also *CRT*.

VCPI (virtual control program interface) A 386 and later processor memory management standard created by Phar Lap software in conjunction with other software developers. VCPI provides an interface between applications using DOS extenders and 386 memory managers.

vertex The corner of a triangle in 3D graphics. The plural of vertex is vertices. See also *vertex shader*.

vertex shader A graphics processing function built into recent 3D graphics chips that manipulates vertices by adding color, shading, and texture effects. Recent GPUs such as the NVIDIA GeForce 3 and GeForce Ti and the ATI Radeon series incorporate vertex shaders. See also *GPU*, *hardware shader*, and *pixel shader*.

vertical blanking interval (VBI) The top and bottom lines in the video field, in which frame numbers, picture stops, chapter stops, white flags, closed captions, and more can be encoded. These lines do not appear on the display screen but maintain image stability and enhance image access.

vertical scan frequency The rate at which the electron gun in a monitor scans or refreshes the entire screen each second.

very high frequency (VHF) The frequency band between 30 and 300MHz.

very large scale integration See *IC*.

VESA (Video Electronics Standards Association) Founded in the late 1980s by NEC Home Electronics and eight other leading video board manufacturers with the main goal to standardize the electrical, timing, and programming issues surrounding 800×600 resolution video displays, commonly known as Super VGA. VESA has also developed the Video Local Bus (VL-Bus) standard for connecting high-speed adapters directly to the local processor bus. The most recent VESA standards involve digital flat-panel displays and display identification.

VFAT (virtual file allocation table) A file system used in Windows for Workgroups and Windows 9x. VFAT provides 32-bit protected mode access for file manipulation and supports long filenames (LFNs)—up to 255 characters in Windows 95 and later. VFAT can also read disks prepared with the standard DOS 16-bit FAT. VFAT was called 32-bit file access in Windows for Workgroups. VFAT is not the same as FAT32.

VGA (video graphics array) A type of PC video display circuit (and adapter) first introduced by IBM on April 2, 1987, which supports text and graphics. Text is supported at a maximum resolution of 80×25 characters in 16 colors with a character box of 9×16 pixels. Graphics are supported at a maximum resolution of 320×200 pixels in 256 colors (from a palette of 262,144) or 640×480 pixels in 16 colors. The VGA outputs an analog signal with a horizontal scanning frequency of 31.5KHz and supports analog color or analog monochrome displays. Also refers generically to any adapter or display capable of 640×480 resolution.

VHS (Video Home System) A popular consumer videotape format developed by Matsushita and JVC.

VIA Technologies A popular vendor of chipsets for AMD Athlon and Intel Pentium 4–based systems; it's also the maker of the VIA C3 processor.

video A system of recording and transmitting primarily visual information by translating moving or still images into electrical signals. The term *video* properly refers to only the picture, but as a generic term, *video* usually embraces audio and other signals that are part of a complete program. Video now includes not only broadcast television but many nonbroadcast applications, such as corporate communications, marketing, home entertainment, games, teletext, security, and even the visual display units of computer-based technology.

Video 8 or 8mm Video Video format based on the 8mm videotapes popularized by Sony for camcorders.

video adapter An expansion card or chipset built into a motherboard that provides the capability to display text and graphics onscreen. If the adapter is part of an expansion card, it also includes the physical connector for the monitor cable. If the chipset is on the motherboard, the video connector is on the motherboard as well.

video graphics array See *VGA*.

video-on-CD or video CD A full-motion digital video format using MPEG video compression and incorporating a variety of VCR-like control capabilities. See also *White Book*.

virtual disk A RAM disk or "phantom disk drive" in which a section of system memory (usually RAM) is set aside to hold data, just as though it were several disk sectors. To DOS, a virtual disk looks and functions like any other "real" drive.

virtual IRQ PCI IRQs higher than 15 (the end of the standard IRQ listing). Windows XP Service Pack 1 and later and Windows 2003 Server assign PCI devices that share hardware IRQs virtual IRQ numbers in Device Manager. See also *IRQ*.

virtual memory A technique by which operating systems such as 32-bit Windows versions load more programs and data into memory than they can hold. Parts of the programs and data are kept on disk and constantly swapped back and forth into system memory. The applications' software programs are unaware of this setup and act as though a large amount of memory is available.

virtual real mode A mode available in all Intel 80386-compatible processors. In this mode, memory addressing is limited to 4,096MB, restricted protection levels can be set to trap software crashes and control the system, and individual real-mode compatible sessions can be set up and maintained separately from one another.

virtual tape library A disk-based backup device that emulates a tape library. See also *tape library*.

virus A type of resident program designed to replicate itself. Usually at some later time when the virus is running, it causes an undesirable action to take place.

VL-Bus (VESA Local Bus) A standard 32-bit expansion slot bus specification used in 486 PCs, the VL-Bus connector was an extension of the ISA slot; any VL-Bus slot is also an ISA slot. Replaced by the PCI bus, the VL-Bus slot was used on only a very few early Pentium systems.

VMM (Virtual Memory Manager) A facility in Windows enhanced mode that manages the task of swapping data in and out of 386 and later processor virtual real-mode memory space for multiple non-Windows applications running in virtual real mode.

vmstat A command-line Linux program that can be used to view server performance and look for bottlenecks.

voice-coil actuator A device that moves read/write heads across hard disk platters by magnetic interaction between coils of wire and a magnet. Functions somewhat like an audio speaker, from which the name originated. The standard actuator type on hard drives.

volatile memory Memory that does not hold data without power. Both Dynamic RAM (the main RAM in a computer) and Static RAM (used for cache memory) are considered volatile memory. See also *nonvolatile memory*.

volt (V) The unit of measurement of electromotive force. One volt is equal to the force required to produce a current of 1 ampere through a resistance of 1 ohm.

voltage reduction technology An Intel processor technology that enables a processor to draw the standard voltage from the motherboard but run the internal processor core at a lower voltage.

voltage regulator A device that smoothes out voltage irregularities in the power fed to the computer.

volume A portion of a disk signified by a single drive specifier. Under DOS v3.3 and later, a single hard disk can be partitioned into several volumes, each with its own logical drive specifier (C:, D:, E:, and so on).

volume label An identifier or name of up to 11 characters that names a disk.

VPN (virtual private network) A private network operated within a public network. To maintain privacy, VPNs use access control and encryption.

VRAM (video random-access memory) VRAM chips are modified DRAMs on video boards that enable simultaneous access by the host system's processor and the processor on the video board. A large amount of information therefore can be transferred quickly between the video board and system processor. Sometimes also called *dual-ported RAM*. It has been replaced by SDRAM, SGRAM, and DDR SDRAM on recent high-performance video cards.

VxD (virtual device driver) A special type of Windows driver. VxDs run at the most privileged CPU mode (ring 0) and enable low-level interaction with the hardware and internal Windows functions.

W3C (World Wide Web Consortium) Sets standards for HTML, XML, and the Web.

wafer A thin, circular piece of silicon either 8" (200mm) or 12" (300mm) in diameter from which processors, memory, and other semiconductor electronics are manufactured.

wait states One or more pause cycles added during certain system operations that require the processor to wait until memory or some other system component can respond. Adding wait states enables a high-speed processor to synchronize with lower-cost, slower components. A system that runs with "zero wait states" requires none of these cycles because of the use of faster memory or other components in the system. The widespread use of L1 and L2 memory caches has made the issue of wait states largely irrelevant. See also *L1 cache* and *L2 cache*.

warm boot Rebooting a system by means of a software command rather than turning the power off and back on. See also *cold boot*.

watt (W) A unit of electrical power. One watt is expended when 1 ampere of direct current flows through a resistance of 1 ohm.

wave table synthesis A method of creating synthetic sound on a sound card that uses actual musical instrument sounds sampled and stored on ROM (or RAM) on the sound card or in system RAM. The sound card then modifies this sample to create any note necessary for that instrument. Produces much better sound quality than FM synthesis.

webcam An inexpensive (usually under $100) video camera that plugs into a USB or an IEEE 1394/FireWire port for use with video chat, websites, or email programs.

Whetstone A benchmark program developed in 1976 and designed to simulate arithmetic-intensive programs used in scientific computing. Remains completely CPU-bound and performs no I/O or system calls. Originally written in ALGOL, although the C and Pascal versions became more popular by the late 1980s. The speed at which a system performs floating-point operations often is measured in units of Whetstones.

White Book A standard specification developed by Philips and JVC in 1993 for storing MPEG standard video on CDs. This is an extension of the Red Book standard for digital audio, Yellow Book standard for CD-ROM, Green Book standard for CD-I, and Orange Book standard for CD write-once.

Whitney technology A term referring to a magnetic disk design that usually has oxide or thin film media, thin-film read/write heads, low floating-height sliders, and low-mass actuator arms that together allow higher bit densities than the older Winchester technology. Whitney technology first was introduced with the IBM 3370 disk drive, circa 1979.

Wi-Fi Name for IEEE 802.11–compliant network hardware that also meets the interoperability standards of the Wireless Ethernet Compatibility Alliance (WECA). Despite the presence of Wi-Fi approval for various brands of hardware, achieving the simplest setup and operation is still easier if you purchase Wi-Fi wireless NICs and access points that support the same standard (802.11a, b, g, or n) from the same vendor. See also *802.11*.

Wi-Fi Protected Access (WPA) A Wi-Fi Alliance standard designed to secure wireless networks, which is much more secure than the previous WEP standard.

wide area network (WAN) A LAN that extends beyond the boundaries of a single building.

Winchester drive Any ordinary, nonremovable (or fixed) hard disk drive. The name originates from a particular IBM drive in the 1960s that had 30MB of fixed and 30MB of removable storage. This 30-30 drive matched the caliber figure for a popular series of rifles made by Winchester, so the slang term *Winchester* was applied to any fixed-platter hard disk.

Winchester technology The term *Winchester* is loosely applied to mean any disk with a fixed or nonremovable recording medium. More precisely, the term applies to a ferrite read/write head and slider design with oxide media that was first employed in the IBM 3340 disk drive, circa 1973. Virtually all drives today actually use developments of Whitney technology.

Wintel The common name given to computers running Microsoft Windows using Intel (or compatible) processors. A slang term for the PC standard.

wire frames The most common technique used to construct a 3D object for animation. A wire frame is given coordinates of length, height, and width. Wire frames are then filled with textures, colors, and movement. Transforming a wire frame into a textured object is called *rendering*.

wireless access point (WAP) A wireless transceiver that acts as a communications hub for network access. Usually included with a router in the form of a wireless router.

wireless local area network (WLAN) A local area network with at least one wireless access point.

word length The number of bits in a data character without parity, start, or stop bits.

workstation 1) A somewhat vague term describing any high-performance, single-user computer that usually has been adapted for specialized graphics, computer-aided design, computer-aided engineering, or scientific applications. 2) A computer connected to a server.

World Wide Web (WWW) Also called the Web. A graphical information system based on hypertext that enables a user to easily access documents located on the Internet.

WORM (write-once, read-many or multiple) An optical mass-storage device capable of storing many megabytes of information but that can be written to only once on any given area of the disk. A WORM disk typically holds more than 200MB of data. Because a WORM drive can't write over an old version of a file, new copies of files are made and stored on other parts of the disk whenever a file is revised. WORM disks are used to store information when a history of older versions must be maintained. Recording on a WORM disk is performed by a laser writer that burns pits in a thin metallic film (usually tellurium) embedded in the disk. This burning process is called *ablation*. WORM drives are frequently used for archiving data. WORM drives have been replaced by CD-R drives, which have a capacity of 650MB–700MB but have similar characteristics.

write precompensation A modification applied to write data by a controller to partially alleviate the problem of bit shift, which causes adjacent 1s written on magnetic media to read as though they were farther apart. When adjacent 1s are sensed by the controller, precompensation is used to write them more closely together on the disk, thus enabling them to be read in the proper bit cell window. Drives with built-in controllers typically handle precompensation automatically. Precompensation usually is required for the inner cylinders of now-obsolete oxide media drives.

write protect Preventing a removable disk or Sony Memory Stick from being overwritten by means of covering a notch or repositioning a sliding switch, depending on the type of media.

X2 A proprietary modem standard developed by U.S. Robotics (since acquired by 3Com) that enables modems to receive data at up to 56Kbps. This has been superseded by the V.90 standard. See also *V.90* and *V.92*.

x86 A generic term referring to Intel and Intel-compatible PC microprocessors. Although the Pentium family processors do not have a numeric designation because of trademark law limitations on trademarking numbers, they are later generations of this family.

Xeon Intel's family name for its server processors derived from the Pentium II, Pentium III, and Pentium 4 desktop processors. The Pentium II Xeon and Pentium III Xeon use Slot 2, whereas Xeon (the Pentium 4 version does not have a numerical designation) uses the Socket 603 or Socket 604. All Xeon processors have larger caches and memory addressing schemes than their desktop counterparts. Some Xeon processors support EM64T 64-bit extensions, and a dual-core version of Xeon with EM64T support was introduced in the first quarter of 2006.

Xeon MP A version of the Intel Xeon made especially for four-way and larger server implementations. Some versions of the Xeon MP support EM64T 64-bit extensions, and a dual-core version with EM64T support was introduced in the first quarter of 2006.

XGA (extended graphics array) A type of PC video display circuit (and adapter) first introduced by IBM on October 30, 1990, that supports text and graphics. Text is supported at a maximum resolution of 132×60 characters in 16 colors with a character box of 8×6 pixels. Graphics are supported at a maximum resolution of 1024×768 pixels in 256 (from a palette of 262,144) colors or 640×480 pixels in 65,536 colors. The XGA outputs an analog signal with a horizontal scanning frequency of 31.5KHz or 35.52KHz and supports analog color or analog monochrome displays. Also used to refer generically to any adapter or display capable of 1024×768 resolution.

XML (Extensible Markup Language) A standard for creating and sharing data and data formats over the Internet and other networks. XML, like HTML, uses markup tags to control the page, but XML tags control both appearance and the uses of the data and can be extended with new tags created by any XML user. See also *W3C*.

XMM (extended memory manager) A driver that controls access to extended memory on 286 and later processor systems. `HIMEM.SYS` is an example of an XMM that comes with DOS and Windows 9x.

XModem A file-transfer protocol—with error checking—developed by Ward Christensen in the mid-1970s and placed in the public domain. Designed to transfer files between machines running the CP/M operating system and using 300bps or 1,200bps modems. Until the late 1980s, because of its simplicity and public-domain status, XModem remained the most widely used microcomputer file-transfer protocol. In standard XModem, the transmitted blocks are 128 bytes. 1KB-XModem is an extension to XModem that increases the block size to 1,024 bytes. Many newer file-transfer protocols that are much faster and more accurate than XModem have been developed, such as YModem and ZModem.

XMS (extended memory specification) A Microsoft-developed standard that provides a way for real-mode applications to access extended memory in a controlled fashion. The XMS standard is available from Microsoft.

XON/XOFF Standard ASCII control characters used to tell an intelligent device to stop or resume transmitting data. In most systems, pressing Ctrl+S sends the XOFF character. Most devices understand Ctrl+Q as XON; others interpret the pressing of any key after Ctrl+S as XON.

Y-connector A Y-shaped splitter cable that divides a source input into two output signals.

Y-mouse A family of adapters from P.I. Engineering that enables a single mouse port to drive two devices. P.I. Engineering also makes the Y-see adapter for dual monitors and the Y-key adapter for dual keyboards.

Yellow Book The standard used by CD-ROM. Multimedia applications most commonly use the Yellow Book standard, which specifies how digital information is to be stored on the CD-ROM and read by a computer. Extended architecture (XA) is currently an extension of the Yellow Book that enables the combination of various data types (audio and video, for example) onto one track in a CD-ROM. Without XA, a CD-ROM can access only one data type at a time. Many CD-ROM drives are now XA capable.

Yellow Book standards See *CD-ROM*.

YModem A file-transfer protocol first released as part of Chuck Forsberg's YAM (yet another modem) program. An extension to XModem designed to overcome some of the limitations of the original. YModem enables information about the transmitted file, such as the filename and length, to be sent along with the file data and increases the size of a

block from 128 bytes to 1,024 bytes. YModem-batch adds the capability to transmit batches, or groups, of files without operator interruption. YModemG is a variation that sends the entire file before waiting for an acknowledgment. If the receiving side detects an error midstream, the transfer is aborted. YModemG is designed for use with modems that have built-in error-correcting capabilities.

Z-buffering A 3D graphics technique used to determine which objects in a 3D scene will be visible to the user and which will be blocked by other objects. Z-buffering displays only the visible pixels in each object.

zero wait states See *wait states*.

ZIF (zero insertion force) Sockets that require no force for the insertion of a chip carrier. Usually accomplished through movable contacts, ZIF sockets are used by 486, Pentium, Pentium Pro, and other socketed processors (including the latest Pentium 4 and AMD Athlon and Duron models).

ZIP (zigzag inline package) A DIP package that has all leads on one edge in a zigzag pattern and mounts in a vertical plane.

Zip drive An external drive manufactured by Iomega that supports 100MB, 250MB, or 750MB magnetic media on a 3 1/2" removable drive.

Zip file A file created using PKZIP, WinZip, or a compatible archiving program.

zipping The process of creating a PKZIP- or WinZip-compatible archive file. See also *unzipping*.

ZModem A file-transfer protocol commissioned by Telnet and placed in the public domain. Like YModem, it was designed by Chuck Forsberg and developed as an extension to XModem to overcome the inherent latency when using Send/Ack-based protocols, such as XModem and YModem. It is a streaming, sliding-window protocol.

zoned recording One way to increase the capacity of a hard drive is to format more sectors on the outer cylinders than on the inner ones. Zoned recording splits the cylinders into groups called *zones*, with each successive zone having more and more sectors per track, moving out from the inner radius of the disk. All the cylinders in a particular zone have the same number of sectors per track.

zoomed video A direct video bus connection between the PC-Card adapter and a mobile system's VGA controller, enabling high-speed video displays for videoconferencing applications and MPEG decoders.