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 or 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.

The computer industry is filled with acronyms used as shorthand for a number of terms. This glossary defines many acronyms, as well as the term on which each acronym is based. The definition of an acronym usually is included under the acronym. For example, *Video Graphics Array* is defined under the acronym *VGA* rather than under *Video Graphics Array*. This organization makes it easier to look up a term—*IDE*, for example—even if you do not know in advance what it stands for (*Integrated Drive Electronics*).

For additional reference, *Que's Computer Dictionary* (ISBN: 0-7897-1670-4) is a comprehensive dictionary of computer terminology.

These Web sites can also help you with terms that are not included in this glossary:

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http://zeppo.cnet.com/Resources/Info/Glossary/
http://www-edlab.ucdavis.edu/ed180/hardwarepracticum.html
http://www.webopedia.com
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/dev A directory in the directory tree that holds device-specific files used by the kernel when working with specific hardware and software devices.

/dev/ttyS0 The device file that refers to the serial port known under MS programs as *COM1*. /dev/ttyS1 refers to COM2. The ttyS? devices replace the older cua? devices.

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

100BaseVG The joint Hewlett-Packard–AT&T proposal for Fast Ethernet running at 100Mbps. It uses four pairs of Category 5 cable using the 10BaseT twisted-pair wiring scheme to transmit or receive. 100BaseVG 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 100BaseT.

10Base2 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*.

10Base5 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*.

10BaseT A 10Mbps CSMA/CD Ethernet LAN that works on Category 3, or better, twisted-pair wiring that is very similar to standard telephone cabling. 10BaseT Ethernet LANs work on a "star" configuration in which the wire from each workstation routes directly to a 10BaseT hub. Hubs may be joined together.

286 See *80286*.

386 See *80386*.

486 See *80486*.

56K The generic term for modems that can receive data at 56Kbps. *See also* V.90, X2, *and* Kflex.

586 A generic term used to refer to fifth-generation processors similar to the Intel Pentium.

640KB barrier The traditional memory limit imposed by the PC-compatible memory model for DOS programs. 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. This DOS legacy does not affect Linux.

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 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.

80387 An Intel math coprocessor designed to perform floating-point math with much greater speed and precision than the main CPU. The 80387 can be installed in most 386DX-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 is 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.

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; it scans every other line every time the screen is refreshed.

abend Short for *abnormal end*. A condition occurring 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.

absolute pathname The same as *pathname*. The full or complete pathname through a directory tree, beginning from the root (/) directory to a specific directory or file.

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.

accelerator board An add-in board replacing the computer's CPU with circuitry that enables the system to run faster. See *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. 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 of the time for a single revolution of the disk platters (latency).

access time stamp The time and date given to a file by the system when the file is accessed in any manner, whether by another program or directly by the user.

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 are 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.

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

active low Designates a digital signal that has to 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.

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. Often synonymous with *circuit board*, *circuit card*, or *card*, but may also refer to a connector or cable adapter, which changes one type of connector to another.

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 that 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 now available in a variety of configurations and speeds. See *DSL*.

AGP (Accelerated Graphics Port) Developed by Intel, a fast dedicated interface between the video adapter or chipset and the motherboard chipset North Bridge. AGP is 32 bits wide, runs at 66MHz, and can transfer 1 or 2 bits per cycle (1x or 2x modes).

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, may also be allowed.

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

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 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. *See also* digital.

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, R is a statement..., and 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. Also the U.S. representative to the International Standards Organization (ISO) in Paris and the International Electrotechnical Commission (IEC). For more information, see the Vendor List on the CD-ROM. Contact ANSI, 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.

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

anti-static mat A pad placed next to a computer upon which components are placed while servicing the system to prevent static damage. Also can refer to a large mat underneath a computer desk and chair that discharges 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 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.

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 allows 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.

apropos Searches a few small databases containing command-related names and phrases for a specific string. For example, the command `apropos file` returns a listing of all commands that have the word *file* inside the brief command description. This is a powerful tool for finding which tools are available to do certain tasks. Use apropos in conjunction with man pages to learn how to do what it is you need or want to do via commands.

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

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. Originally developed by John Murphy of Datapoint Corporation, although ARCnet interface cards are available from a variety of vendors.

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.

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 through 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 through 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, `http://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.

aspect ratio The measurement of a film or television viewing area in relative height and width. The aspect ratio of most modern motion pictures varies, from 3:5 to as large as 3:7, which creates a problem when a wide-format motion picture is transferred to the more square-shaped television screen, with its aspect ratio of 3:4.

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 may vary. Timing is dependent 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 regarding 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 different timing or clock rate (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 and a 40-pin connector and its associated signals. *See also* IDE.

ATA-2 The second-generation AT Attachment interface specification. This version defines faster transfer modes and logical block addressing schemes to allow high-performance, large-capacity drives. Also called *Fast ATA*, *Fast ATA-2*, and *enhanced IDE (EIDE)*.

ATAPI AT Attachment Packet Interface A specification that defines device-side characteristics for an IDE-connected peripheral, such as CD-ROM or tape drives. ATAPI is essentially an adaptation of the SCSI command set to the IDE interface.

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.

ATX A motherboard and power supply form factor standard designed by Intel and introduced 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.

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

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

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 allows a modem to hang up the telephone line when the modem at the other end hangs up.

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.

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

available memory Memory currently not in use by the operating system, drivers, or applications that may 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.

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.

background A term used to indicate a program that is relegated to operate in an unattended mode, freeing up the shell that launches the program to do other work. Most all programs can be launched in the background, but this is not always necessary or even advisable, depending on the interaction the user expects to have with the operating program.

backplane A rarely used motherboard design in which the components normally found on a motherboard are located instead on an expansion adapter card plugged into a slot. In these systems, the board with the slots is the backplane.

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

backup The process of duplicating a file or library onto a separate piece of media. Good insurance against the loss of an original.

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 cannot hold data reliably because of a media flaw or damaged format markings.

bad track table A label affixed to the casing of a hard disk drive that tells which tracks are flawed and cannot hold data. The listing is entered into the low-level formatting program.

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 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) Used 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 writable 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 must always be added or removed in full-bank increments.

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

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

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, an interpretive language, meaning that each statement is translated and executed as it is encountered, but can be a compiled language, in which all the program statements are compiled before execution.

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 may translate into many individual bits, bits per second (bps) normally 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 may 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. Thousands of PC IBM- and Apple-related BBSes offer a wealth of information and public-domain software that can be downloaded.

B-channel The two bearer channels in ISDN that run at 64Kbps each and carry the data.

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.

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

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

BIOS (basic input/output system) The part of an operating system that handles the communications between the computer and its peripherals. Often burned into read-only memory (ROM) chips or rewritable flash (EEPROM) memory chips. With Linux, after the operating system loads, the BIOS is bypassed and Linux communicates directly with the hardware.

bipolar A category of semiconductor circuit design, which was used to create the first transistor and the first integrated circuit. Bipolar and CMOS are the two major transistor technologies. Most 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 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 means that the monitor can display only black and white pixels; a bit depth of four means that the monitor can display 16 colors; a bit depth of eight allows for 256 colors; and so on.

bit map 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. A bit map contains a bit for each point or dot on a video display screen and allows for 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.

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 The specific sections of a sector on a physical drive, the size of which is determined when the physical drive is partitioned. Blocks are addressed specifically by a sequential numbering system beginning with the first block and ending with the last block on the physical drive.

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.

block fragment The amount of disk space left in a block after it is used. Blocks are not always completely filled, and many have empty space at the end (or bottom) of the block.

BNC (Bayonet-Neill-Concelman) Also known as *British-Naval-Connector*, *Baby-N-Connector*, or *Bayonet-Nut-Coupler*; nobody seems to be quite sure what the actual name is. 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 10Base2 networks (also known as *IEEE 802.3*, or *Thinnet*) to terminate coaxial cables. It is also used for some high-end video monitors.

bonding In ISDN, joining two 64Kbps B-channels to achieve 128Kbps speed.

Boolean operation Any operation in which each of the operands and the result take one of two values.

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 will transfer the virus to the hard disk, after which it will subsequently be loaded every time the system is started. Mostly a problem for Windows and DOS PCs or Linux PCs dual booting one of these other operating systems.

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

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.

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.

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 different 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.

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 where 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 instead of the last accessed data remains in the buffer (cache). A cache can improve performance greatly over a plain buffer.

bug An error or defect in a program.

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

burst mode A memory cycling technology that takes advantage of the fact that most memory accesses are consecutive in nature. After setting up the row and column addresses for a given access, using 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 instead of a serial port or motherboard mouse port. The bus mouse connector looks like a motherboard mouse (sometimes called a *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.

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

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

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

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 called an *adapter*.

card edge connector See *edge connector*.

CardBus A PC card 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 standard.

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.

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 is also used in optical recording.

CCITT An acronym for the Comitée 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 *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-inch (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-inch) version of the CD is known as *CD-3*.

CD Video A CD format introduced in 1987 that combined 20 minutes of digital audio and 6 minutes of analog video on a standard 4.75-inch CD. Upon introduction, many firms renamed 8-inch and 12-inch videodiscs as *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 *laserdisc* and more recently *DVD*.

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. Developed and marketed by Warner New Media.

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. Developed and marketed by Warner New Media.

CD-DA (Compact Disc Digital Audio) Also known as *Red Book Audio*, this is the digital sound format used by audio CDs. CD-DA uses a sampling rate of 44.1KHz and stores 16 bits of information for each sample. CD audio is not played through the computer, but through a special chip in the CD-ROM drive. Fifteen minutes of CD-DA sound can require about 80MB. The highest quality sound that can be used by multimedia PC is the CD-DA format at 44.1KHz sample rate. See *CD*.

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-R (Compact Disc-Recordable, sometimes also called *CD-Writable*) CD-R disks 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 allow data recording on the disc at different times in several recording sessions. Kodak's Photo CD is an example of CD-R technology and fits up to 100 digital photographs on a single CD. Multisession capability allows several rolls of 35mm film to be added to a single disc on different occasions.

CD-ROM (Compact Disc-Read Only Memory) A 4.75-inch 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. CD-ROMs require more error-correction information than the standard prerecorded compact audio disc. 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; 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 provides for data compression right on the disk, which can also 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 that the drive can rewrite at least one thousand times. CD-RW drives can also 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-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*.

Centronics connector Refers to one of two types of cable connectors used with either parallel or SCSI 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, that supports text and graphics. Text is supported at a maximum resolution of 80×25 characters in 16 colors with a character box of 8×8 pixels. Graphics is 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 that 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.

character special Special characters are often referred to as *nonprinting* characters because they won't display directly when used. These are usually used as control codes, and various programs often give the user the ability to embed, hide, and show such control codes. Such control codes are also used actively at the shell prompt to send signals to running programs.

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

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.

chipset A single chip or pair of chips that integrate into it 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 *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 per second is 36.45Mbps.

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, which 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 multiplier A processor feature in which 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).

clock The source of a computer's timing signals. Synchronizes every operation of the CPU.

clone Originally, this term 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 what 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 will adjust the rotational speed to maintain a constant track velocity as the diameter of the track changes. CLV drives rotate faster 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.

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.

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 primarily used by some larger companies. It has never achieved popularity on personal and small business computers.

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 that you can hear and understand what the other party is saying.

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 requires a stronger write current.

cold boot Starting or restarting a computer by resetting or turning on the power supply. *See also* warm boot.

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.

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*.

Color Graphics Adapter See *CGA*.

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

COM port The DOS and Windows term for a serial port on a PC that conforms to the RS-232 standard. *See also* RS-232 *and* /dev/ttyS0.

COMDEX The largest international computer trade show and conference in the world. COMDEX/Fall is held in Las Vegas during October, and COMDEX/Spring usually is held in Chicago or Atlanta during April.

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

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.

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

CompactFlash An ATA flash memory card physical format that is approximately one third the size of a standard PC card. Often abbreviated *CF*, CompactFlash cards are identical in function to standard ATA Flash PC cards, 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 slot.

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.

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).*

configuration files Files that direct how a program loads and behaves when operating. In Linux, such files are usually placed in the /etc/ file directory for convenience.

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 normally 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).

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

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

convergence 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.

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. This was the dominant operating system in the late 1970s and early 1980s for small computers used in a business environment.

cps (characters per second) A data transfer rate generally estimated from the bit rate and the character length. At 2,400bps, 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 240cps. 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 IC using VLSI (very-large-scale integration) technology to pack several different 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.

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.

crosstalk The electromagnetic coupling of a signal on one line with another nearby signal line. Crosstalk is caused by electromagnetic induction, in which a signal traveling through a wire creates a magnetic field that induces a current in other nearby wires.

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 hyphen that appears onscreen to indicate the point at which any input from the keyboard will be placed.

cycle The amount of time for a signal to transition from 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. The total number of 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 4GB hard disk has 10 platters with 20 heads (19 for data and one servo head) and 4,000 cylinders, in which each cylinder is composed of 19 tracks.

D/A Converter (DAC) A device that converts digital signals to analog form.

daemon A program that resides in memory (RAM) and provides services to other programs. Somewhat similar to TSR programs in the MSDOS operating system, although considerably more capable.

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.

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.

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 DDS (digital data storage) standard for storing computer data. Raw capacities for a single tape are 2GB for DDS, 4GB for DDS-2, and 12GB for DDS-3, with double that for compressed data.

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 whereby mathematical algorithms are applied to the data in a file to eliminate redundancies and therefore reduce the size of the file. See *lossy compression* and *lossless 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.

data modification time stamp A time and date given to a file by the system when the file is modified, whether by another program or directly by the user.

data separator A device that separates data and clock signals from a single encoded signal pattern. Usually, the same device does 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 An add-on board to increase functionality and/or memory. Attaches to the existing board.

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

DB-9 9-pin D-shell connector, primarily used for PC serial 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 3MB in 1971 that uses a quarter-inch wide tape 600 feet in length.

DCE (Data Communications Equipment) The hardware that performs the communication, usually a dial-up modem that establishes and controls the data link through the telephone network. *See also* DTE.

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

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

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 instead of a public-access telephone line. The communications channel also may 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, 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 and operational until changed by the user. An assumption the computer makes when no other parameters are specified. The term 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 that files are stored on consecutive sectors in adjacent tracks. Important when using an operating system such as Windows but not important with Linux's file system, which isn't as susceptible to fragmentation.

degauss (1) To remove magnetic charges, or to erase magnetic images. Normal applications include 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) Also, 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 file Files found in the /dev/ directory that provide the specifics (I/O addressing, port addressing, major and minor numbers, and so on) of the device to the kernel and other programs that may use the device.

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.

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 to indicate in what area the problems lie.

die An individual chip (processor, RAM, or other integrated circuit) cut from a finished silicon chip wafer and built in to the physical package that will connect 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 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 signals Discrete, uniform signals. In this book, the term refers to the binary digits 0 and 1.

digitize To transform an analog wave to a digital signal that a computer can store. Conversion to digital data and back is performed by a Digital to Analog 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 64-bit wide, 168-pin memory module used in Pentium and newer PCs. Available in several versions, including 5v or 3v, buffered or unbuffered, with FPM/EDO or SDRAM memory, and in 64-bit (non-ECC/parity) or 72-bit (ECC/parity) form. Most Pentium and newer PCs require 3.3v unbuffered SDRAM DIMMs in either non-ECC or ECC versions (ECC recommended).

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 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.

disc A 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* is often used as a short form for *videodisc* or *compact audio disc (CD)*.

disk access time See *access time*.

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

Distribution A time- and effort-saving way for Linux users to install Linux on their computers. Distributions usually do most of the work involved in setting up a Linux system (resolving dependencies, collecting and preparing programs, and so on). A popular and up-to-date distribution list can be found at `www.linuxhq.com/dist-index.html`.

dithering The process of creating more colors and shades from a given color palette. In monochrome displays or printers, dithering can vary 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. Dithering is also known as *error diffusion*.

DMA See *direct memory access*.

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

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

DOS (Disk Operating System) A generic term for a collection of programs stored on the disk that contain routines enabling the system and user to manage information and the hardware resources of the computer. The DOS must be loaded into the computer before other programs can be started. This term is also used to refer to specific operating systems such as MS-DOS, PC-DOS, and other similar DOS's.

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.

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 *MFM*.

downtime Operating time lost because of a computer malfunction.

DPMS (Display Power Management Signaling) A VESA standard for signaling a monitor or display to switch into energy conservation modes. 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 made 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 that it will lose 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 *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 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 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.

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

DVD (Digital Versatile Disc) Originally called *Digital Video Disc*. A new type of high-capacity CD-ROM disc and drive format with up to 28 times the capacity of 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, and 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.

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.

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, AOEUI, together under the left hand in the center row and the five most frequently used consonants, DHTNS, under the fingers of the right hand.

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

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.

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

EDO (Extended Data Out) RAM A type of RAM chips that allow for a timing overlap between successive accesses, thus improving memory cycle time.

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 that 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 a *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 is 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 15.75, 18.432, or 21.85KHz, and 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 *ATA-2*.

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 allows for backward compatibility with older plug-in adapters.

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.

embedded controller In disk drives, a controller built in to 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.

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.

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*.

Enhanced Graphics Adapter See *EGA*.

Enhanced Small Device Interface See *ESDI*.

EPP (Enhanced Parallel Port) A type of parallel port developed by Intel, Xircom, and Zenith Data Systems that operates almost at 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.

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 provides for a maximum data transfer rate to and from a hard disk of between 10Mbps and 24Mbps.

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.

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 in to the motherboard. Also referred to as 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 that is addressed by an Intel (or compatible) 286, 386, or 486 processor in the region beyond the first megabyte. Addressable only in the processor's protected mode of operation.

external device A peripheral that is 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.

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

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

FAT (file allocation table) With Microsoft operating systems such as DOS and Windows 9x, a table held near the outer edge of a disk that tells which sectors are allocated to each file and in what order. Linux can be configured to work with FAT disks.

FAT32 A disk file allocation system from Microsoft that uses 32-bit values for FAT entries instead of 16-bit values used by the original FAT system, enabling partition sizes up to 2TB (terabytes). FAT32 first appeared in Windows 95B and is also found in Windows 98 and Windows 2000.

fax/modem A peripheral that integrates the capabilities of a fax machine and a modem in one expansion card or external unit.

Fdformat Formats a floppy disk. The user is advised to read the man page for fdformat before using this command because there are a great many possible floppy disk formats and the user will most likely want to specify a particular one.

FDISK The name of the MS-DOS disk-partitioning program to create the master boot record and allocate partitions for the operating system's use.

fdisk Similar in nature to the MSDOS FDISK program but with considerably more functionality, the Linux/UNIX fdisk program is used to set up and manage partitions on physical devices such as hard drives.

feature connector On a video adapter, a connector that allows 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.

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 compression See *compressed file*.

filename The name given to the disk file.

file system A generic term for specific methods of reading, writing and storing files on a block device, usually a physical drive (hard drive or floppy.) Linux supports many, many types of file systems, including umsdos and vfat (Microsoft-type file systems,) ext2 (Linux native file system), and file system types related to various flavors of UNIX.

FireWire Also called *IEEE 1394*. 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.

firmware Software contained in a read-only memory (ROM) device. A cross between hardware and software.

fixed disk Also called a *hard disk*, a disk that cannot 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 *EEPROM*.

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 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.

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, allowing for more precise control of the read/write positioning and therefore narrower track spacing and more data packed into a smaller area than traditional floppy disks.

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 like a DOS subdirectory.

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.

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 that the computer can read or write to it. Checks the disk for defects and constructs an organizational system 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.

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) Also, 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 a second for PAL/SECAM.

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 by a user 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, also may refer to the suppression of the online local echo.

full-height drive A drive unit that is 3 1/4 inches high, 5 3/4 inches wide, and 8 inches deep.

full-motion video A video sequence displayed at full television standard resolutions and frame rates. In the United States, this would equate to NTSC video at 30 frames per second.

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

gas-plasma display Commonly used in portable systems, 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 would convert between SMTP (Internet) email format to MHS (Novell) email format. The term gateway is also used as a slang term for router. *See also* router.

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.

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.

giga A multiplier indicating 1 billion (1,000,000,000) of some unit. Abbreviated as g or G. When used to indicate a number of bytes of memory storage, the multiplier definition changes to 1,073,741,824. One gigabit, for example, equals 1,000,000,000 bits, and one gigabyte equals 1,073,741,824 bytes.

gigabyte (GB) A unit of information storage equal to 1,073,741,824 bytes.

Gnome A desktop manager program similar to KDE that provides menued programs and a drag-'n'-drop desktop environment to the user similar to MS Windows. Although this environment is similar to the MS Windows operating system, it is not necessary to operate either Linux or X and exacts a considerable hit on performance on all but the speediest of machines.

GNU An acronym meaning *GNUs, not UNIX*. The GNU software project was begun in 1983 by Richard Stallman with the intent of giving programmers free (that is, noncommercial) tools with which to work. By 1993, these programming tools were in wide use. GNU tools are available at `www.gnu.org/home.html`.

graphics accelerator A video processor or chipset specially designed to speed display and rendering of graphical objects onscreen.

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 disks require special code and are not compatible with standard CD-ROMs. A CD-ROM cannot be played on the CD-I machine, but Red Book audio can be played on CD-I devices.

GUI (Graphical User Interface) A type of program interface that allows users to choose commands and functions by pointing to a graphical icon using either a keyboard or pointing device such as a mouse. KDE is an example of a GUI for Linux.

half duplex Signal flow in both directions but only one way at a time. In microcomputer communications, half duplex may 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 inches high, and either 5.75 or 4 inches wide and 4 or 8 inches 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 halftoning. The human eye will merge the dots to give the impression of gray shades.

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

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

Hard link This is a second (or third or fourth) name for a particular file. Users are strongly advised to read the man page for the `ln` command.

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

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 a 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 that 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.

heat sink A mass of metal attached to a chip carrier or socket for the purpose of dissipating heat.

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.

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

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 at Lake Tahoe, Nevada.) A revised version of the format was adopted by the ISO as ISO 9660.

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 ration of 5:3 (or 1.67:(1) and a video bandwidth of 30–MHz (5+ times greater than NTSC standard). Digital HDTV has a bandwidth of 300MHz. HDTV is subjectively comparable to 35mm film.

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 ratio of the number of times the data is found in the cache to the total number of data requests is the hit ratio. 1:1 would be 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.

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

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 USRobotics proprietary high-speed modem-signaling scheme, developed as an interim protocol until the V.32 protocol could be implemented in a cost-effective manner.

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 allow you to mix graphics with text, change the appearance of text, and create hypertext documents with links to other documents.

HTTP (Hypertext Transfer Protocol) The protocol that describes the rules that 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.

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.

hypertext A technology that allows for 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.

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

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

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

IC (integrated circuit) A complete electronic circuit contained on a single chip. May consist of only a few or thousands of transistors, capacitors, diodes, or resistors, and 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 to 10 circuits. MSI (medium-scale integration) equals 10 to 100 circuits. LSI (large-scale integration) equals 100 to 1,000 circuits. VLSI (very-large-scale integration) equals 1,000 to 10,000 circuits. ULSI (ultra-large-scale integration) equals more than 10,000 circuits.

IDE (Integrated Drive Electronics) Describes a hard disk with the disk controller circuitry integrated within it. The first IDE drives commonly 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 were standard ST-506/412 drives. *See also* ATA.

IEEE 1394 See *FireWire*.

IEEE 802.3 See *10Base2*.

incremental backup A backup of all 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.

Init files Called during the boot up process, these files come in two major variations: BSD style and SysV style. The SysV style is slowly replacing the BSD style of init scripts because they allow for easier access and modifications by other programs. This comes at the cost of more complexity with a steeper learning curve. Init files, or *scripts*, do such things as initialize your printer,

modem, sound card, NIC card, file system, and so on, during the boot process. Without init scripts, you'd have to do all that manually, which would be quite a chore!

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. Can produce output with quality approaching that of a laser printer at a lower cost.

Inode Also called the *file serial number* and *index number*, an inode uniquely identifies a file within a file system.

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

instruction 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.

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.

interleaved memory The process of alternating access between two banks of memory to overlap accesses, thus speeding up data retrieval.

internal device A peripheral device that is installed inside the main system case either in an expansion slot or in 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 over phone lines. 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. There are several million hosts on the Internet. A host is a mainframe, mini, or workstation that directly supports the Internet protocol (the IP in TCP/IP).

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 slower 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.

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

IPX (Internet Packet eXchange) Novell NetWare's native LAN communications protocol 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.

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 through IRQ7. On the AT and PS/2 systems, 16 IRQ lines are numbered IRQ0 through IRQ15. IRQ lines must be used only by a single adapter in the ISA bus systems, but Micro Channel Architecture (MCA) adapters can share interrupts.

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

ISA (Industry Standard Architecture) The bus architecture that was 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 still found in PC systems today.

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 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, and level two allows filenames of up to 32 characters. *See also* high sierra format.

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.

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. For 2,400bps communication, most U.S. manufacturers observe V.22bis, wheras V.32, V.32bis, V34 and V34+ are standards for 9,600, 14,400, 28,800, and 33,600bps, respectively. The V.90 standard recently was defined for 56Kbps modems.

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.

Jaz drive A proprietary type of removable media drive with a magnetic hard disk platter in a rigid plastic case. Developed by Iomega and currently available in 1GB and 2GB sizes.

JEDEC (Joint Electronic Devices Engineering Council) A group that establishes standards for the electronics industry.

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-inch centers.

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 may resemble flight yokes and steering wheels or may incorporate tactile feedback.

JPEG (Joint Photographic Experts Group) The international consortium of hardware, software, and publishing interests who, 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 can also compress real-time video (30 frames per second) and animation. Lossy compression permanently discards unnecessary data, resulting in some loss of precision.

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

jumper 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 connects the pins electrically and closes the circuit. By doing so, it connects the two terminals of a switch, turning it “on.”

KDE A desktop manager program that provides menued programs and a drag-n-drop desktop environment to the user. Although this environment is similar to the MS Windows operating system, it is not necessary to operate either Linux or X and exacts a considerable hit on performance on all but the speediest of machines.

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 is widely accepted in the academic world.

kernel Operating system core component.

key disk In software copy protection, a distribution floppy disk that must be present in a floppy disk drive for an application program to run.

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

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

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

KFlex 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 *and* V.90.

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, and one kilobyte equals 1,024 bytes.

kilobyte (KB) A unit of information storage equal to 1,024 bytes.

L1 cache (level one) A memory cache that is built in to the CPU core of 486 and later generation processors. See *cache* and *disk cache*.

L2 cache (level two) A second-level memory cache that is external to the processor core, usually larger and slower than L1. Normally found on the motherboard of 386, 486, and Pentium systems and inside the processor package or module in Pentium Pro and Pentium II systems. Moving the L2 cache onto the processor in the Pentium Pro and Pentium II allows it to run at speeds up to full processor speed rather than motherboard speed. See *SEC (single edge contact) cartridge*, *cache*, and *disk cache*.

landing zone An unused track on a disk surface on which the read/write heads can land when power is shut off. The place that 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. Like the MNP and HST protocols, 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.

large mode Another name for the LBA translation scheme used by IDE drives to translate the cylinder, head, and sector specifications of the drive to those usable by an enhanced BIOS.

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 that 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 only to 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.

latency (1) The amount of time required for a disk drive to rotate half of 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 either 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.

LIF (Low Insertion Force) A type of 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, not widely supported by software applications.

LILO An install boot loader. Using the configuration file /etc/lilo.conf, lilo will boot up your machine using any number of parameters, which you set in your lilo.conf configuration file. Users are strongly advised to read the lilo and lilo.conf man pages for usage details before modifying or otherwise changing their lilo.conf file.

line voltage The AC voltage available at a standard wall outlet, nominally 110-120v.

Lithium Ion A portable system battery type that is longer-lived than either NiCad or NiMH technologies, cannot be overcharged, and holds a charge well when not in use. Lithium Ion batteries are also lighter weight than the either NiCad or 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 that is directly attached to a processor and which 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 normally is invoked through an ATE1 command, which causes the modem to display your 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.

logical unit number See *LUN*.

Login The process whereby the user lets the system know that he is now working on the system and will be requiring system resources. This usually requires the user to type in his username and password. The login process can be highly customized to both suit the user and make the system happy, willing, and eager to serve.

lossless compression A compression technique that preserves all the original information in an image or other data structures.

lossy compression A compression technique that achieves optimal data reduction by discarding redundant and unnecessary information in an image.

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.

LPX A semi-proprietary motherboard design used in many Low Profile or Slimline case systems. Because there is no formal standard, these are typically not interchangeable between vendors and are often difficult to find replacement parts for repair 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, normally a single logical unit 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). Also see *PUN*.

LZH (Lempel Zev Welch) A compression scheme used in the GIF graphic format.

machine address A hexadecimal (hex) location in memory.

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

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 in contact with a magnetic field, in this case, the read element material and the magnetic bit. Such drives use a magnetoresistive read sensor for reading and a standard inductive element for writing. A magnetoresistive read head is more sensitive to magnetic fields than inductive read heads.

Man page One of the most common forms of documentation found on Linux/UNIX systems, the man page gives the user a formatted and referenced description of the usage of a particular command. Using the man pages is usually as simple as typing `man <command>`, in which `man ln` is a good example to try. A most important command related to man is `apropos`, which will assist the user in deciding what command or commands will help in a certain task. See the entry for *apropos*.

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

master partition boot sector On hard disks, a one-sector record that gives essential information about the disk and tells the starting locations of the various partitions. Always the first physical sector of the disk.

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 has incorporated the math coprocessor into the main processors in what is called the *floating-point unit*.

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.

MCGA (MultiColor Graphics Array) A type of PC video display circuit introduced by IBM on April 2, 1987, that supports text and graphics. Text is supported at a maximum resolution of 80×25 characters in 16 colors with a character box of 8×16 pixels. Graphics is 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.

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 also included a parallel printer port.

mean time between failure See *MTBF*.

mean time to repair See *MTTR*.

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

mega A multiplier indicating 1 million (1,000,000) of some unit. Abbreviated as m or M. When used to indicate a number of bytes of memory storage, the multiplier definition changes to 1,048,576. One megabit, for example, equals 1,000,000 bits, and one megabyte equals 1,048,576 bytes.

megabyte (MB) A unit of information storage equal to 1,048,576 bytes.

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 relatively slow system memory.

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

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.

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 0.25 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.

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

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

mini-tower A type of PC system case that is shorter than a full or mid-sized tower.

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

Mkfs Makes a file system on a designated device. This program can be dangerous to your current file systems if you mistakenly specify the incorrect device, so be sure to read the man page if you are new to using this program.

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.

mnemonic An abbreviated name for something that is 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), 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. Ensures 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 will connect with MNP Level 5 if V.42bis is unavailable.

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 Pentium II processor in its TCP form, mounted on a small daughterboard along with the power supply for the processor's unique voltage requirements, 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. Modulates, or transforms, digital signals from a computer into the analog form that can be carried successfully on a phone line; also demodulates signals received from the phone line back to digital signals before passing them to the receiving computer.

module An assembly that contains a complete circuit or subcircuit.

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 close 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 Allows the user to add and remove file systems to his system at will. Because the mount command allows the user considerable latitude in the types of file systems mounted, how they

are mounted (read-only, read/write), and where they are mounted, the user is advised to read and refer regularly to the mount man page until he or she is comfortable using mount.

mouse An input device invented by Douglas Engelbart of Stanford Research Center in 1963 and popularized by Xerox in the 1970s. A 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 on the screen. The top side features two or three buttons and possibly a small wheel used to select or click items on screen.

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. Also see lossy. The MPEG-1 standard delivers decompression data at 1.2–1.5MBps, allowing 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 (2–15Mbps) needed 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.

MPR The Swedish government standard for maximum video terminal radiation. The current version is called *MPR II*.

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.

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 are rapidly changing and enhancing the computing environment.

multisession A term used in CD-ROM recording to describe a recording event. Multi-session capabilities allow data recording on the disk at different times in several recording sessions. Kodak's Photo CD is an example of 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. 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.

NetBEUI (NetBIOS Extended User Interface) A network protocol used primarily by Windows NT and most suitable for small peer-to-peer networks.

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).

network A system in which a number of independent computers are linked to share data and peripherals, such as hard disks and printers.

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.

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 their 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.

NLX A new low-profile motherboard form factor standard that is basically an improved version of the semiproprietary LPX design. 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.

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.

nonvolatile memory (NVRAM) Random-access memory whose data is retained when power is turned off. 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*. 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. *See also* chipset *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, line frequency of 15.75KHz, frame frequency of 1/30 of a second, and a color subcarrier frequency of 3.58MHz. It is an interlaced signal, which means that 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 vid*eo.

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 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) Memory that retains data without power. Flash memory and battery-backed CMOS RAM are examples of 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.

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.

ODI (Open Data-link Interface) A device driver standard from Novell that allows you to run multiple protocols 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 that sells its product to a reseller. Usually refers to the original manufacturer of a particular device or component. Most Compaq hard disks, for example, are made by Conner Peripherals, who is considered the OEM.

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.

Open Source A term that directly refers to the method of copyrighting—known as *copyleft* in the Linux world—whereby creators of programs use a copyright that, to varying degrees, assures the user that the code and use of the program are free to use and are to remain free to use. The most commonly used of these types of copyrights is the GNU_GPL or GNU General Public License.

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.

optical disk A disk that encodes data as a series of reflective pits that are read (and sometimes written) by a laser beam.

Options Most commonly used to refer to the various switches available when asking a program to perform an operation for a user. Options are usually preceded by a -, which tells the program that it must do a specific action or use a specific processing technique. Options are well defined inside man pages.

Orange Book The standard for recordable compact discs (like CD-ROM, but recordable instead of read-only). Recordable compact discs are called *CD-R* and are becoming popular with the wide-spread use of multimedia. Part of the Orange Book standard defines rewritable Magneto-Optical disks and another section defines optical write-once, read-many (WORM) disks.

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.

OSI (Open Systems Interconnection) Reference Model Developed by the International Organization for Standardization (abbreviated as the 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.

output Information processed by the computer, or the act of sending that information to a mass storage device such as a video display, a printer, or a modem.

over-clocking The process of running a processor at a speed faster than the officially marked speed by using a higher clock multiplier or faster bus speed. Not recommended or endorsed by processor manufacturers. *See also* clock multiplier.

OverDrive An Intel trademark name for its line of upgrade processors.

overlay Part of a program that is loaded into memory only when it is required.

overrun A situation in which data moves from one device faster 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 will always fill the display area. *See also* underscanning.

overwrite To write data on top of existing data, thus erasing the existing data.

package A device that includes a chip mounted on a carrier and sealed.

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. 2) PAL also stands for 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 that 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 may 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 were 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.

park program A program that executes a seek to the highest cylinder or just past the highest cylinder of a drive so that the potential of data loss is minimized if the drive is moved.

partition A section of a hard disk devoted to a particular storage task. A hard disk under Linux can have many partitions, each occupied by a specific file directory tree or even a separate operating system.

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 matrix Another name for dual scan display type LCDs.

Pathname The path through a directory tree to a particular directory or file; that is, /usr/local/pics/Propaganda/Vol11/Penguin-sushi-5.JPG is the pathname to the file named Penguin-sushi-5.JPG.

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, and hard disks.

PCI (Peripheral Component Interconnect) A standard bus specification initially developed by Intel 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.

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.

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 that is segmented into a separate 8KB cache for code and another 8KB cache for data. The Pentium includes an FPU or math coprocessor. The Pentium is backward compatible with the 486 and can operate in real, protected virtual, and virtual real modes.

Pentium II An Intel sixth-generation processor similar to the Pentium Pro, but with MMX capabilities and SEC cartridge packaging technology.

Pentium Pro An Intel sixth-generation 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 separate die inside the processor package. The Pentium Pro includes a FPU or math coprocessor. The Pentium Pro is backward compatible with the Pentium and can operate in real, protected, and virtual real modes.

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.

PGA (1) Pin Grid Array. A chip package that has a large number of pins on the bottom designed for socket mounting. 2) Also a Professional Graphics Adapter, a limited-production, high-resolution graphics card for XT and AT systems from IBM.

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 may have resolutions as high as 2,048×3,072 pixels. Up to 100 true-color images (24-bit color) can be stored on one disk. Photo CD images are created by scanning film and digitally recording the images on compact discs (CDs). 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 allows several rolls of film to be added to a single disk 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. A single physical drive may be divided into multiple logical drives. Conversely, special software can span a single logical drive across two physical drives.

physical unit number See *PUN*.

pin (1) The lead on a connector, chip, module or device. 2) Personal Identification Number. A personal password used for identification purposes.

pin compatible Chips having the same pinout functions.

pinout A listing of which pins have what 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 current mode is mode 4.

Pipe A tool that allows the output of one program or process to be used as input by another program or process. The pipe is represented on the command line by a ¦ in the command `cat file.txt ¦ less`, in which the cat command displays the file called *file.txt* through the program called *less*, which gives the user considerable control over the way the file is finally displayed.

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*.

planar board A term equivalent to motherboard, used by IBM in some of its literature.

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 popular 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 allows 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.

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. Contrasts with interrupt-driven communications, in which the device generates a signal to interrupt the system when it has data to send.

port address One of a system of addresses used by the computer to access devices such as disk drives or printer ports. You may need to specify an unused port address when installing any adapter boards in a system unit.

port 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 communications between it and various devices.

port replicator For mobile computers, a device that plugs into the laptop and provides all of 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 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.

portable computer A computer system smaller than a transportable system but larger than a laptop system. 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.

POSIX A standard set of criteria by which UNIX programs, file systems, and other related items are to perform in relation to one another. Most of the common varieties of UNIX, including Linux, are POSIX compliant to varying degrees.

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, 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.

POTS (Plain Old Telephone Service) Standard analog telephone service.

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 *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 allows a computer to use the Internet with a standard telephone line and a high-speed modem. PPP is a new standard that replaces SLIP. PPP is less common than SLIP; however, it is increasing in popularity.

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.

primary partition An ordinary, single-volume bootable partition. *See also* extended partition.

Process In its simplest definition, a process is a running program. Processes can be grouped according to type, function, or name, and so on, according to the needs of the user or system administrator. Many, many programs are available for managing, manipulating, and getting information about processes. Use of the apropos and man pages are advised when you have to find out about processes running on your system.

processor See *microprocessor*.

processor speed The clock rate at which a microprocessor processes data. A typical Pentium PC, for example, operates at 200MHz (200 million cycles per second).

program A set of instructions or steps telling the computer how to handle a problem or task.

PROM (Programmable Read-Only Memory) A type of memory chip that can be programmed to store information permanently—information that cannot be erased.

proprietary Anything invented by one company and that uses components only available from 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 only from 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 may be defined in protocols.

PS/2 mouse A mouse designed to plug into a dedicated mouse port (a round, 6-pin DIN connector) on the motherboard, rather than plug 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.

QIC (Quarter-Inch Committee) An industry association that sets hardware and software standards for tape-backup units that use quarter-inch-wide tapes.

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.

rails Plastic strips attached to the sides of disk drives mounted in IBM ATs and compatibles so that the drives can slide into place. These rails fit into channels in the side of each disk drive bay position.

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 Linux, a RAM disk looks like and functions like any other drive.

RAM (random-access memory) All memory accessible at any instant (randomly) by a microprocessor.

RAMBUS Dynamic RAM See *RDRAM*.

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. There are several raster graphics standards.

RCA jack Also called a *phono connector*. A plug and socket for a two-wire coaxial cable used to connect audio and video components. The plug is a 1/8-inch thick prong that sticks out 5/16-inch from the middle of a cylinder.

RDRAM (Rambus DRAM) A high-speed dynamic RAM technology developed by Rambus, Inc., which will be supported by Intel's 1999 and later motherboard chipsets. RDRAM transfers data at 1G per second or faster, which is significantly faster than SDRAM and other technologies and which will be capable of keeping up with future-generation high-speed processors. 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/write head A tiny magnet that reads and writes data on a disk track.

read-only file A file whose permissions settings in the file's directory entry tell the kernel not to allow writes into or over the file, as well as who is allowed to write to the file.

read-only memory See *ROM*.

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 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 is also 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), and 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. *See also* CD-A *and* CD-DA.

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 a second, or else 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, a byte, or a computer word, and intended for a special purpose.

Relative pathname An abbreviated pathname that begins relative to the current directory. Whereas an absolute pathname might be /usr/local/pics/Propaganda/, a relative pathname to the same directory would be pics/Propaganda/ (if you were currently working in the /usr/local/ directory) or local/pics/Propaganda/ (if you were currently working in the /usr/ directory).

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.

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.

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 comprised of separately controllable red, green, and blue signals; as opposed to composite video, in which signals are combined prior to output. RGB monitors typically offer higher resolution than composite monitors.

ribbon cable Flat cable with wires running in parallel, such as those used for internal IDE or SCSI.

RIMM (Rambus Inline Memory Module) A type of memory module made using RDRAM chips. See *RDRAM*.

RISC (Reduced Instruction Set Computer) Differentiated from CISC, 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 2-wire connector type used for single-line telephone connections.

RJ-14 The standard 4-wire connector type used for two-line telephone connections.

RJ-45 A 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 because of 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 BIOS (read-only memory basic input/output system) A BIOS encoded in a form of read-only memory for protection. Often applied to important startup programs that must be present in a system for it to operate.

ROM (read-only memory) A type of memory that has values permanently or semi-permanently 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.

Root (directory) The base of the directory tree on a Linux/UNIX system, which is also simply known as /.

Root (user) The user primarily responsible for the behavior of the system. Because of this level of responsibility, the root user has (practically) universal privileges and can do almost anything that can be done on a system. Users are advised to be careful with both using root privileges and giving access to root privileges to unknown parties.

router Hardware that routes messages from one local area network to another. 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.

routine Set of frequently used instructions. May 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.

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.

scanning frequency A monitor measurement that specifies how often the image is refreshed. *See also* vertical scan frequency.

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 was approved in 1994, and SCSI-3 is currently in the development process. Normally uses a 50-pin connector and permits multiple devices (up to eight including the host) to be connected in daisy-chain fashion.

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) cartridge An Intel processor packaging design in which the processor along with several L2 cache chips are mounted on a small circuit board (much like an oversized memory SIMM), which is then 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 very much like an adapter card slot.

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.

second extended file system Also known as *ext2*, this is the file system native to Linux. Much older versions of Linux may use either minix or ext (for extended) file systems, but ext2 is the current standard for Linux systems.

sector A section of one track defined with identification markings and an identification number.

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.

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.

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 allow for 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 mouse A mouse designed to connect to a computer's serial port.

serial port An I/O connector used to connect to serial devices.

serial The transfer of data characters one bit at a time, sequentially, using a single electrical path.

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 will be unable to read the additional session data on the disk. The advent of Kodak's Photo CD propelled the desire for multisession CD-ROM XA (extended architecture) drives.

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 ROM 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 a DOS or Windows system to access BIOS code without the penalty of additional wait states required by the slower ROM chips. Also called *shadow RAM*. With Linux, because Linux bypasses the ROM and works from drivers in memory anyway, shadow RAM or ROM are not needed.

Shell the primary user interface between the kernel (the operating system proper) and the user. It is via the shell that the user issues commands and gets results from his commands. There are a variety of shells, but the one most commonly preferred is known as Bash. Bash combines the best of features of a number of predecessor shells and is currently best available for general usage.

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 different specifications exist for a drive powered on or off.

signal-to-noise (S/N) ratio The strength of a video or audio signal in relation to interference (noise). The higher the S/N ratio, the better the quality of the signal.

SIMM (Single Inline Memory Module) An array of memory chips on a small PC board with a single row of I/O contacts.

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, there is commonly one ground line 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- and twenty-eight-position DIP devices with .300-inch 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 allows a packet to traverse multiple networks on the way to its final destination.

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.

Slot 2 A motherboard connector for Pentium II Xeon processors intended mainly for fileserver applications. Slot 2 systems support up to four-way symmetric multiprocessing.

SMBIOS A BIOS that incorporates system management functions and reporting compatible 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.

socket A receptacle, usually on a motherboard although sometimes also found on expansion cards, that processors or chips can be plugged into.

Socket 1–8 The Intel specifications for eight different sockets to accept various Intel processors in the 486, Pentium, and Pentium Pro families.

soft error An error in reading or writing data that occurs sporadically, usually because of a transient problem such as a power fluctuation.

Soft link This is a path written to a filename whereby the user can reference a file in another directory by simply referencing the soft link in the current directory. Users are strongly advised to read the man page for the `ln` command.

software A series of instructions loaded in the computer's memory that instructs the computer in how to accomplish a problem or task.

SO-J (Small Outline J-lead) A small DIP package with J-shaped leads for surface mounting or socketing.

South Bridge The Intel term for the lower-speed component in the chipset that has always been a single individual chip. Also called the *PIIX (PCI, ISA, IDE eXcelerator)*, the South Bridge connects to the 33MHz PCI bus and contains the IDE interface ports and the interface to the 8MHz ISA bus. It also normally contains the USB interface and even the CMOS RAM and real-time clock functions. The South Bridge contains all of the components that make up the ISA bus, including the interrupt and DMA controllers. *See also* chipset *and* North Bridge.

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.

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 chip larger than conventional DRAM chips. SRAM is volatile, meaning it will lose data with no power.

ST-506/412 A hard disk interface invented by Seagate Technology and introduced in 1980 with the ST-506 5MB hard drive.

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 power supply A backup power supply that quickly switches into operation during a power outage.

Standoff 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, therefore 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.

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.

stepping The code used to identify the revision of a processor. New masks are introduced to build each successive stepping, incorporating any changes needed to fix known bugs in prior steppings.

storage Device or medium on or in which data can be entered or held and retrieved at a later time. Synonymous with memory.

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 that 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*.

Superblock Containing group descriptors, inode tables, and block and inode bitmaps for your physical drives, the superblock and its backups contain the descriptions of what is where on your drives.

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) Originally, this referred to a video adapter or monitor capable of 800×600 resolution. However, this term is now often misused and used to refer to any video adapter or monitor that can display any resolution greater than 640×480.

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.

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.

Symbolic link The more common name for a soft link. *See also* soft link.

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 with asynchronous communication. Some mainframes support only synchronous communications 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.

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 allows 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 allows for instant power on and power off.

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 MPR II. 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 that provide training and technical support.

TCP (Tape Carrier Package) A method of packaging processors for use in portable systems that reduces the size, the power consumed, and the 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/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 kinds of networks. This is the primary protocol used by the Internet.

temporary backup A second copy of a work file, usually having the extension BAK. Created by application software so that 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 1 trillion (1,000,000,000,000) of some unit. Abbreviated as t or T. When used to indicate a number of bytes of memory storage, the multiplier definition changes to 1,099,511,627,776. One terabit, for example, equals 1,000,000,000,000 bits, and one terabyte equals 1,099,511,627,776 bytes.

terabyte (TB) A unit of information storage equal to 1,099,511,627,776 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. Functions to prevent the reflection or echoing of signals that reach the ends of the bus and to ensure that the correct impedance load is placed on the driver circuits on the bus. Most commonly used with the SCSI bus.

TFT (Thin Film Transistor) The highest quality and brightest LCD color display type. A method for packaging one to four transistors per pixel within a flexible material that is the same size and shape as the LCD display, so that the transistors for each pixel lie directly behind the liquid crystal cells that they control.

thin Ethernet See *10base2* or *IEEE 802.3*.

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 *10base2* or *IEEE 802.3*.

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.

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.

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. Transmits at speeds of 16Mbps. Because of the token-passing scheme, access to the network is controlled, unlike the slower 10BaseX Ethernet system in which collisions of data can occur, which wastes time. The Token-Ring network uses shielded twisted-pair wiring, which is cheaper than the coaxial cable used by 10Base2 and 10Base5 Ethernet and ARCnet.

toner The ultrafine colored plastic powder used in laser printers and photocopiers to produce the image on paper.

tower A personal computer that normally sits on the floor and that is mounted vertically rather than horizontally.

TPI (tracks per inch) Used as a measurement of magnetic track density. Standard 5 1/4-inch 360KB floppy disks have a density of 48 TPI, and the 1.2MB disks have a 96 TPI density. All 3 1/2-inch disks have a 135.4667 TPI density, and hard disks can have densities greater than 3,000 TPI.

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 one inch 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.

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.

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 only on AC power. Because of advances primarily in LCD and plasma-display technology, these systems are largely 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, there are 256 possible color values (2 to the 8th power). To obtain 16.7 million colors, each of the primary colors (red, green, and blue) is represented by 8 bits per pixel, which allows for 256 possible shades for each of the primary red, green, and blue colors or 256×256×256 = 16.7 million total colors.

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*.

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.

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 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.

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.

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- or XT-class systems, and the 16450 and 16550A are used in AT-class systems.

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.

uninterruptible power supply (UPS) A device that supplies power to the computer from batteries so that 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*.

UNIX An operating system developed in the late 1970s by Bell Laboratories. Linux is an "open source" variety of UNIX, developed to get around the constraints of commercial copyrights that greatly inhibited growth and development of the operating system. When comparing Linux to the commercial UNIXes, the user should remember the comparison between a (Linux) Porche and all the Yugos. Generally speaking, the GNU tools are considerably superior to similar tools found on commercial-based UNIXes.

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.

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) A 12Mbs (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.

utility Programs that carry 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 FSK (frequency shift keying) 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 DPSK (differential-phase shift keying) to encode as much as two 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 QAM (quadrature amplitude modulation) to encode as much as four bits per baud.

V.23 An ITU standard for modem communications at 1,200 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 that 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 QAM (quadrature amplitude modulation) and optional TCM (trellis-coded modulation) to encode as much as four data bits per baud.

V.32bis An ITU standard that extends the standard V.32 connection range and supports 4,800; 7,200; 9,600; 12,000; 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 QAM (quadrature amplitude modulation) and TCM (trellis-coded modulation) to encode as much as six data bits per baud.

V.32terbo A proprietary standard proposed by several modem manufacturers that will be cheaper to implement than the standard V.32 fast protocol but that will only support transmission speeds of up to 18,800bps. Because it is not an industry standard, it is not likely to have 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.90 ITU-T designation for a defining the standard for 56Kbps communication. Supercedes the proprietary X2 schemes from U.S. Robotics (3Com) and K56Flex from Rockwell.

vaccine A type of program used to locate and eradicate virus code from infected programs or systems.

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 may 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 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.

VFAT (virtual file allocation table) A file system used in Windows for Workgroups and Windows 95/98. 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 compatible 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, that 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 is supported at a maximum resolution of 320×200 pixels in 256 (from a palette of 262,144) colors 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.

VHS (Video Home System) A popular consumer videotape format developed by Matsushita and JVC.

video A system of recording and transmitting primarily visual information by translating moving or still images into electrical signals. The term video properly refers only to 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 in to 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 will be 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 a number of disk sectors.

virtual memory A technique by which operating systems 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.

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. Now replaced by PCI bus.

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.

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.

voltage reduction technology An Intel processor technology that allows 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 that is operated within a public network. In order 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 thus can be transferred quickly between the video board and the system processor. Sometimes also called *dual-ported RAM*.

VxD (virtual device driver) A special type of Windows driver. VxDs run at the most privileged CPU mode (ring 0) and allow low-level interaction with the hardware and internal Windows functions.

wafer A thin circular piece of silicon from which processors, memory, and other semiconductor electronics are manufactured.

wait states Pause cycles during system operation that require the processor to wait one or more clock cycles until memory can respond to the processor's request. Enables the microprocessor to synchronize with lower-cost, slower memory. A system that runs with "zero wait states" requires none of these cycles because of the use of faster memory or a memory cache system.

warm boot Rebooting a system by means of a software command rather than turning the power off and back on. *See also* cold boot.

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. The sound card then modifies this sample to create any note needed for that instrument. Produces much better sound quality than FM synthesis.

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. 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 was first introduced with the IBM 3370 disk drive, circa 1979.

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 30 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. Most drives today actually use Whitney technology.

Wintel A slang common name given to computers running Microsoft Windows using Intel processors.

wire frames The most common technique used to construct a three-dimensional 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*.

word length The number of bits in a data character without parity, start, or stop bits.

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 cannot 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.

write precompensation A modification applied to write data by a controller to alleviate partially 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 closer together on the disk, thus enabling them to be read in the proper bit cell window. Drives with built-in controllers normally handle precompensation automatically. Precompensation normally is required for the inner cylinders of oxide media drives.

write protect Preventing a removable disk 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 allows modems to receive data at up to 56Kbps. This has been superseded by the V.90 standard. *See also* X2 *and* V.90.

x86 A generic term referring to Intel and Intel-compatible PC microprocessors. Although the Pentium, Pentium Pro, and Pentium II do not have a numeric designation due to trademark law, they are later generations of this family.

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 is 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 31.5 or 35.52KHz and supports analog color or analog monochrome displays.

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 300 or 1,200 bps 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.

XON/XOFF Standard ASCII control characters used to tell an intelligent device to stop or resume transmitting data. In most systems, typing 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.

X Window System (X) The GUI interface server used with Linux/UNIX. X provides a graphical interface for the user, usually in conjunction with a window manager (WindowMaker, Enlightenment, Fvwm, and so on) and sometimes additionally with a desktop manager (KDE, Gnome). The server client model allows for considerable flexibility, stability, and performance that can be greatly customized according to the user's needs and wishes.

Y-connector A Y-shaped splitter cable that divides a source input into two output signals.

Yellow Book The standard used by Compact Disc-Read Only Memory (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 allows for the combination of different 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. 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 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 in midstream, the transfer is aborted. YmodemG is designed for use with modems that have built-in error-correcting capabilities.

ZIF (Zero Insertion Force) Sockets that require no force for the insertion of a chip carrier. Usually accomplished through movable contacts and uses primarily 486, Pentium, and Pentium Pro processor systems.

zip drive An external drive manufactured by Iomega that supports 100MB magnetic media on a 3 1/2-inch removable drive.

ZIP (Zigzag Inline Package) A DIP package that has all leads on one edge in a zigzag pattern and mounts in a vertical plane.

Zmodem A file-transfer protocol commissioned by Telenet 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 In hard drives, a 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 as you move 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, allowing high-speed video displays for videoconferencing applications and MPEG decoders.