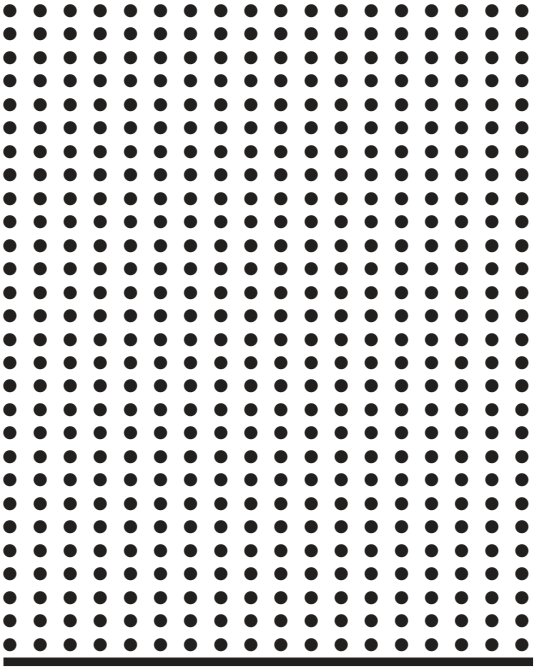
Adaptive Technologies for Learning & Work Environments

SECOND EDITION

JOSEPH J. LAZZARO



ADAPTIVE TECHNOLOGIES FOR LEARNING & WORK ENVIRONMENTS

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JOSEPH J. LAZZARO

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I dedicate this book to my parents,

Salvatore and Phyllis Lazzaro,

who tried to teach me right from wrong,

despite my best efforts to the contrary.

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INTRODUCTION

My journey with technology began with my father, who taught me how to use the right tool for the job. My father worked for General Electric for over thirty years as a machinist making jet aircraft engines. He was the one that the company turned to when one of the engines on the production line failed to meet specifications and had to be fixed, and fast! When he caught me using a screwdriver as a chisel when I was a teenager, he gave me a lecture about the importance of using the correct tool for the job that has remained with me to this day. When he asked if I would use a wrench as a hammer, his point was clear even to a teenager whose skull filled with mush. During the writing of this book, I have tried to keep my father's teachings in the forefront of my thoughts.

This book describes many tools that I hope will help you to increase your independence and provides detailed explanations of how to adapt personal computers for individuals with sensory, physical, speech, and learning disabilities. The text reveals the broad categories of assistive equipment available and how they relate to personal computers, operating systems, and applications software.

Because the Microsoft Windows operating system dominates the market at the present time and supports the widest available base of adaptive technology, it is logical for this book to focus on that platform. However, we also discuss the Apple Macintosh, Unix, and other operating systems where applicable. We make no judgment calls regarding the value of one operating system over another. We merely go with the flow and acknowledge consumer forces that have spoken. At some future time, Windows may no longer be the dominant operating system. If a future edition of this book becomes a reality, it will reflect what is dominant in the industry at its time of publication.

This book has been written with the nontechnical person in mind. Technical terms, when used, are defined. The technologies discussed focus on information access, which is necessary for every vocation and field of study. The book is intended for individuals with sensory, physical, speech, and learning disabilities. The text will also be helpful and comforting for friends, family members, coworkers, teachers, librarians, and anyone else involved with individuals with disabilities. People can also use this book to browse through the

many forms of cost-effective adaptive technologies if they need to comply with the Americans with Disabilities Act and other disability legislation, or if they want to do the right thing.

For individuals with disabilities, adaptive technology grants independence and self-sufficiency, even when the barriers seem insurmountable. The term *disability* as used in this book means any permanent sensory, learning, or physical condition that seriously limits an individual's ability to perform life-support tasks, such as seeing, hearing, walking, learning, or speaking.

You don't have to have a permanent disability to use this book. If you are recovering from an injury or have a temporary disability, this book is still appropriate. The book spotlights technologies that are available to you at this moment, not in the laboratory in some nebulous future. The book focuses on adaptive hardware and software you can install on your personal computer, devices that allow individuals with disabilities to learn, work, play, and gain access to information independently.

If you're concerned about complying with the Americans with Disabilities Act and other legislation, this book will instruct and educate you about the various forms of assistive technology being employed on the job, at home, in the library, in public facilities, and in the classroom. It also discusses the Internet and intranets, and how to maximize accessibility in those environments.

The book describes how personal computers can be equipped with a variety of powerful adaptive technologies to enable individuals to speak with an unlimited vocabulary, print hard-copy braille, magnify text and graphics, scan printed materials, respond to spoken commands, utilize alternative keyboards and mice, and communicate with friends and associates over the Internet. The text also discusses useful applications for personal computers already equipped with adaptive technology, including connecting to computer networks, accessing the Internet, sending and receiving electronic mail, scanning documents, browsing the Web, conducting virtual conferences, attending chat sessions, searching CD-ROM reference systems, and more. The book also describes how to analyze the environment for the provision of appropriate adaptive technology, how to provide training and ongoing technical support, and how to build a solid foundation for the deployment of assistive technology in a public setting.

Practical examples show you how to deploy the various technologies discussed. In addition, the appendixes identify over two hundred specific products that are typical of the myriad adaptive technologies available and offer extensive information about topics ranging from adaptive technology providers to disability-friendly legislation. Below is a brief description of each chapter.

Chapter 1 discusses basic computer hardware, which will bring you up to speed on the physical components of a typical personal computer. The chapter covers central processors, memory, motherboards, circuit cards, disk drives, slots, keyboards,

mice, CD-ROMs, CD-Rs and CD-RWs, modems, monitors, and other peripherals. This chapter is a straightforward overview that will help readers configure computers with many forms of adaptive technology.

Chapter 2 describes how to operate a computer using the keyboard instead of the mouse and includes pointers about keyboard shortcuts and built-in accessibility utilities for the Microsoft Windows, Apple Macintosh, and other operating systems. For many persons with disabilities, the mouse presents a significant barrier, so this chapter shows how to operate the computer directly from the keyboard and how to take advantage of the built-in accessibility utilities offered by computer platforms.

Chapter 3 discusses technologies to assist persons with vision impairments. It spotlights speech, braille, scanning, and magnification systems that enable people who are blind or have low vision to use computers and access information.

Chapter 4 highlights technologies to assist persons who are deaf or hard of hearing. It describes technologies that enhance communication over the telephone, on the Internet, and face-to-face.

Chapter 5 discusses technologies to assist persons with motor disabilities. It examines how a variety of hardware and software, from adapted keyboards to voice-recognition systems, can help individuals bypass the traditional computer keyboard.

Chapter 6 addresses technologies designed to assist persons with speech disabilities. The chapter describes how specialists evaluate candidates for communications technology, the basics of alternative communications devices, and how those technologies can help level the playing field for persons with speech disabilities.

Chapter 7 describes technologies to assist persons with learning disabilities. The technologies highlighted in this chapter help individuals overcome barriers that affect learning and working. The chapter describes how professionals evaluate candidates for compensatory technology and discusses a wide variety of solutions.

Chapter 8 describes how to build a solid foundation for supporting adaptive technology. It discusses the importance of having a competent evaluation before obtaining assistive technology and the roles played by assistive technology specialists and trainers. The chapter also discusses the value of establishing a solid infrastructure to support adaptive technology in universities, libraries, and other public entities.

Chapter 9 provides a basic overview of the Internet and the World Wide Web, and describes the fundamentals of Net access. The chapter spotlights the importance of accessible Web design and discusses validation software that automatically checks Web sites for accessibility. Intranets, which are private networks, are also examined.

Chapter 10 discusses strategies for funding adaptive technology. It presents cost-saving ideas and common sense approaches to tapping resources in both the public and the private sectors.

The appendixes are designed to serve as handy references. They

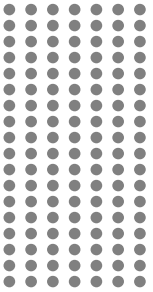
include keyboard shortcuts for the Windows and Macintosh operating systems, lists of assistive products categorized by disability, a directory of national disability-related organizations, a list of toll-free telephone hotlines for persons with disabilities, summaries of laws that support the provision of adaptive technology and the rights of the disabled, and a directory of technology assistance centers nationwide.

The reasonable man adapts himself to the world;

The unreasonable one persists in trying to adapt the world to himself.

Therefore all progress depends on the unreasonable man.

—George Bernard Shaw



1

Personal Computer Hardware Basics

The personal computer (PC) represents an electronic bill of rights for persons with disabilities, granting broad independence and vastly increased quality of life. Born from the ashes of war and conflict, computers now bring new life and hope to countless individuals with disabilities around the world. It goes without saying that personal computers have been the greatest force for positive change in the history of rehabilitation. Computers are powerful tools because they are readily configured to support a wide range of adaptive technologies to assist persons with disabilities. These technologies include speech synthesis, video magnification, braille input/output devices, scanners, speech recognition, alternative keyboards, environmental control systems, and alternative communications systems, to name just a few.

The PC is now everywhere—in the workplace, classroom, library, and home. Computers were first conceived in order to execute rapid and accurate mathematical calculations, but today's computers perform much more than computational tasks.

Computers let you write documents, manage budgets, compose video presentations, search library databases, write and play music, send and receive electronic mail, browse Web pages, conduct video conferences, talk over the phone, shop for goods and services, trade stocks, book airline and hotel reservations, play games, and much more. Students use computers to tackle classroom assignments, and employees perform work at the business site or telecommute from off-site locations. Computers are now an indispensable tool in the real world, and many forms of adaptive technology empower computer users with disabilities.

WHO SHOULD READ THIS CHAPTER?

This chapter is intended as an overview of personal computer architecture, giving you basic knowledge of the hardware that supports the operating system and application software. Please be advised that a complete text on computer hardware could easily fill volumes, but that is well outside the scope of this book. You should also be aware that the computer field is in a constant state of change, which means that it is vital to keep abreast of new technologies and techniques.

If you have a strong knowledge of personal computer hardware, you can safely skip this chapter. But if you have never taken a computer apart, or have little knowledge of what's inside the box, this chapter was written just for you! If your desire is to achieve proficiency in the application of adaptive technology, to be most effective, you will sooner or later have to work with the actual hardware.

COMPUTER HARDWARE

Hardware consists of all the components that constitute the physical computer. The hardware supports the operating system and applications software programs. All the hardware combined is often referred to as the platform. The following sections describe the basic hardware components of a typical personal computer: central processor, memory, input devices, output devices, disk drives, expansion slots and circuit cards, input/output ports, and modems.

The Central Processing Unit

The central processing unit (CPU), also called a microprocessor, is the engine that drives the computer. It is the heart of any computer system. The CPU interprets and carries out instructions according to specific software programs. It resides on the motherboard—the main circuit board for a computer system. In the past, the CPU of a mainframe computer filled a room, but the CPUs that drive current personal computers are wafer-thin chips about an inch square.

The CPU is of immense significance because the speed of the processor determines the amount of work the computer can perform and how long it will take to accomplish a given task. The speed of the CPU is measured in megahertz, abbreviated MHz. One megahertz is one million cycles of the CPU per second. This measurement is called the clock speed for the computer. The faster the clock speed, the more work the computer can perform. Faster clock speeds mean that more calculations per unit of time can be performed, and this is directly related to system performance.

Current personal computers have clock speeds of several hundred megahertz per second. Even faster clock speeds of over 1,000 megahertz are now available, and speeds are going up as prices decrease. Be aware that

manufacturers raise their CPU clock speeds virtually overnight, and the best source to check for the latest developments are the computer magazines available at newsstands and on the Net.

If you're a person with a disability, you should purchase a computer with a fast CPU and as much memory as possible because computers fitted with adaptive equipment may need additional speed and resources to support both adaptive and nonadaptive hardware and software. This is especially true when running such technologies as speech recognition and voice synthesis. If the CPU is using a significant portion of its power running the adaptive equipment, it will have little power left over to deal with other applications. The reverse is also true. Thus, a fast CPU will prevent the system from being slowed down.

Memory

Memory is the physical work space of a computer system, the place where documents are stored while work is performed on them. Memory is often confused with disk storage space, which will be discussed later in this chapter. The important point to remember is that memory is temporary storage, whereas disk storage is permanent. When you switch off your computer, everything stored in memory is destroyed. That is why it is important to frequently save your work.

Memory defines the amount of work that can be performed by a computer system and is one of the yardsticks against which performance is measured. There are two different types of memory: alterable and unalterable. Memory that is alterable by the user is called random-access memory (RAM), and memory that is unalterable is called read-only memory (ROM). RAM and ROM are measured in units called bytes. The terms *bytes* and *bits* are used extensively in the world of computers. A byte is one character of information, such as a letter, number, or punctuation mark. Bytes are composed of even smaller units known as bits. It takes eight bits to make one byte. Metric prefixes denote quantities of storage for memory and other units. Thus, a kilobyte (K) is 1,000 bytes of information, and a megabyte (MB) is 1,000,000 bytes. (It's a bit more complicated than that, but this serves as an approximation.)

If you're using any form of adaptive software, memory is one of the most valuable resources your computer has to offer. If you're using a speech-synthesis or voice-recognition software program, the demands on a computer's memory are especially high and require a system with 128 to 256 megabytes of memory. If you're deaf or hard of hearing, a system with 128 megabytes should be sufficient. If you have a motor or speech disability, you should consider a system with from 128 to 256 megabytes of memory, as you will undoubtedly be running a voice-recognition or dictation package to enter information and control your programs. You should also be aware that adaptive software utilities can be loaded concurrently, making it vital to have a system with as much memory as possible.

Input Devices

Computers are information-processing machines, and the keyboard allows you to enter commands and information into the system. Personal computers use a typewriter-style keyboard as the primary input device. You type on the keyboard, and the information appears on the display. The mouse is another type of input device. It is used to point to and select objects on the screen. The next sections discuss these input devices and point out their possible barriers that can be overridden by adaptive technologies.

Keyboards

Keyboards are input devices that allow users to enter data to be processed by the computer. Based on the time-honored design of the traditional typewriter, computer keyboards contain about one hundred individual alphanumeric keys similar to the print symbols on a standard typewriter.

Although somewhat similar to typewriters, computer keyboards contain keys not found on typewriters. These unique keys allow you to enter information in a way different from that of typewriters, to move the cursor through documents, and to issue specific commands to the system. For example, a numeric keypad contains numbers and calculator-style arithmetic operators for performing calculations. Arrow keys move the cursor up and down one line at a time or left and right one character at a time. Other keys on the keyboard rapidly move the cursor through documents in larger increments if desired: The PAGE UP and PAGE DOWN keys move the cursor up or down one page at a time. The CONTROL+HOME key combination moves the cursor to the top of the current document, and the CONTROL+END key combination moves it to the end of a document. When the INSERT key is struck, you can inject characters, words, sentences, or blocks of text into the space next to the cursor.

Included on a computer keyboard are unique keys for command and control functions. The CONTROL (CTRL) and ALTERNATE (ALT) keys provide users with additional shift keys, allowing commands to be sent directly to the computer. For example, to print a document, you must depress the CTRL key while holding down the P key. To save a document, you would simply strike CTRL+S. The keyboard also contains twelve function keys, labeled F1 through F12. These are usually arranged across the top of the keyboard, although alternative arrangements are available. The function keys are used to execute commands at various levels. (See chapter 2 for a description of Windows commands.) Function keys can also be programmed to execute multiple keystroke sequences. Pressing a single function key can issue a series of complex commands in succession. For desktop computers, the keyboard is usually a discrete peripheral, attached to the main computer with a short cable. Detachable keyboards are more adaptable as they can be mounted close to you or at a more desirable work angle.

For persons with disabilities, the keyboard may present a great barrier or no barrier at all. The barriers clearly depend on the nature of the disability.

For persons with vision impairments, the keyboard itself presents few barriers, and speech, magnification, and braille adaptive technologies provide verbal, visual, or tactile feedback of individual keystrokes. For persons who are deaf or hard of hearing, the keyboard offers few barriers. For persons with motor disabilities, the keyboard can present a significant barrier, but adapted keyboards, voice-recognition, and other assistive systems can be of great help. Because the keyboard plays a major role in the use of a personal computer, it is the focus of many adaptive technologies to remove or reduce barriers.

Mice

The mouse is a small device that is used to point to and launch programs and documents. Mice are palm-sized instruments with a roller ball on their underside and with two or three control buttons to click on top. Some mice include a roller wheel to aid in pointer movement. When the mouse is moved, the cursor follows on the screen, and the cursor points to the place desired.

Mice can present barriers for persons who have visual or motion-related disabilities. However, using keyboard commands to move directly to desired points on the screen can overcome these barriers. (See chapter 2 for a description of how to operate the computer directly from the keyboard.)

Trackballs

A trackball is an upside-down mouse with the ball on top. You roll the ball with your fingers, which moves the mouse pointer around the screen. Trackballs thus remain stationary, mounted in a holder. The size of the ball can vary from one unit to another. Mice and trackballs connect to the computer using a cable or wireless connection. Wireless mice, trackballs, keyboards, and other devices permit increased freedom by doing away with the traditional interface cable.

Cameras and Scanners

You can connect cameras and scanners to your computer to access a wide variety of information. You can use your digital camera to snap pictures and then upload the digitized photographs into your computer for storage, printing, or e-mailing to a friend or family member. Web cameras, or Web cams, let you conduct video conferences over the Internet that provide both sound and video at all sites of participation. You can also use a Web cam to monitor your home remotely, to see who is at the front door, or for a wide variety of other applications.

Scanners, which let you scan text or graphics into your computer, have many useful applications for persons with disabilities. A scanner is similar in function to a camera and looks much like a small desktop photocopier. You simply place text or graphics printouts on the scanner, close the lid, and press a button to have the image on the page transmitted directly into your personal computer. Scanners can thus be used as reading machines to assist persons with vision impairments access the printed word. They can also be used to

scan images of documents that can then be magnified on the computer screen. In addition, scanners let you scan photographs and other pictorial information into your computer for editing, printing, or transmission. Cameras and scanners typically connect to the computer through the standard USB port.

Output Devices

Computers require ways to present information to users, either during processing or after processing is completed. Personal computers use a video monitor screen as an output device, allowing the computer to display both text and graphics. Other output devices are printers that provide hard-copy paper documents. The next sections describe these and other output devices, along with the barriers they may present and the role of adaptive technologies in overcoming the barriers for persons with certain disabilities.

Monitors

Monitors are visual displays that are similar to standard television screens. The monitor contains a gun that fires a beam of electrons at a light-emitting layer on the interior face of the tube. When an electron strikes this layer, a dot of light appears on the screen. Monitors are capable of displaying text and graphics, and can display all the colors of the spectrum. Through the use of different chemicals in the photosensitive layer, all the colors of the spectrum are reproduced. Monitors have separate controls for brightness and contrast similar to the controls on a standard television. Monitors are external peripherals that connect to the computer using an interface cable.

Depending on an individual's disability, monitors can introduce immense barriers or no barrier whatsoever. For persons with vision impairments, the monitor presents a great barrier in its unmodified form. The technologies of speech synthesis, magnification systems, and braille can translate the output from a monitor into a verbal, enlarged, or tactile format, allowing persons with vision impairments greater access. For persons who are deaf or hard of hearing or those who have motor or speech disabilities, the monitor offers little or no barriers.

Printers

The printer is the most commonly used output device, except for the computer monitor. You can connect a printer to your computer to produce hard-copy printouts of text and graphics. Printers are external peripherals that connect to your computer via the serial, parallel, or Universal Serial Bus (USB) port. Typical printers are capable of printing on standard letter stock, envelopes, labels, and even high-quality photo paper. There are many brands and types of printers on the market, from inexpensive models suited for the home user all the way up to high-capacity units for corporate environments.

Laser printers are popular among many users because they offer high-quality production of both text and graphics. Laser printers use a photoreac-

tion process similar to that of photocopiers. First the laser printer creates a graphic image in its memory of the page to be printed, then it reproduces that image using a laser to write the image line by line onto a rotating cylinder. After passing under the laser, the cylinder is covered with toner, which adheres to the cylinder wherever the laser was present. The cylinder is then covered with ink and pressed to the paper to produce the image. Ink will transfer to the paper only where the toner was present. The laser printer can print text and graphics in any number of type sizes and character sets.

Inkjet printers are also popular among users because they are inexpensive and capable of producing high-quality text and graphics. As the name implies, an inkjet printer uses controlled streams of ink to spray shapes of letters and other symbols directly on the paper. Inkjet printers can be used to print both text and graphics and are often less-expensive alternatives to laser printers.

Storage Devices

As we saw in the last section, memory is temporary storage, but disk storage is permanent. All computers need a place to store information permanently. The disk drive is one of the most important subsystems of the personal computer, as it is there that documents and files will be stored while the system is not in use. The disk drive is a high-speed data recorder capable of storing and retrieving large quantities of information. Tape drives also store data, but are now mainly used to make duplicate copies of a disk drive for safekeeping. However, disk drives have much in common with their tape-based cousins—both types of devices rely on magnetic oxide media and recording heads to store information. A disk drive records data on an oxide-coated spinning platter.

The amount of disk storage, measured in kilobytes, megabytes, or gigabytes, is of prime importance. The larger the storage space, the more information you can access. Since there are strong trends for providing text and other information in disk-based formats, and since information stored on disk is more accessible than printed material, disk storage is especially important to the disability community. Therefore, you should favor purchasing personal computers with as much disk storage space as possible, keeping both present and future disk storage needs in mind.

Floppy Disks and Hard Disks

The two most common types of disk storage devices for personal computers are floppy disks and hard disks. A floppy disk drive uses removable disks for storage; thus, you can record information on blank disks, similar to recording information on blank tape cassettes. The floppy disks used in newer computers are 3.5 inches in size and are enclosed in a rigid plastic shell. A 3.5-inch disk can hold from 1.4 to 2.8 megabytes of information. To visualize those amounts, consider that an average paperback book takes about 750 to 1,000 kilobytes of storage space.

Floppy disks allow you to transport information easily and quickly from one computer system to another, as easily as removing and inserting a cassette. Hard disks are becoming more like floppy disks in that they can often be removed from one machine and inserted into another—again, similar to inserting a cassette or cartridge. The primary advantage of hard disk systems is that they are fast at transferring data. Hard disks also have a much greater capacity to store information than floppies do. The typical hard disk drive is a sealed unit that can hold gigabytes of information. One gigabyte (G) is equal to 1,000 megabytes. There are also large-capacity removable disk systems, such as Zip and Super drives, that permit you to store much more information than a floppy disk can hold.

Personal computers typically possess one floppy disk drive and one hard drive, but numerous combinations are possible. You can configure a system with multiple hard drives and a combination of floppy, Zip, and CD-ROM drives, depending on your requirements.

For persons with disabilities, information stored on disk is much more accessible. Therefore, you should select the largest hard drive you can afford when purchasing a system. For some individuals, inserting and removing disks may be a barrier, so a computer is more accessible if everything is stored on the internal hard drive.

CD-ROMs

Compact disks are a powerful and flexible storage technology for personal computers. *CD-ROM* stands for *compact disk–read only memory.* As the name implies, information on a CD-ROM disk can be read but not added to or deleted. A CD-ROM disk can hold about 750 megabytes of information. A single CD-ROM disk can often store an entire dictionary, encyclopedia, or virtual library of information.

CD-Rs

If you wish to write your own CDs, compact disk–recordable (CD-R) drives allow you to permanently record large quantities of information. These data recorders come bundled with recording software that permits you to write CDs that can be accessed using a personal computer and also to write audio CDs that can be played on a music system.

CD-RWs

A CD-R drive allows you to write your own compact disks, but you can write material only once and you cannot erase it. A compact disk–rewritable (CD-RW) drive is more versatile. It allows you to write, erase, and rewrite information to CDs over and over, much as you use your hard disk drive. For persons with disabilities, compact disks are beneficial due to their high storage capacity. You can use CDs to store large quantities of information: text, sounds, and images. Because CD drives are so common, compact disks make sense as a

portable storage medium, allowing you to carry large quantities of information with you.

DVDs

The latest generation of CD-ROM is known as *DVD, for Digital Video* (or *Versatile*) *Disk.* The DVD disk is the same size and shape as a standard CD-ROM disk, except that it holds much more information. A single DVD disk can hold up to 4.7 gigabytes of information, enough for a feature-length movie. It is expected that DVD will replace the older forms of CD-ROM, videocassettes, and laser disks. DVD drives can play standard CD-ROM disks. DVD2 drives can also play CD-ROM disks recorded on CD-R drives.

Tape Drives

Tape drives allow you to record large quantities of information and are readily interfaced to personal computers. Tape drives employ removable cartridges or cassettes for storing information. You can use a tape drive to record all the information stored on your system and recall that information at a later time. Tape drives are used mainly for making backup copies of your information and are well worth the investment as a protection against system crashes and loss of data. A typical tape drive is similar to a cassette recorder, allowing the contents of a hard disk to be quickly and easily copied. Current tape drives can compress information as it is stored, allowing larger amounts of information to fit on the backup tape. You can program a tape backup system to back up an entire drive from beginning to end or only files that have been modified after a selected date. The first approach allows you to back up the drive in its entirety, and the second to back up only the files that have changed. You should make a regular schedule for backing up your system. The data stored on your computer is irreplaceable! Tape drives are not used for retrieving data rapidly, as are floppy and hard disk drives, because you must wind through the tape to find specific files or folders. Tape drives can be purchased either as internal units or as external mechanisms with separate enclosures.

Expansion Slots and Circuit Cards

Expansion slots allow you to expand and upgrade your computer system by plugging in new hardware. The slots are inside the computer, located on the motherboard. You can plug a wide variety of cards into these slots to expand, upgrade, or change your system altogether. An expansion slot provides both data and electrical connections for a given circuit card.

Circuit cards perform a wide range of functions that can increase the overall power and capability of an existing computer system. Circuit cards allow you to add extra equipment such as modems, network interfaces, sound cards, video adapters, and ports. Although they are not found on every brand of computer system, expansion slots are standard equipment on most computers.

Installing a Circuit Card

When a circuit card is plugged into the system, it is as if it had been installed at the factory. To install a circuit card into an expansion slot, first turn off the power to avoid shock or damaging the circuit card itself. You should be standing on a static-free mat and use a wrist ground strap to avoid damaging the circuits, which are sensitive to static electricity. You can permanently damage computer chips and other circuitry by discharging enough static electricity from your body. Next, open the computer case with a screwdriver to expose the expansion slots. The slots usually can be found along the rear of the case, and the circuit cards are plugged into the slots in a vertical position. Some computer systems have slots arranged in a horizontal configuration, and the circuit cards are inserted on their sides rather than upright. The rear of the circuit card often has a metal plate that contains an interface jack or other type of connector. These connectors are used to attach cables to the circuit card. For example, a sound card plugged into your computer would then connect to a microphone and speakers through its interface jacks on the rear of the card.

When installing a circuit card, some technical considerations are in order. Each circuit card must be assigned a unique number known as an interrupt. An interrupt may be thought of as a phone number. Each card must have its own unique number, and no two cards can share the same interrupt; otherwise the system will fail to operate. A circuit card interrupt can be set by flipping tiny switches on the card. These switches are called dip switches. Some cards are altered using jumper blocks, which are changed by moving a tiny connector from pin to pin. Current circuit cards can be changed through software, making the hardware installation more streamlined.

Memory addresses are also important when installing a card. As with interrupts, circuit cards can be set to occupy unique memory addresses. No two cards can share the same memory address; otherwise the system will fail. Some computers automatically adjust the address locations of the installed circuit cards to prevent conflicts with other cards, while others must be manually configured. Memory addresses, like interrupts, can be changed using dip switches, jumpers, or software switches. Although a full discussion of interrupts and memory addressing is beyond the scope of this book, it is important to know that such conflicts can cause problems when some personal computers are customized with circuit-card-based adaptive technology.

Plug and Play

If you're squeamish about installing new hardware in your system and didn't quite grasp interrupts and memory address conflicts, the technology known as Plug and Play can help you with the installation process by automatically configuring circuit cards and system software so that everything works without the need for manual troubleshooting. The good news about Plug and Play is that it enables the installation of all manner of circuit cards across computer brands and platforms, and is now standard equipment for most models of

computers. Plug and Play essentially lets you plug a card into the computer, turn the computer on, and have the operating system automatically detect and recognize that a new card has been seated. The operating system will then install the correct software driver for the new card or ask you for a floppy disk or CD-ROM containing the software it needs. It's that simple!

Expansion slots and circuit cards are the foundation for many forms of adaptive technology, allowing off-the-shelf personal computers to be configured for persons with disabilities. Since many adaptive devices are circuit cards, personal computers can readily be adapted with many different types of assistive technology.

Sound Cards

The Sound Blaster and its many clones have become the de facto speech standard for Windows-based personal computers. The Sound Blaster supports both speech-synthesis and voice-recognition software, allowing your computer to talk or to respond to spoken commands and dictation. The Sound Blaster can also support audio recording and editing software and be used to play music CDs on your system. Sound cards support many forms of speech-synthesis and voice-recognition technology, making them popular in the disability community.

You can readily install a sound card in your computer, provided you have an empty slot and enough CPU and RAM to support it. Many Windows-based and Unix-based computers now available routinely come bundled with sound cards installed, making them speech-compatible right out of the box. The Apple Macintosh has built-in speech and sound capability, making it speech-compatible as well.

Input/Output Ports

Computer input/output ports allow you to plug external peripherals into your computer. These ports are located on the back panel of your system and allow you to connect printers, external disk drives, scanners, modems, networks, digital cameras, and adaptive devices. All you need is an interface cable with appropriate connectors at each end to plug the device into one of the ports.

Ports communicate with external peripherals and devices by sending data back and forth in a system known as handshaking. This allows information to flow between the computer and the peripheral and prevents loss of information. There are several types of input/output ports found on personal computers. The types are serial, parallel, Small Computer System Interface (SCSI), and USB. In each case, input/output ports allow computers to connect to external devices, but the actual data formats differ from one port type to another. A full description of those data formats is beyond the scope of this chapter.

Serial and Parallel Ports

Serial ports send data one bit after another, similar to the cars of a train following one another in sequence. With parallel ports, data travels in parallel wires, side by side, as on a multiple-lane highway. It is important to know which port type is required to interface a given external device, but this can be determined by contacting the manufacturer or reading the technical documentation for the device. Your computer can have more than one of each kind of port installed, and it makes sense to have enough ports to meet or exceed your expansion options. You may only require one port today, but that is likely to change as your needs become more sophisticated.

SCSI Ports

SCSI ports are used to communicate with other internal or external devices. SCSI ports can control multiple devices by connecting one device after another along a chain.

USB Ports

A USB port can connect more than one device at a time to your computer. USB ports are included with most computer systems. The USB interface standard may eliminate the need to deal with circuit interface cards, which are difficult for many users to cope with. Similar in some respects to SCSI, the USB allows us to create a daisy chain of devices, eliminating problems like interrupts and memory address conflicts.

Modems

The modem, a necessary addition to most computer systems, is used to send and receive information over the telephone system. You can use a modem to connect to an online service, the Internet, or another modem-equipped computer. The term *modem* is short for *modulator/demodulator.* The pulsed signals produced by a modem are transmitted over the telephone lines and are decoded at the other end by the receiving modem. A computer connected to the phone via modem can call other computers to send and receive data. That data might be the latest stock prices, the morning newspaper, an encyclopedia, a graphic image, a text document, or electronic mail from the office. A modem is a powerful option to attach to any personal computer because it can greatly broaden the user's information horizons.

Numerous types and brands of modems are on the market. They can be purchased as either external or internal devices for computers. Some modems also may double as facsimile (fax) machines, allowing you to send and receive faxes.

Modem performance is measured by how fast the unit sends information to a remote system. The speed of a modem is known as the baud rate and is measured in the number of bits transmitted per second. (Baud rate is also used to measure the speed of data flow with other computer devices.) Current modems can transmit at baud rates of approximately 56 kilobits per second.

Higher baud rates are also possible, and broadband connections to the Internet with a cable or digital subscriber line (DSL) modem are much faster.

Cable and DSL Modems

Cable and DSL modems are known as broadband modems because they allow for much higher data transmission speeds than conventional modems. Cable modems connect you to the Internet over standard cable television lines, and there are numerous providers offering such Internet access to consumers. DSL modems also connect you to the Internet at very high speeds, similar to those of a cable modem, but they use standard telephone lines. Cable and DSL modems are on average fifty times faster than standard modems and measure their speed in millions of bits per second.

PORTABLE PCs

As personal computers grew more powerful, they also grew smaller due to demands from the business community and the general public for computers that were both robust and compact. Businesspersons want to take their computers on trips and to conferences and meetings; therefore, the ideal personal computer should fit in a briefcase, be lightweight, and be capable of running its user's preferred word-processing, database, and spreadsheet software. Persons with disabilities also require lightweight computers. In fact, portability is a desired trait in virtually any kind of computer or adaptive device, and it can be especially important for persons with disabilities because they use their computers for more demanding tasks than writing letters or looking up phone numbers. That is, persons with disabilities often must carry their computers to communicate with friends, family, and co-workers. Many powerful computer systems are portable and can be adapted for persons with a wide range of disabilities.

Notebook Computers

As the demand for truly lightweight and portable computers has grown, a new generation of even smaller computers has sprung into existence. These petite machines received the fitting name *notebook* because they are about the same size and shape as the notebooks commonly used by students. The typical notebook computer weighs about five pounds and includes the same capabilities found on much larger desktop computers. You can purchase notebook computers with fast processors, large memory, CD-ROM drives, DVD drives, network interfaces, sound cards, and speakers—virtually everything you can find on a desktop computer system. Most notebooks contain Personal Computer Memory Card Interface Adapter (PCMCIA) expansion slots that permit you to connect peripherals to the computer, similar to plugging a circuit card into a desktop system. PCMCIA cards are tiny, about the same size as a credit

card. Today, you can purchase notebooks with the same power as personal computers and enjoy the same computer power and flexibility on the road as in the office.

Palmtop Computers

The development of ever smaller and lighter portable computers continues. Presently, the palmtop computer is the machine of choice for many users. These computers often measure their weight in ounces and are smaller than a paperback book. While not as powerful as their notebook cousins, palmtop computers permit you to maintain your contact manager, send and receive electronic mail, surf the Web, and interface with larger computer systems. Some palmtop units come bundled with infrared ports, allowing you to send and receive data without having to use a cable connection. Some palmtops also have expansion slots for upgrading the system or adding adaptive equipment.

As computers continue to evolve, we can say with certainty that they will grow ever smaller, lighter, and more powerful. Portable computers allow persons with disabilities to carry the equivalent of bookshelves of information on the road and to access that information with their choice of adaptive equipment. Prices for such transportable computers are steadily falling, making it possible for more individuals to take advantage of this technology.

Global Positioning Systems

A global positioning system (GPS) consists of a string of space satellites orbiting the globe. The satellites broadcast radio signals that are received on the Earth's surface by handheld receivers. Your GPS receiver picks up the signals from the satellite and then displays your exact location, using the satellite signals as a yardstick. A global positioning system allows you to know with extreme accuracy your exact position on the Earth's surface. Global positioning system technology has wide applications, not the least of which is to assist persons with disabilities. Persons who are blind or have low vision use talking GPS receivers to help with mobility and orientation. Global positioning systems help users find where they're going and plot the most direct route to a desired destination.

SELECTING A PERSONAL COMPUTER

At first glance, choosing a personal computer can seem a formidable task, one requiring the skills of an electronics engineer or systems analyst. There are many questions to ask when configuring a personal computer system to support assistive technology: What adaptive hardware and software will be necessary? Which computers are compatible with the required adaptive hardware or software? How fast must the central processing unit be to support both the adaptive and the nonadaptive equipment? How much memory is needed, and

how much disk capacity is required? What physical size is appropriate: desktop, notebook, palmtop? Is there any nonadaptive hardware and/or software that will perform the same tasks at a lower price? Selecting the right personal computer, adaptive equipment, and application software does not have to be a hardship; it can actually be a pleasant task, so long as the goal is approached after some planning.

The first question you should ask is, "What type of adaptive technology is needed?" This is not always an easy question to answer, but the subsequent chapters in this book will provide some basic guidelines. The important purpose of any form of adaptive technology is to provide a tool that enables you to perform independently. You may need to enlist the help of a rehabilitation engineer or adaptive technology consultant to help you determine what technologies are appropriate.

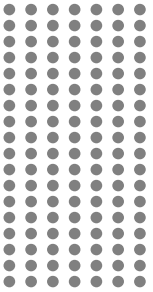
Once you have determined the requirements of your adaptive equipment, you can start looking for the computer hardware to support it. The system requirements will tell you how much processor, memory, and disk space are required to run the solution and if you will need other peripherals. If the desired adaptive equipment is based on a circuit card, you should determine that the card is compatible with the computer hardware. If the adaptation is software based, you should determine what computer the software will run on. The computer should have enough CPU power, memory, and disk storage space to run all of your hardware and software. In addition, you may want to purchase the computer and any required adaptive technologies from a local vendor who routinely configures computers and adaptive equipment. This will provide you with more reliable access to specialized technical support, upgrades, training, and maintenance.

Once you have determined what adaptive solution is appropriate, the next question is, "What nonadaptive software is necessary?" You can compose a list of the necessary tasks. The list typically includes such tasks as writing documents, compiling address books, browsing the Internet, sending and receiving e-mail, keeping track of personal and business finances, digital photography, shopping online, playing games, and even creating audio and video presentations. The list will help you to decide what tasks are most important and to select the right software to tackle each job. This is a good time to get familiar with the programs that meet your requirements, as there are likely to be at least several that meet your needs. Take the time to learn the system requirements and capabilities of each product before you make a purchase. You should also take advantage of any demoware that is offered because it will allow you to try the software before you buy it. Demoware is typically the same software offered for commercial sale, except that it has an expiration date and limits your use to sessions of only thirty to sixty minutes each. You can use the Internet to search for and download demoware on your computer for immediate use.

You should also talk with other people about what software they're using and their experiences with the various packages. You can join user groups to

plug into a wealth of knowledge, support, and even friendship. A group that I am personally familiar with from the Boston area, the Visually Impaired/Blind Users Group (VIBUG), formerly of the Boston Computer Society, is a solid source of grassroots and professional information about computers and adaptive technology to serve the visually impaired community. You can find out more information about VIBUG by pointing your Web browser to http://www.vibug.org. I have benefited from being a member of the organization and consider it, and groups like it, among the most positive forces for constructive change in the industry.

When selecting a computer system for the purposes of adaptation, first find the adaptive and nonadaptive software that you require, then find the hardware to support it. Before buying a software application, check its packaging for a list of system requirements. The system requirements will tell you how much processor, memory, disk space, and other resources are necessary to support the configuration. If you faithfully look to the system requirements, you will become comfortable planning and configuring your computer system.



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Driving the Computer from the Keyboard

Personal computers provide a platform of independence for users with disabilities, and built-in keyboard commands and accessibility utilities increase that self-reliance. As discussed in chapter 1, the personal computer employs output devices for displaying data and input devices for entering commands and information. The two basic input devices are the keyboard and the mouse. The keyboard lets you enter data and issue commands. The mouse, in conjunction with the keyboard, lets you point to objects on the screen and select or run them on demand. For persons with disabilities, the keyboard and mouse can prove to be significant barriers, but accessibility utilities and keyboard shortcuts can help to overcome them.

A key focus of adaptive technology is the ability to control a computer directly from the keyboard without having to use a mouse. In place of the physical mouse, a user employs keyboard shortcut commands to move the mouse pointer, explore the user interface, and activate or select objects. This chapter describes how to run Microsoft Windows, the Apple Macintosh, and the Unix environment from the keyboard, without having to use the mouse. The built-in accessibility utilities for these operating systems are also discussed. Given the dominance of Microsoft Windows and given the great range of adaptive technology that is compatible with Windows, we will focus on that platform. However, the discussion will remain general whenever possible to demonstrate commands and methodologies that are common to all operating systems. This, it is hoped, will serve the greatest number of readers.

THE GRAPHICAL USER INTERFACE

This section describes the Graphical User Interface (GUI) employed by Windows, Macintosh, Unix, and other operating systems. This chapter and its

associated appendix material will show you how to control your computer, interact with the operating system, and navigate and control applications programs directly from the keyboard without having to utilize the mouse. However, if you wish to use the mouse, this chapter will not conflict with your use in any way. Because individual choice is of paramount importance, we seek to include a variety of technologies and methodologies that will equip readers to make informed decisions.

Most operating systems in use today employ a Graphical User Interface to display information to the user and to control the operating system and applications software programs. Older operating systems, such as DOS (Disk Operating System), employed text to display information on the video monitor in an 80-character-by-25-line grid. These older operating systems did not encourage a standard user interface, which resulted in a different appearance and command structure for each applications software package.

Graphical User Interfaces use a grid of pixels to display both text and images—everything from simple text documents to multimedia presentations. Pixels are tiny points of light that can be gathered into any shape, whether characters or pictures or control objects. Pixels allow text characters to appear in any font, size, or color, and can be combined to create detailed graphics. Pixels enable you to control the look and feel of the screen presentation and to control any menus visible on-screen. The GUI is controlled by moving the mouse pointer to various control objects on the screen and by clicking one of the mouse buttons to activate the control objects.

The mouse is a tiny device that lives on your desk and fits in the palm of your hand. As indicated above, it allows you to move a cursor/pointer around the computer screen. When you move the pointer to an object on the screen, such as a menu, you can press a button on the mouse to activate the menu. This action is known as pointing and clicking, and is the standard methodology for controlling computers equipped with Graphical User Interfaces.

Using the mouse is easy enough in concept. You use the mouse to point to an object on your screen and that object then becomes highlighted. The mouse contains buttons that allow you to select that object and perform other operations. It's that simple. But not if you're a person with a disability. Using the mouse is straightforward and easy to comprehend if you can see what's on the screen and manipulate the mouse. But if you have difficulty seeing the screen or physically moving the mouse, the mouse becomes a barrier. Fortunately, the mouse is not the only way to control your computer, for there are many ways to run your computer directly from the keyboard. In the next section, we'll use the Windows operating system to give examples of some of the features of Graphical User Interfaces that make them accessible to persons with disabilities and allow navigation with the keyboard instead of the mouse.

Standardization

After only a few minutes of experience with Windows, you'll notice that the software programs visually resemble each other. Most traditional Windows-

based programs share the same user interface, and as a result, they look and operate virtually identically. The same is true for the Macintosh and Unix platforms. The common user interface enables novice users to learn the operating system rapidly and confidently, because the skills acquired running one software program can be directly transferred to other programs. Unfortunately, of late, more and more applications are adapting a "Web-like" design and, as a result, are dispensing with established conventions. Such applications may look unique, but they sacrifice the benefits that users gain from consistency.

Windows software programs that comply with Microsoft standards share the same visual appearance for the most part and use a common command structure. Each program contains some or all of the same basic components: main parent window, window frame, title bar, menu bar, toolbar, status bars, scroll bars, and child windows.

When a program is launched, it appears on your screen in a window. This is the parent window, which can fill the entire screen or only a portion of it, depending on your preferences. The parent window contains all the windows, menus, and objects that let you control the program. It also has the ability to open child windows to display information or prompt you for input. Child windows are smaller windows that usually appear within or in front of the parent window. The parent window contains the program title bar, menu bar, toolbar, and one or more child windows. The title bar contains the name of the program as well as buttons for closing or changing the window's size. At the left end of the title bar is often an icon. By clicking on the icon, you can display the window's shortcut menu, which lets you close, move, or resize the window using the keyboard. You can use the ALT+- keyboard command to pop up a menu that lets you restore, minimize, or maximize the child window. And you can use the ALT+SPACEBAR keyboard command to bring up a menu that lets you restore, minimize, or maximize the parent window.

The window frame makes it easy to see the outline of the window, and in many cases you can resize the window by dragging an edge of the frame with the mouse. The menu bar and toolbar offer command menus to control the program. Scroll bars along the side or bottom of the window allow you to display different parts of a document that's too big to fit into the window in its entirety. A status bar along the bottom of the window may display information about the application or the document you're reading. Some applications also have document windows, child windows displayed within the main application window.

Dialog boxes are one of the most common parts of the Windows, Macintosh, and other Graphical User Interfaces. Dialog boxes are used to control programs and pop up for numerous operations, such as printing documents, saving files, and confirming a program shutdown. Most applications display dialog boxes as child windows in front of the main window to get your attention or ask for information.

STARTING WINDOWS AND BASIC NAVIGATION

When you start your computer, the operating system loads from the hard disk drive, bringing your system to life. Whether you're running a Windows, Macintosh, or Unix platform, the same concept holds true. After the operating system loads, you will have the opportunity to log in and begin your work.

Logging In

After you see the start-up information and logos, the first interaction you'll have with your system is when it asks you to log in. This involves typing in your name and password, which lets the computer know who you are. You can set up the computer so that each person using the machine has his or her own unique working environment. An environment consists of the colors, font sizes, and other preferences that are automatically invoked when you log in. You can also use accessibility settings or your own adaptive technology to help you log in.

If you choose, you can bypass the login by pressing ESC, or you can turn off the login prompt altogether. On Windows NT or Windows 2000, you can bypass the login process if you're running your computer at home, but you may not be allowed to do so if you're on a network at work or at school. In addition, some adaptive technologies may not be able to run until you've logged on, which can make it tricky if you need the adaptation to log in!

Once you've logged in, the first screen that Windows presents contains several discrete objects that you can navigate and control. Those objects are the taskbar and the desktop. The taskbar is normally at the bottom of your screen, but you can move it to the top or either side by dragging it with the mouse. The taskbar displays a number of separate areas, including the Start button (which you press to display the Start menu), the task buttons, and the taskbar icons. On Windows 98, Windows Me, and Windows 2000 there are also a number of optional toolbars that you can display within the taskbar.

The Start menu, which you display by pressing the taskbar's Start button or CTRL+ESCAPE, is an important tool because it lets you launch applications and documents, and also perform useful actions such as finding files, getting help, changing settings, shutting down your computer, and other tasks. In simple terms, the Start button lets you pop up a series of menus that contain software programs and documents that you can launch.

The desktop is another sort of menu that contains links to software programs and documents, except that it is always visible on-screen. Think of the desktop as a constantly visible list of tools that are used frequently. The desktop contains icons representing programs, documents, and locations such as your network and the recycle bin. The taskbar's task buttons show you all the application windows that are currently loaded into memory and running, and you can switch to one of those windows just by clicking on the corresponding button. The taskbar icons are displayed by some utilities to give you informa-

tion or make it easy to adjust settings. Typically you might see icons that let you adjust the speaker volume, indicate that you have new e-mail waiting, and tell you the status of the battery if you're running on a notebook computer. It also displays the current time. By default, you'll see the Quick Launch toolbar, which has icons for starting commonly used programs such as Outlook and Internet Explorer. (You can also run those programs from the Start menu, so the Quick Launch toolbar is really just a convenience for people who use a mouse.) As you gain more experience, you can customize the Start menu, the desktop, and the toolbars to let you quickly access programs and documents that you use daily. A word of caution: If you're using adaptive technology, especially a screen reader, you want to avoid customizing as much as possible to maximize system performance and reliability.

Navigating with the TAB Key

The TAB key is one of the most commonly used keys on the keyboard. It will help you move around your computer's various screens and cycle between the areas on the taskbar and the desktop. The TAB key is also used to move through dialog boxes throughout the operating system and in applications software programs. In addition, the TAB key is used a great deal when browsing the Web to move from one link to another on a Web site. From the Windows main screen, you can use the TAB key to cycle between the Start button, task buttons, toolbars (including the Quick Launch toolbar), taskbar icons, and desktop.

Try hitting the TAB key repeatedly, and you'll see how the focus moves from the Start button to the Quick Launch toolbar, to the task buttons, to the taskbar icons, to the desktop, and finally back again to the Start button. The TAB key allows you to make a complete circuit of those objects. You cannot get lost or stray from the beaten path because the TAB key moves in a circular route from one object to another. If you want to move backward by one or more objects, simply use the SHIFT key in combination with the TAB key: SHIFT+TAB.

Selecting Objects with the ENTER Key

The ENTER key is a powerful keyboard shortcut that lets you bypass the mouse for activating objects. You can test this by using the TAB key command described earlier. Strike the TAB key until you land on the Start button, then press the ENTER key. This will open the Start menu, showing you a list of programs and documents. Now use your DOWN ARROW key to move down the list in the Start menu, and strike the ENTER key when you land on a program or document that you wish to launch. Pay close attention as you move down the Start menu and take notice of items that include "..." as part of the title. The ellipsis points indicate that you will be taken to a dialog box when you strike ENTER on that item. Also, some menu items have a dark triangle pointing to the right. Activating such an item will take you to a submenu. Screen readers will

generally announce this as "submenu." You can close a menu at any time by pressing the ESCAPE key, located on the upper-left corner of your keyboard.

The Start Button Hot Key

A hot key is a keystroke that lets you start an application or perform a function with a single keystroke. Hot keys can be used to launch applications, run scripts, or start your adaptive technology. By now you should realize that the Start button is one of the most important objects in the Windows environment, as it contains a list of software programs and documents that you can launch at will. Because of this button's importance, there is a key command to move directly to it from any point within the operating system. Simply striking the CTRL+ESCAPE key sequence will bring you directly to the Start button and open it. To perform this sequence, simply depress the CTRL key and strike the ESCAPE key while CTRL is held down. You can then use the UP and DOWN ARROW keys to move through the Start menu options and use the ENTER key to select any program or submenu on the Start menu.

If you pressed CTRL+ESC to open the Start menu, you can press ESC to close the menu and leave the focus on the Start button. That's a convenient way to get into position to press TAB to move between areas on the taskbar and the desktop.

Switching from One Application to Another

The Windows and other operating systems allow you to run more than one program at a time in a process called multitasking. Microsoft Windows lets you manage multiple applications by displaying each program individually within its own window on-screen. You can also choose to have each program fill the entire screen.

Try launching several programs into memory by going to the Start button with CTRL+ESCAPE. Use your arrow keys to move to a desired program or document, and strike the ENTER key. Pop up the Start menu again, and launch another program or document. As you launch each program or document, you'll notice that its icon appears on the taskbar at the bottom of the screen. This should reinforce the concept that the Start menu and desktop are menus of programs and documents, whereas the taskbar is a list of programs and documents that are currently running.

Now that you have at least two programs or documents loaded into memory and running, you may be asking yourself how to control all of them at once. The answer is simple. You control only one program at a time. (Programs that are pushed into the background can continue running with reduced system resources, depending on your system configuration.) The program that you can control is the one that currently has the focus. You can switch the focus from one program to another using the ALT+TAB key command sequence.

Simply hold down the ALT key and repeatedly strike the TAB key. This will cycle you from one program to another and back to your starting point. Pressing ALT+TAB just once always takes you to the window you most recently visited, so when you need to switch back and forth between two windows in which you're working, it's often convenient to do so by pressing ALT+TAB.

Menu Navigation

As discussed earlier, Windows programs share a common structure. The title appears at the top of the window containing the program. The menu bar appears beneath the title, and the main document window beneath the menu bar. The menu bar contains the control menus for applications software programs. The menu system allows you to load documents into memory, save documents to disk, print documents, cut and copy information to the clipboard, change the view of a document, use tools and utilities that help you create and customize your documents, obtain help, and more, depending on the nature and configuration of the application. The menu bar is an important part of any program as it allows you to control the software and settings for your computer system. You can use the ALT keyboard command to go directly to the menu bar of any application. Simply strike and release the ALT key, and you will be automatically taken to the menu bar. You can then use your LEFT and RIGHT ARROW keys to move horizontally along the menu bar. As you progress horizontally, you will move from one submenu to another. Simply use the DOWN or UP ARROW keys to move into a submenu. You can use the ENTER key to select menu options once they have been activated. You can also use other hot keys to directly pull down a menu. Just hold down the ALT key and strike the keyboard letter that corresponds to the highlighted letter in the menu name on the menu bar. Try hitting ALT+F to go directly to the File menu on the menu bar or ALT+H to go directly into the help system.

Shutting Down Applications

If you wish to shut down an application or document, you can use the ALT+F4 keyboard shortcut command. This simple command brings up a dialog box that asks you if you really want to quit the currently running application. You can use the TAB key to move through the dialog box to select Yes, No, or Cancel. If you select Yes, the program will be unloaded from memory, and its icon will disappear from the taskbar. See appendix A for a listing of Windows keyboard shortcuts and commands.

NATIVE ACCESSIBILITY UTILITIES

Microsoft Windows 2000 includes a set of accessibility utilities that can also be found in Windows 95, Windows 98, and Windows Me. These utilities help

users with disabilities control the computer, change how the keyboard behaves, drive the mouse, and other useful functions. The accessibility features and utilities are installed by default, but can also be configured to your individual needs.

To assist users with configuring the built-in accessibility utilities, Windows 2000 includes an Accessibility Wizard. The Accessibility Wizard walks you through the configuration process one step at a time. The wizard asks you questions and configures the built-in accessibility utilities accordingly. You can run the Accessibility Wizard when you first configure your computer or later, after you've gained some experience. The Accessibility Wizard helps users who have difficulty seeing the screen, hearing sounds from the computer, typing on the keyboard, or driving the mouse.

The Windows Control Panel also lets you adjust the settings of the various accessibility utilities. Simply go to the Start menu, then to Settings, then to Control Panel. The Control Panel contains groups of utilities that pertain to accessibility.

Three useful accessibility utilities are Narrator (new in Windows 2000), On-Screen Keyboard (available in Windows 2000 and Windows Me), and Magnifier (available in Windows 2000, Windows Me, and Windows 98). Narrator is a simple screen reader designed to assist persons who are blind or visually impaired. Narrator provides voice output with a limited number of Windows programs and is useful when a third-party screen reader is not available. Narrator can speak characters aloud as they are entered at the keyboard, and can also speak menus and other screen objects. On-Screen Keyboard is a utility designed to assist users who have difficulty typing on the keyboard. It allows users to control the computer using an alternative pointing device or joystick. On-Screen Keyboard can show two basic keyboard layouts, a standard keyboard with a numeric keypad or a keyboard without a numeric keypad. Magnifier is a screen-enlargement software program to assist users who have low vision. It also provides a high-contrast setting to make the screen easier to read. In addition, Magnifier can follow the mouse pointer as it is moved around the screen and track the cursor for editing text.

Utility Manager

Utility Manager is a program in Windows 2000 that lets you configure and manage all of the built-in accessibility utilities and allows you to check the status of any of the individual utilities. Utility Manager also enables you to load or terminate any of the accessibility utilities from its Control menu or to automatically launch any of the accessibility utilities upon system start. You can launch Utility Manager by going to the Start menu, then to Programs, then to Accessories, and finally to Accessibility, where you can select Utility Manager. You can also use the ALT+U hot key to automatically start Utility Manager.

Control Panel Accessibility Utilities

The Windows Control Panel lets you adjust the settings of the individual accessibility utilities built into the operating system and to configure the nonadaptive aspects of your entire computer system. You can find the Control Panel by going to the Start menu, then to Settings, then finally to the Control Panel. The Control Panel lets you manage display, Internet, keyboard, mouse, sound, multimedia, user, and password options. It also lets you turn on a feature that provides additional keyboard help with some software programs. Below are brief descriptions of the utilities that support accessibility in the Control Panel.

StickyKeys

The StickyKeys utility is a powerful tool for users who have difficulty with compound keyboard sequences. Such keyboard sequences are commonly needed to type a capital letter or execute a CTRL or ALT key command. Compound key sequences require you to hold down more than one key at a time, which presents obvious barriers for some users with disabilities. The StickyKey utility allows you to convert compound key sequences into single keyboard presses. You can activate StickyKeys through the Control Panel or from Utility Manager. When you need to type a capital letter, simply strike and release the SHIFT key, then strike the desired letter. StickyKeys holds down the SHIFT key electronically, turning this compound key sequence into something more manageable.

FilterKeys

FilterKeys is a utility that filters out repeated keystrokes that can occur when you accidentally hold a key down for too long. This utility forces the computer to ignore such accidental repeating key sequences. FilterKeys can be found in the Control Panel or under Utility Manager.

SoundSentry

SoundSentry is a utility that generates a visual signal when the computer produces sounds. It is useful for users who have hearing-related disabilities. SoundSentry flashes the screen or window border to alert you that a sound is being generated by the computer. You can find this utility in the Control Panel or under Utility Manager.

ShowSounds

ShowSounds tells your programs to display captions of speech or other sounds generated by your computer. The software application must have built-in captions for this feature to work. You can find ShowSounds in the Control Panel or under Utility Manager.

MouseKeys

MouseKeys lets you use the numeric keypad to control the movement of the mouse. This may be useful for users who have difficulty using the mouse.

MouseKeys does not interfere with your ability to use the numeric keypad to enter numbers. You can find MouseKeys in the Control Panel or under Utility Manager.

High Contrast

The Control Panel includes a High Contrast utility that alters the display to make it more readable for users with low vision. The High Contrast mode provides enhanced color schemes and different font sizes to make it easier to read the screen. You can find this utility in the Control Panel or under Utility Manager.

The Macintosh and Unix platforms also have built-in accessibility options and utilities, similar to those found on Windows. There are, of course, differences in features and functionality across platforms. The Macintosh accessibility options are known as Universal Access, and those found in the Unix environment are called AccessX.

Active Accessibility

Although the Windows operating system contains many built-in accessibility utilities and features, you may choose to use a third-party adaptive device from one of the many adaptive technology vendors. There is a wide variety of adaptive technology available for the Windows operating system, such as screen readers, screen-magnification utilities, and voice-recognition packages. To more fully support third-party adaptive technology, Microsoft has developed Active Accessibility, a tool used by hardware and software vendors to make their adaptive technology products more compatible and streamlined with the Windows operating system. Functioning in much the same manner as a client/server mechanism, Active Accessibility allows adaptive technology to reach into the operating system to retrieve information necessary for the user. This information allows programs like screen readers to interpret the complex Windows environment and to manage information displayed on the screen. In simple terms, Active Accessibility allows adaptive technology to communicate with the internal operating system, and this results in more robust integration between adaptive and nonadaptive equipment.

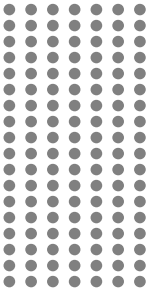
ACCESSIBILITY UTILITIES ACROSS PLATFORMS

Like Windows, the Macintosh and Unix platforms have built-in accessibility utilities, such as StickyKeys and MouseKeys. This section outlines in brief some of the accessibility utilities and keyboard shortcuts found on Macintosh and Unix platforms. Windows, Macintosh, and Unix platforms share a common set of accessibility utilities. They all share a common core subset of these utilities, but not all utilities and shortcuts are available on each of the platforms.

On the Macintosh platform, the built-in accessibility utilities are called Universal Access. On older Macintosh systems, these utilities were known as Easy Access. The Macintosh-based utilities offer ways to alter the behavior of the keyboard, drive the mouse, generate synthesized speech, and magnify the video display. The accessibility utilities found in the Unix operating system are known as AccessX and are similar, but not identical, to those found on the Windows and Macintosh platforms. See appendix B for a list of Macintosh keyboard shortcut commands.

There is also a series of accessibility utilities for the legacy DOS operating system for older computer platforms that may still be running in this environment. The Access Pack contains utilities to help with keyboard access, driving the mouse, and other features. See the Microsoft Web site at http://www.microsoft.com/enable for more information about their adaptive technology efforts, Access Packs, additional keyboard commands, tips and tricks, accessible documentation, and more.

Running your computer from the keyboard is a powerful method for maximizing your independence and gaining increased access to software and information. You can employ keyboard commands and shortcuts to control the operating system and applications programs stored on your personal computer. You can also use these keyboard-based command sequences to browse the World Wide Web and access other Internet applications. Keyboard shortcuts and commands are a positive trend that is now common across many operating systems and applications programs, and work on these important features is an ongoing process. It is desirable to build support for adaptive technology directly into computer operating systems as this allows individual applications to take advantage of these features to increase accessibility for the widest possible audience.



3

Technology for Persons with Vision Impairments

With appropriate adaptive technology, barriers are forced to drop, and persons with disabilities can realize their full potential. Using assistive technology, persons who are blind or have low vision can independently operate computer workstations, surf the Internet, communicate extensively, and access the written word in quantity. The major categories of adaptive technologies to assist persons with vision impairments include speech synthesis, magnification systems, braille printers, and optical character recognition.

Speech-synthesis systems allow computers and other devices to speak out loud, thus making them accessible to persons with vision impairments. Magnification systems enlarge the text displayed on computer screens as well as printed texts, making them much easier to read. Braille printers and displays translate printed text into tactile braille, permitting access to personal computer screens and other forms of information. Optical character recognition systems read the printed word and speak it aloud or transmit the text into personal computers for storage and retrieval.

SPEECH-SYNTHESIS ENGINES

The technology of speech synthesis is one of the most powerful computer applications being used to assist persons who are blind or have low vision as well as persons with a wide variety of other disabilities. It is also one of the least-expensive computer adaptations available; thus, it is a widely used form of assistive technology.

Speech synthesis is the artificial generation of the spoken word through the application of computer-based hardware and software. A speech engine is a software program that runs on your computer and translates text into

human-sounding speech in real time. Speech engines speak with an unlimited vocabulary and employ mathematical algorithms to translate text into phonemes, which are the basic building blocks of speech. These building blocks are rapidly assembled to generate sounds for letters, words, and phrases. Speech engines require a sound card to operate.

Sound Cards

Sound cards support software speech engines, providing the output hardware to play speech, music, and sound effects on your computer. You can plug a sound card into your computer to turn the system into a talking PC. The typical sound card contains memory, microprocessors, digital signal processors, digital-to-analog converters, and a set of input/output jacks. This allows you to plug in a set of stereo speakers, headphones, and a microphone. You must have a sound card and speakers installed in your computer if you want it to talk or recognize your voice.

If your computer doesn't have a sound card, they are relatively inexpensive to purchase and are readily installed. Sound cards can also be installed by any competent computer dealer. If you're comfortable working inside your computer, you should have little or no trouble installing a sound card. All you have to do is open up your computer, find an empty slot, and plug in the card. Once the card is installed, reboot your computer, and install the driver software that came with the card. The software driver tells your computer how to control the sound card and can be forgotten once installed. When you purchase a sound card, it will come bundled with driver software on a CD-ROM or floppy disk.

The sound card has created a standard platform for speech technology, allowing the creation of many text-to-speech and speech-to-text engines and products. The benefit of the sound card is that it has become standard equipment among most Windows-based and other personal computer platforms. The Apple Macintosh computer platform has built-in speech hardware and software, and the Unix operating system is also compatible with sound cards. Thus, you do not have to physically open your computer to install a speech device. The sound card can run a variety of voice-enabled adaptive software programs, including screen readers, scanning software, talking browsers, and screen-magnification programs. With all this in mind, let's look at voice-enabled applications to assist persons with vision impairments.

SCREEN READERS

Screen readers are software programs that work with your sound card to provide voice output while you run applications like word processors, databases, spreadsheets, browsers, and other applications. A screen reader can drive a sound card as well as older speech synthesizer hardware. Screen readers come bundled with speech engines, which handle the text-to-speech conversion pro-

cess. Screen-reading software allows you to access applications software with an unlimited vocabulary voice and to convert the text or graphics display of personal computers into verbal output. In other words, a screen reader converts your computer into a talking computer system.

The screen reader is the first program that should be loaded into memory after you start your computer. Many screen readers can be installed so that they start up automatically, making it easier for users to take control. Your screen reader can coexist in memory with other software packages. The screen reader activates your sound card, letting you hear your keystrokes as they are entered at the keyboard and also letting you read what is displayed on the video monitor.

Screen readers are highly configurable and can be set up to meet your specific requirements. The typical screen reader can instruct the sound card to speak keystrokes as individual letters or as words. You can configure your screen reader to read any portion of the screen with a single keystroke. This is useful for rapidly reading small segments of the computer screen, such as the program title, menu bar, current word or line, or whatever is desired. The screen reader also can verbalize the video display in virtually any unit desired: characters, words, lines, windows, or even whole documents.

Screen readers can be configured to work with many of your applications software and can be programmed to automatically monitor and then read selected portions of the screen. For example, if a dialog box pops up on the screen, the screen reader can be programmed to automatically read the entire contents of the box, just its title, the default selection in the box, or whatever you require. You can customize screen readers to work with specific word processors, databases, spreadsheets, browsers, and other software.

Screen readers work in concert with built-in keyboard commands that move the mouse and cursor. As a result, it is possible to read controls within a dialog box by using the TAB key to move from object to object and when using CTRL+HOME to move to the top of a document, CTRL+END to move to the end of a document, or the PAGE UP or PAGE DOWN keys to move up or down in page units. As the pointer moves from one object to another, the screen reader verbalizes that object. Thus, when appropriately configured, the screen reader allows you to verbally glance at any portion of the video screen. Moreover, you can define exactly what the synthesizer should speak and what it should not speak, which can be useful when a program constantly prints new information to the screen, such as updates of the time and date. The silence feature is important because a screen reader will verbalize every word present on the video display and will not stop talking until it is commanded to do so. You can also silence your screen reader with a keystroke, useful if a sighted person takes over the machine to accomplish a task.

One of the most important features offered by today's screen readers is known as mouse pointer mode. It lets you examine the current screen in detail and allows you to read what is on the video display. You can use it to move the mouse pointer to any portion on the screen and read individual characters,

words, icons, lines, or whole windows. You can also use this mode to point to an object and select it with the mouse. All such actions are accomplished by using the keyboard arrow keys to move the mouse pointer without moving the physical mouse. Most screen readers allow you to move the mouse pointer to any portion of the screen to explore its contents without sending commands to the applications program currently running. With many screen readers, you can use mouse pointer mode to read the screen, search for icons or text, and send commands directly to the running application.

In addition, screen readers allow you to have full control over the sound card to manage such properties as volume, rate, and pitch. You can also control the punctuation level and choose whether all punctuation, some punctuation, or no punctuation will be spoken. You can tell the sound card to pronounce or filter out specific punctuation marks; to pronounce numbers either as full digits or as words; to weed out strings of repeating characters, such as dots, dashes, or decorative characters; and to indicate capital letters by using a higher pitch or by saying "capital."

As with Microsoft Windows, Graphical User Interfaces often display more than one window on the screen at a time. One of the most important jobs performed by screen readers is keeping all screen windows isolated so that you can deal with each window individually and not become confused by overlapping text and graphics. If you are running a word processor in one window and a browser in another, the screen reader will work with one application at a time, depending on which one has the focus, and automatically loads custom speech environment settings for each applications program. Some vendors offer network versions that can be loaded onto a central file server, allowing you to deploy your screen reader to every computer on the network.

Screen-Reader Commands

The commands found on the typical Windows screen reader are listed below. The list illustrates the core commands found on most screen readers, although your specific screen reader may not possess all of them.

- Speak current character
- Speak prior character
- Speak next character
- Speak current word
- Speak prior word
- Speak next word
- Spell current word
- Speak current line
- Speak prior line
- Speak next line
- Silence speech output

- Speak current window title
- Speak top line of current window
- Speak bottom line of current window
- Speak the status line
- Speak selected highlighted text
- Speak default button of dialog box
- Speak tab controls of dialog box
- Search screen for string
- Click left/right mouse button
- Lock left/right mouse button
- Set typing echo
- Set screen echo
- Speak color
- Speak font
- Speak cursor or mouse coordinates

Using the many functions of commercial screen readers, off-the-shelf software packages can speak with an unlimited vocabulary voice, allowing persons with vision impairments equal access to software and information. Although many programs work effectively with screen readers, you should be aware that not all applications are friendly to speech output. You should contact the vendor of any application (or any adaptive equipment) that does not work with your screen reader and make them aware of the incompatibility.

Narrator

For persons with vision impairments and other disabilities, Microsoft has included a simplified screen-reader program called Narrator in Windows 2000. Narrator requires a sound card to operate and works with programs that support Microsoft's Active Accessibility standard. Active Accessibility provides a pathway of communication between the operating system and adaptive technologies like screen readers. Narrator lets you read objects on the screen out loud and provides speech output for basic navigation. Narrator was intended to provide speech output for people who do not have a screen reader available and is not intended to compete with full-featured commercial screen readers.

Narrator provides a minimum level of functionality for users who cannot read the screen; users who require voice output on a regular basis should obtain a full-featured screen reader, many of which are commercially available. Narrator is designed to be used only (1) when you're forced to perform some basic tasks on a computer other than your own, where your normal aids are not installed; (2) to help you reconfigure your computer when something goes wrong that prevents you from using your normal aid; and (3) to assist you in

logging on or performing other tasks where security settings won't let you run third-party software such as commercial screen readers. Narrator works only with software that supports the Microsoft Active Accessibility standard because it is designed to let users run the Windows shell, setup, and Control Panel, notepad, and a few other key components that they may need to run in the situations listed above. Narrator is available only in English under Windows 2000.

MAGNIFICATION SYSTEMS

One of the most widespread adaptive technologies for persons with vision impairments, magnification systems enlarge text and graphics, empowering many individuals to pursue career and educational goals. Objects that are magnified produce a larger image within the eye; thus, they are much easier to see. The technology of magnification systems can be employed to access printed text and to magnify information displayed on computer screens. The following sections discuss many forms of magnification technology, including low-technology optical aids, magnification software programs, and closed-circuit television reading systems.

Low-Vision Aids

One of the first magnification approaches to try is that of optical aids, often called low-vision aids. These optical aids consist of magnifying glasses and small handheld telescopes—inexpensive low-vision technologies useful for reading text or even computer screens. Some low-vision aids are handheld; others can be mounted on eyeglass frames. You can consult with a low-vision specialist or low-vision clinics for evaluations of the various optical aids and devices.

The fact that most low-vision aids are portable is of immense value. This allows you to carry the various devices for many different applications at work or school and at home to read daily mail, the newspaper, food containers, medicine bottles, photographs, or the occasional novel. The devices also may be useful for mobility purposes, making you a safer and more confident traveler.

Some low-vision optical aids can be attached to personal computers. Once such a device has been fitted to the face of the monitor, the lens provides about 2x magnification. This type of lens also provides a shield from glare, which may be a great barrier to a person with low vision.

Large Monitors

If you need computer magnification, nonadaptive technology can sometimes provide the solution. A larger monitor can provide you with a magnification environment, thus supplying access to the wealth of information stored in a personal computer. A larger monitor will provide increased character size but

will not reduce any of the information content that is normally present. Although the magnification will not be as great as that of a software magnification system, many individuals find such larger monitors useful.

CLOSED-CIRCUIT TELEVISION SYSTEMS

The closed-circuit television system (CCTV) is an efficient way for persons with low vision to read books and other printed material independently. These devices consist of a detachable video camera and a television-type screen. CCTV systems also come equipped with sliding trays or tables that hold books and other printed information beneath the video camera and that adjust for maximum visibility. The sliding trays and tables can be motorized, allowing individuals to scan books or other printed material automatically. CCTV systems can provide from 2x to about 60x magnification, depending on the system.

The typical CCTV is relatively easy to operate and usually requires only a little user training. You merely aim the video camera at the desired reading material and focus the image on the video display, which allows you to read the printed material in as large a typeface as necessary for clarity. A unit is about the same size and weight as a small television system, but portable units are also on the market. Monitors range in size from four inches to twenty-one inches and come in color or black-and-white. There are also CCTV systems that are worn on the body, mounted on goggles that permit reading of printed materials.

Many CCTV systems can be interfaced to a personal computer to perform double-duty reading tasks. By splitting the image, half of the screen can contain a printed book or other print material while the other portion of the screen contains output from a computer video monitor. This can be extremely useful if you're entering print information into a personal computer or if you're interacting with both computers and printed text. However, a CCTV cannot magnify computer images without magnification software.

Handheld CCTV Systems

In addition to the larger, desktop-sized CCTV systems just described, there are numerous CCTV systems that fit in the palm of the hand. These devices are about the same size as a computer mouse, and many connect readily to standard televisions. Such units offer a less-expensive alternative to larger, desktop systems. Some handheld units come bundled with various mounting devices, such as flexible arms and goose-neck mountings, that allow you to suspend the camera over a book or other reading material. This allows you to use the CCTV to read as well as write. Many handheld CCTV systems are highly portable, and can easily be taken along on trips and plugged into standard televisions on location.

Head-Mounted CCTV Systems

Head-mounted CCTV systems have also entered the market in recent times. These systems are worn much like a pair of glasses or goggles and can be used for many reading tasks. Although head-mounted devices are not generally recommended for mobility purposes, they can be used effectively to read printed material, and some plug directly into computers and televisions. Some head-mounted systems can be expensive, as expensive as a typical desktop unit, but prices are decreasing as the technology continues to develop.

MAGNIFICATION SOFTWARE

Perhaps the most-used magnification adaptation currently on the market is magnification software. This software allows personal computer users to increase the size of the characters displayed on a computer's video screen. Magnification programs can enlarge both text and graphics, depending on the brand chosen. Some programs also feature speech output and can provide magnification and speech at the same time. You are strongly advised to "test-drive" any potential magnification software package before selecting one for purchase. Testing is important because not all magnification programs are exactly alike in producing the shapes of characters while in enlargement mode.

The typical magnification program is a memory-resident utility that is run immediately after Windows or the operating system has been loaded. Time of loading is important to keep firmly in mind with most adaptive software. Adaptive software that is loaded immediately after system start allows you to immediately take control of the computer. The typical magnification software program can magnify the video display from about 2x to 20x. Most magnification software packages are compatible with standard video monitors and video adapter cards. Magnification packages track the mouse and cursor, following it around the screen, which allows you to remain oriented within the document.

You can easily install a screen-magnification program, as most programs have their own install utility included. Software magnification programs can be moved from one computer to another simply by uninstalling the software from one machine, physically bringing the magnification software to another computer, and then installing it on that machine. In this manner, a magnification user can use the same magnification program on a home computer and on a computer at a work site or in a school laboratory. Some vendors offer network versions that can be loaded onto a central file server, allowing deployment of magnification to every computer on the network.

Magnification systems are a cornerstone technology. The current magnification software packages are compatible with both text-based and graphics-based systems, a user-friendly environment for the individual with low vision. We can look forward to more magnification software in the near future because these utilities are desired by large segments of our aging population. Increasing numbers of vendors are entering this market.

Magnifier

Magnifier is a software program provided by Microsoft to magnify the computer screen for users with vision impairments. Magnifier is not a fully featured screen-magnification program and is not intended to compete with commercially available screen-magnification programs, but it is useful when you're forced to perform some basic tasks on a computer other than your own, where your usual adaptive technology is not installed, or to help you reconfigure your computer when something goes wrong that prevents you from using your usual adaptive technology. You can also use Magnifier to assist you in logging on or performing other tasks where security settings won't let you run third-party software such as commercial screen magnifiers. Magnifier provides up to 9x magnification and works with programs that support Active Accessibility and those that use standard Windows screen elements.

BRAILLE SYSTEMS

Braille is the focus of many adaptive hardware and software systems to assist persons with vision impairments. Braille printers can emboss braille at speeds of up to several hundred characters per second, and braille displays can provide braille output for computer access. The following sections discuss using braille translation software to translate word-processing text files into braille suitable for embossing on a braille printer; using braille printers for personal, business, and mass-production applications; braille displays, devices designed for accessing personal computers via mechanical braille output; and braille note takers, portable devices that offer the same convenience as a portable data assistant or a pocket computer.

Braille Basics

A braille character is called a cell, with each cell consisting of varying configurations of six individual dots. The dots are numbered 1 through 6, with dot 1 in the upper left corner of the cell and dots 2 and 3 just underneath. Dot 4 is in the upper right corner of the cell and dots 5 and 6 are just below. Using this combination of dots, it is possible to write letters, math symbols, music symbols, and even foreign languages. In the past, only skilled braille transcribers could convert printed text into braille because the rules for the production of braille are very strict and exacting. There are two basic forms of literary braille, Grade 1 and Grade 2. Grade 1 braille consists of the alphabet, numbers, and standard punctuation symbols, with no contractions. Grade 2 braille consists of the preceding and complex contractions to save page space. There are also braille codes for computer braille and for mathematics and scientific notation (Nemeth code).

Braille Translation Software

There are several software programs on the market that convert standard text into braille. Braille translators permit you to compose, edit, and print braille documents. Translation software generally features spell checking, foreign-language support, and support for documents containing more than one language. Many translators allow you to see braille dots on your screen, useful for sighted transcribers to proofread before printing.

To configure a personal computer capable of producing braille, you need to add both hardware and software to the existing system. The software is the braille translator, and the hardware is the braille printer or embosser. The terms *printer* and *embosser* are used interchangeably. Braille translation software packages convert text into correctly formatted and contracted braille. Thanks to braille translation software and personal computers, braille can now be produced in quantity by people with limited knowledge of the discipline. The process is one of text flowing in one end and braille flowing out the other, with the software in the middle performing the translation process.

To compose a document intended for braille output, first create the source file in a word processor. Save the file to your hard disk, and then open the file in your braille translator. You can edit the file in the translator if necessary. Finally, translate and print the document.

In the production of braille documents, formatting can often be an issue, depending on the form of the source document. If you're transcribing a fairly standard text document, with double returns between paragraphs, your braille translator should be able to handle the task easily without human intervention. But brailling more complex documents, like spreadsheets and tables, can be more problematic and often requires human intervention to reformat the table to maintain clarity. Fine-tuning of braille translators' formatting capabilities is still continuing.

Braille translators follow a two-step process, first translating the text, then formatting. First, the print symbols in the source document are translated into a corresponding braille computer symbol suitable for sending to your braille printer. Second, the braille translator reformats the text to conform to the smaller braille page. The reformatting process is the next step, as the size differential between print and braille can be considerable. The page count for a typical braille book is about two and one-half times greater than that of a printed text. Some braille volumes are also much larger, as braille is commonly printed on 11-by-11½-inch paper stock. To save space, braille translators employ numerous contractions for common words, such as *and, the,* and *for,* and for common letter combinations, such as *st, er, ing,* and *ed.* In the past, the myriad braille contractions required the skills of an experienced transcriber to implement, but due to braille translation software, the personal computer can be a powerful assistant for braille production.

Braille Printers

Braille printers, or braille embossers, are devices that are dedicated to printing out documents in braille. The typical braille printer uses blunt pins to punch dots into heavyweight paper for production of braille hard copy. The pins drive the paper against a rubberized plate that absorbs the force of impact and prevents the pins from punching the dots completely through the stock. There are several classes of braille printers, each designed to produce defined quantities of braille. The basic divisions are personal, medium, and heavy duty.

Personal-duty braille printers are designed for use by a single individual and are the least expensive of the three classes of braille printers. This type of printer is best suited for the home user or student needing to produce a limited amount of braille per day, such as class notes, shopping lists, or personal correspondence. Personal class printers are not intended to generate production quantities of braille, as would be required by a school, library, or other public facility. The average printer of this type prints at a speed of about ten to forty characters per second.

Medium-duty braille printers are suited for more demanding environments than are personal-class printers. They have higher printing speeds than personal-class machines, with speeds ranging from forty to one hundred characters per second. Medium-duty printers are more solidly constructed and are suited for small-business applications or for users with heavier braille demands than those handled by personal printers. Medium-class printers are frequently used for small public facilities and organizations that need to print braille on a regular basis. Many of these printers can emboss interpoint braille, which involves printing on both sides of the paper to save stock. Such printers are not suited for a braille publishing house or other organization that needs to print multiple copies of braille books or magazines.

Heavy-duty braille printers are engineered for a braille production facility and for organizations that need to print large quantities. Heavy-duty class printers can print at speeds ranging from one hundred to several hundred characters per second. Some models can print entire pages at a time. They also can emboss on both sides of the stock.

Braille Displays

Braille displays connect to personal computers and translate text displayed on the screen into instantaneous braille output. You will need a screen-reader program to drive your display, and you can use it in concert with your sound card as well. The combination will provide you with braille and speech output at the same time, speech only, or braille alone. When choosing a braille display, be sure that your screen reader supports the display you've chosen.

A braille display interfaces to a computer through one of the computer's input/output ports, which may be serial, parallel, or USB. The screen reader follows the mouse or cursor pointers and sends the corresponding text to the

braille display. When the display receives the text string, it automatically displays the text using mechanical braille dots. The dots are controlled by the display, and pop up and down to form the braille characters that correspond with the incoming text stream. Braille displays can be of great value for word processing, database management, spreadsheet functions, computer programming, surfing the Web, and many other tasks.

Braille displays can be purchased in various sizes, according to the number of characters the unit is capable of displaying at one time. Sizes range from twenty characters to forty, sixty-five, or eighty characters. Braille displays employ an eight-dot braille code to present information. The additional two dots are used to provide information about the text being displayed, such as whether it contains highlighting or flashing video. Most models are roughly the same size and shape as a standard computer keyboard, but some units are small and portable, and thus suitable for using on a notebook computer.

For the user who is a confident braille reader, or for persons who are deaf and blind, braille displays are powerful access technology. Braille displays readily attach to many computer platforms and are also available in portable devices you can take on the road.

Braille Note Takers

Smaller and more powerful computers are offered each passing year, and the adaptive computer market is no exception. There are numerous braille-based note takers currently available for users who are blind, have low vision, or are deaf and blind.

Braille note takers offer combinations of braille keyboards for input and speech synthesizers and braille displays for output. The typical braille note taker employs a braille display of approximately forty braille characters to maintain portability. Braille note takers offer much the same convenience as a typical portable data assistant or pocket computer. These units typically include word processing, calendar, phone list, and print functions and Internet capability. Some devices offer direct compatibility with mainstream operating systems and permit documents created on a personal computer to be transmitted to the note taker for use on the road. This also works in reverse, allowing you to create documents on your note taker and send them to your desktop or notebook PC. Most units are equipped with interface ports to connect disk drives, modems, printers, and other peripherals.

OPTICAL CHARACTER RECOGNITION SYSTEMS

It goes without saying that books and magazines in their usual printed form are inaccessible to the blind and people with low vision. This is just starting to change with the advent of electronic books, but, sadly, there are still many materials that are available only in hard-copy format.

Fortunately, the technology of optical character recognition (OCR) systems can overcome many of the barriers inherent in printed materials. In simple terms, OCR systems transmit printed material into your personal computer, allowing you to read the material in the mode you find most comfortable and appropriate. Once you have scanned a book into your computer, you can read the text using speech, braille, or magnified output. You can also transmit the text to a note taker for use on the road.

OCR systems consist of hardware and software, and are readily interfaced to most personal computers. The first thing you need is a flatbed scanner, which is used to scan the book or other printed material. Flatbed scanners, which are mainstream technology, are readily available and relatively inexpensive. Most flatbed scanners interface to personal computers using a standard SCSI or USB port. All you have to do is plug in the scanner and install the drivers that came packaged with the unit.

The next step is to install the OCR software that came with your scanner, and you're ready to scan and read documents. The OCR software controls the scanner device and uses pattern-matching techniques to actually recognize the characters present on the printed page. The software first takes a picture of the page and then converts the digital image into actual text, as if you had typed the page in yourself at the keyboard. Depending on the speed of your computer, most scanning packages can read a printed page in a few tens of seconds.

There are several OCR programs available that offer speech output and other assistive functions for users with disabilities. Such programs allow you to scan documents and have them spoken out loud after they have been scanned. The software also allows you to save the scanned material to various file formats or print the scanned document in braille. Many scanning software programs also provide online dictionaries and spell-checking software, allowing you to verify the document after it has been scanned. While many adapted OCR packages offer speech output, some also provide screen magnification for users with low vision, allowing text enlargement alone or accompanied with speech output.

There are also stand-alone scanning systems available for users with vision impairments and other disabilities. These systems consist of a personal computer, control keypad, flatbed scanner, sound card, speakers, disk drives, and OCR software in a single integrated package. If you're unfamiliar with how to operate a personal computer and only wish to read documents, a stand-alone scanning system can be an easy and streamlined way to access printed material. Many of these stand-alone scanning systems can be upgraded to full-blown computer status by adding a full-sized keyboard.

Scanning Text into Your Computer

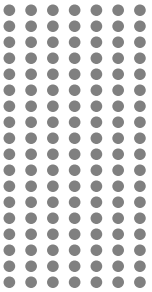
You can employ an OCR system to read books and other documents and to save such documents on your computer for future reading or retrieval. You can

configure a system for scanning documents into various word-processor formats and employ speech, magnification, or braille technology to read the scanned documents. Many flatbed scanners can be equipped with an automatic document feeder that allows you to load the scanner with stacks of pages for reading. The document feeder automatically inserts one page at a time into the scanner. Thus, the scanner and its feeder can transform a job that would have taken days of hand-tended operation into a virtually automatic procedure. Books are scanned by laying the opened pages facedown, scanning, then turning the pages and placing that view facedown, and so forth.

A document that has been scanned into your computer becomes immediately more useful and universal in terms of access. For example, the file can be spoken aloud by using a sound card and screen-reading software. Alternatively, the electronic file can be used to produce a magnified version of the document by printing with different typefaces or by using a software-based magnification system. Furthermore, the document can be translated into braille using a braille translation software package and braille printer.

Scanning systems have reached a prominent state of development. The future of this technology is extremely positive, chiefly because the mainstream business world relies on scanning technology for document and image processing; such demand is driving down prices for OCR systems. More powerful computer platforms are driving prices further down because such platforms are more capable of converting text into machine-readable form. These trends are leading to increased productivity and opportunity for persons who rely on scanning technology.

A list of products for persons who are blind or have low vision is presented in appendix C.



4

Technology for Persons Who Are Deaf or Hard of Hearing

Computers and adaptive technology have contributed much to society in general, having changed the way we communicate with one another forever. This revolution includes persons who are hard of hearing or deaf, because computers and adaptive technology expand everyone's ability to share information. The Internet offers monumental potential as it rapidly evolves into the platform by which we all communicate with one another in any format we desire.

This chapter discusses a wide range of technologies for persons who are hard of hearing or deaf, everything from advanced hardware and software to traditional sound-amplification systems. Text telephones are devices that provide the ability to communicate with friends and associates by typing text messages back and forth over landline or wireless phones. Relay services permit you to use a human operator to place calls to persons who do not have a text telephone at their end of the conversation. Alphanumeric pagers permit text messages to be flashed back and forth for instant communication. Instant messaging lets you send text messages to anyone on the Internet for expanded communication. Internet chat allows you to communicate in real time with individuals over the Internet in text format. Standard fax and e-mail permit communication over the Internet among friends and associates across town or around the world. Baudot/ASCII modems, which plug into personal computers and can be used to communicate with text telephones and personal computers, provide a wider range of communications alternatives. Visual indicator software permits personal computer software applications to provide visual feedback when critical system sounds are utilized. Computer-aided transcription and computer-aided real-time reporting provide text transcripts of meetings, classes, and public gatherings. Personal computers equipped with training software can be used to teach sign language or to reinforce existing skills.

Signaling systems offer a way to monitor the environment for important sound sources. Captioning systems translate the spoken word into text, making television programming and multimedia more accessible. Electronic amplification systems provide sound boosting and filtering for face-to-face communication and phone communication. The following sections provide an overview of these basic technologies and how they work.

TEXT TELEPHONES

Text telephones, often known as TDDs (telecommunications devices for the deaf) or TTYs (teletypewriters), are used to send typed messages back and forth over telephone lines. Text telephones are often used by persons unable to benefit from amplification technology as well as by persons with speech disabilities. Most units, about the size of a notebook computer, are portable and run on battery power. Their main components are a keyboard, a visual display, and telephone connectors. The keyboard contains most of the symbols available on a typewriter, arranged in either a three- or a four-row configuration. The visual display usually is like that of a digital clock or calculator, employing light-emitting diodes rather than a cathode ray tube. Some units also have enlarged displays, permitting persons with low vision easier access to conversations. Text telephones connect to the telephone system in one of two ways: by using a direct connect modular jack, as on most telephones, or by inserting the telephone handset into a rubberized acoustic coupler.

Text telephones speak a language known as Baudot. The Baudot code was brought into use in 1874, when it was used to increase traffic on telegraph systems. Baudot is a 5-bit binary language that is transmitted at a fixed speed of 45.5 bits per second, about 60 words per minute. The Baudot code is virtually out of use, except with text telephones. Newer text telephones often have the capability to speak ASCII (American Standard Code for Information Interchange), which is also used by personal computers. Baudot and ASCII are fundamentally incompatible with one another (as discussed in the section on Baudot/ASCII modems later in this chapter). Text telephone conversations can take place only if both participants agree beforehand to communicate in either Baudot or ASCII code. Fortunately, many text telephones can select between Baudot and ASCII code at the flick of a switch.

Cordless and Cellular Phones

If you're like most people, you'll need to communicate with persons while you're on the go. To facilitate this, you can use some brands of text telephones in conjunction with your cellular or cordless phone. But first you will need a text telephone that is compatible with your particular brand of cellular or cordless phone. You should be aware that cellular phones are of two basic types: digital and analog. Currently, analog cellular phones are more widely supported

by text-telephone manufacturers than are digital models. Before purchasing a text telephone to be used in conjunction with a cellular or cordless telephone, you should check with the manufacturer of the text telephone to determine if it is compatible with your cellular or cordless phone, especially if your phone is of the digital variety.

Text-Telephone Etiquette

Text telephones are relatively simple to operate. You type messages on the keyboard of your text telephone that are transmitted over the phone lines to appear on the video display of the remote text telephone. Once a call has been established, you can communicate with another person simply by typing messages back and forth. The two-way message traffic appears on both video displays in real time as the messages are flashed over the telephone.

When communicating over a text telephone, you should observe some basic guidelines. Because most text telephones can display only one line of text at a time, there is no need to press the ENTER or RETURN key after each line. When talking over a text telephone, it is important to let the other person know that it is his or her turn to speak by typing GA, which stands for "go ahead." When the conversation is over, type SK for "stop keying."

Text Telephones and the Americans with Disabilities Act

According to the Americans with Disabilities Act (ADA), "One text telephone must be provided inside any building that has four or more public pay telephones, counting both interior and exterior phones. In addition, one text telephone must be provided whenever there is an interior public pay phone in a stadium or arena; convention center; hotel with a convention center; covered shopping mall; or hospital emergency, recovery, or waiting room. One accessible public phone must be provided for each floor unless the floor has two or more banks of phones, in which case there must be one accessible phone for each bank."

Braille Text Telephones

The standard output device for text telephones is the visual display or printer. But not all text telephones are restricted to visual output methods only; some provide braille output so that persons who are both blind and deaf can interact with others in employment, social, and educational settings. It should not be assumed that all persons who are deaf-blind are totally blind and totally deaf. It is always more accurate to evaluate persons with disabilities as individuals with different capabilities. Individuals who have some remaining hearing and vision can employ the standard access technology that applies to persons with low vision, such as speech synthesis, magnification systems, braille printers and displays, and optical character recognition systems. If the person is totally blind and totally deaf, then braille access technology may be most

appropriate. As discussed in chapter 3, braille printers and braille displays allow computers and other communications devices to be readily accessed.

TELECOMMUNICATIONS RELAY SERVICES

Although the text telephone is an efficient instrument for allowing persons who are deaf or hard of hearing to communicate independently with the community in general, it has a basic built-in limitation: It cannot be used to communicate with a person who does not also have a text telephone. However, telecommunications relay services can fill that need. The services are dedicated to placing telephone calls for persons who are deaf or hard of hearing or who have other disabilities. Persons with speech disabilities also utilize relay services. These services are most useful for calling persons who do not have a text telephone. A person who is deaf or hard of hearing uses the service by calling the relay bureau from a text telephone, and a hearing person places the call over standard voice lines. A hearing person at the relay bureau functions as a translator, relaying messages between the persons at both ends of the conversation.

ALPHANUMERIC PAGERS

For the busy person constantly on the go, immediate access to clients and information is critical. Pagers allow us to stay in touch with the home office, as well as family members and friends. This technology is of great value for persons who are deaf or hard of hearing, as text pagers allow visual communication over long distances. Pagers also permit you to send and receive phone calls via text messaging, send faxes, send and receive e-mail, and have interactive chats. If you have a hearing disability, when choosing a pager for yourself, you should check with the manufacturer to determine how the unit alerts you to the presence of an incoming page. Many units provide an audible signal when an incoming page is being received, but such a signal is not accessible to many users who are deaf or hard of hearing. Check with your pager manufacturer to determine if the pager includes a vibrating alert system. Such a system provides a more accessible way of letting you know when incoming messages are being received.

INSTANT MESSAGING

With the growth and almost limitless expansion of the Internet, communication has greatly expanded for persons who are deaf or hard of hearing. The Internet has created a backbone for many forms of communication among

individuals, including plain text, graphics, and other formats. An Internet technology known as instant messaging offers tremendous possibilities for the community as a whole.

Instant messaging permits individuals to send messages back and forth to one another over the Internet using a wide variety of platforms. The platform is not limited to desktop computers, but can also be a notebook or pocket computer connected to the Internet in a wireless mode.

CHAT

The Internet has created an environment where individuals can communicate with one another in a wide variety of formats. You can send electronic mail to anyone in the world using your personal computer. This has become commonplace and virtually indispensable in today's world. The technology known as online chat has been in existence for quite some time and is being utilized by countless persons who are deaf or hard of hearing to communicate with friends, family, and co-workers.

Online chat permits you to use your personal computer to type messages back and forth across the Internet to any number of people, from a single individual to a group consisting of hundreds of persons. An online chat may take the form of a private conversation between just two people or a group discussion similar to a classroom or lecture environment. If you have a computer connected to the Internet, you already possess the capability to take advantage of online chatting.

FAX

Fax machines are ubiquitous, and it makes sense to have the ability to use this resource when available and required. Fax systems permit you to send text and pictorial information anywhere in the world, as long as the destination fax machine is ready to receive. Persons who are deaf or hard of hearing may find using fax a convenient alternative for some forms of communication, depending on the requirements of the situation. Fax machines have become standard equipment in virtually every public facility and even in some households. They can transmit images to other fax machines over standard telephone lines at a rate of several pages per minute.

Short messages, long documents, and detailed pictures and drawings can be sent by fax. In addition, fax machines can be used to alert an individual that a telephone call is coming from a text telephone. A fax can be used to ask for information, such as the time of a class or meeting, or to order food or other products over the telephone.

However, with all their benefits, fax machines are of little use for rapid, two-way conversation because information can be faxed in only one direction at a time.

Fax machines can be purchased as stand-alone devices that are about the same size as a small desktop photocopier. They are also available on computer modems, which allows a computer to receive faxes and to transmit PC-created documents to any destination.

COMPUTER-ASSISTED ACCESS

Computers can be used as text telephones and for general information access, which empowers persons who are deaf or hard of hearing at school and on the job. Computers also create an accessible environment in which persons who are deaf or hard of hearing can use networks, electronic mail, bulletin boards, Web sites, instant messaging, and the Internet to send and receive information.

In general, the personal computer does not present a barrier for those who are deaf or hard of hearing. In fact, it can provide a valuable means of access to the telephone system and stored online information. The one caveat is that multimedia software and Web sites can present a significant barrier when sound files are used to present information. The World Wide Web Consortium's Web Accessibility Initiative guidelines describing how to make software and Web sites more accessible state firmly that any sound files utilized in a software program or Web site should also be available in text format so that everyone has access to all information. Personal computers can readily be adapted to communicate with both text telephones and other computers by adding a Baudot/ASCII modem to the system. For persons who are deaf-blind, further adaptations, such as the braille printers or displays described in chapter 3, may be desirable.

Baudot/ASCII Modems

Offering a world of communications possibilities, Baudot/ASCII modems can communicate with text telephones as well as with personal computers. These modems connect to personal computers in the same manner as standard modems; they can be internal, circuit-card-based devices or external devices that attach to a serial port. Like standard modems, Baudot/ASCII modems require software to operate. With a personal computer equipped with a Baudot/ASCII modem, you can send and receive calls from both text telephones and personal computers, allowing you to talk by typing messages back and forth as on a standard text telephone. Because Baudot/ASCII modems speak the language of the text telephone (Baudot) and the language of the personal computer (ASCII), they can overcome the barriers of electronic-language incompatibility. However, only Baudot or only ASCII must be used at both ends of the conversation. This means that both parties to the conversation must agree on which format will be used throughout, either Baudot or ASCII. With the growing number of computers, there is a strong need for text-telephone

users to communicate with personal computers. Fortunately, text telephones can often be made ASCII-compatible by adding an ASCII-code module to the unit.

Text-Telephone Software

Just as standard computer modems require software, so do Baudot/ASCII modems. Text-telephone software permits standard modems to function as text telephones. Some Baudot/ASCII modems have their own dedicated software; other software programs are memory resident and can work with many hardware configurations.

Visual Indicator Software

The primary exception to the lack of barriers presented by personal computers for persons who are deaf or hard of hearing is the beep and other sounds produced by software programs. The beep tone is a signal that computers use when an error condition has occurred or when the user needs to provide more information. Because the speaker beep may be inaudible to persons who are deaf or hard of hearing, the built-in SoundSentry software in the Windows operating system can provide a visual rendering of the beeping by making the screen flash. The Macintosh also includes a utility to flash the screen when the computer beeps. It is found under the Control Panel screen, where it is possible to set the volume of the internal speaker to any desired level. If you set the level of the speaker to zero, then the screen will flash every time the speaker beeps.

Computer-Aided Transcription

Computer-aided transcription serves persons who are deaf or hard of hearing when they attend public gatherings, such as group assemblies, town meetings, classroom sessions, and courtroom proceedings. It increases accessibility to public functions by providing a real-time visual transcript of the proceedings. Computer-aided transcription, which is relatively simple in concept, requires a skilled typist who can key sixty to ninety words per minute, a personal computer, a large display monitor, and word-processing software.

CART Reporting

Another form of transcription service, computer-aided real-time transcription (CART), requires a trained court stenographer and a computer program that converts the stenographic symbols into standard printed text. Although this system provides real-time text of public gatherings, it may be more expensive than computer-aided transcription because skilled stenographers are more highly trained and their equipment is more sophisticated and expensive. The stenographic method provides a real-time transcript of the proceedings, whereas computer-aided transcription provides summaries of a class, meeting, or other gathering.

As the typist or stenographer keys in the audio portion of the presentation, the text scrolls onto the display monitor or video output screen. The text can be projected onto a screen, giving the entire assembly access to the transcription. The text can also be saved to the hard disk or to the floppy disk of the transcription computer, allowing a printed or braille copy to be generated upon request. Information about obtaining transcription services can be found by contacting your local state rehabilitation commission, independent living center, or commission for the deaf.

Computerized Sign Language Training

Persons who are deaf or hard of hearing use several visual languages to communicate: American Sign Language (ASL), signed English, and finger spelling. American Sign Language is a visual language that uses hand, arm, and body movements to relate words and concepts. It has its own syntax that does not resemble the English language. Signed English, another visual form of sign language, corresponds with the spoken form of the English language. Signed English also uses hand, arm, and body movements to construct words and phrases. Finger spelling, a less complex form of sign language, uses the hands and fingers to spell out words one letter at a time. Finger spelling thus has a one-to-one correspondence with the English alphabet.

A personal computer can be a valuable tool for teaching or reinforcing ASL or finger spelling. A variety of software programs to teach and reinforce ASL are available for personal computers. These software programs use graphics of sign symbols to aid in instruction and learning.

SIGNALING SYSTEMS

As with other forms of assistive technology, the goal of many adaptive systems is to transform one form of communication into another, such as to convert text into speech. Signaling systems monitor sound in the environment and convert the sound energy to a visible, tactile, or vibrating signal, which allows persons who are deaf or hard of hearing to live more independently. These systems are more often employed by persons who are totally deaf than by those who are minimally hard of hearing. For the person who is deaf or who is severely hard of hearing and must manage a home or business, many sound sources in the environment must be monitored daily. Signaling systems constantly monitor select sound sources, listening for specific frequencies and durations. When the signaler detects a desired sound, it alerts you to its presence in a tactile or visual format.

The standard doorbell is a common audio-signaling system that alerts hearing persons to the presence of a visitor. But for a person who is deaf or hard of hearing, the traditional audible doorbell is not useful as a signaling device. For a person who is hard of hearing, the doorbell may be audible only when the person is

in the same room with the ringer and may be totally inaudible some distance from the doorbell. Doorbell signalers are perhaps the most common type of sound-monitoring equipment for persons who are deaf or hard of hearing.

There are three basic types of doorbell signalers: hard-wired, acoustic, and magnetic. Hard-wired doorbell signalers interface electrically to the power leads within the doorbell itself and are activated by the electrical energy that is sent to the doorbell when the doorbell button is pressed. Acoustic doorbell signalers monitor the doorbell by using a microphone and are activated by sound waves. Magnetic signalers attach to the doorbell housing with a suction cup and are activated by the magnetic pulse that is created when the doorbell rings.

Hard-wired, acoustic, and magnetic signalers operate in much the same manner despite their differing approaches to monitoring the doorbell system. When any of these signalers detects a ringing doorbell, it immediately transmits a code warning to a receiver by sending a signal through the standard electrical system of the building. When the transmitter sends an alert signal to a remote receiver, the receiver flashes a room lamp under its jurisdiction, for example. The receiver includes a built-in electrical outlet to accept the power plug of a room lamp or other appliance. Multiple receivers may be used to flash every lamp in the house when the doorbell is pressed.

Each system has advantages and disadvantages. Hard-wired signalers are less prone to false signals because they are not activated by sound energy; however, they require a professional to install. Acoustic signalers are more prone to false positive incidents, but they can be installed more readily by nonprofessionals. Magnetic signalers offer the reliability of a hard-wired system with the ease of installation of an acoustic system.

Using the same basic technology, other important sounds in the environment can be monitored. For example, parents need to listen for the sound of a crying baby. A baby signaler placed close to the child constantly monitors for crying. Because the baby's cry is unique, the signaler listens for a specific duration and pitch. When it detects the target pitch and intensity, it transmits an alert signal to a remote receiver to flash lamps in the vicinity of the parents.

Similarly, but perhaps not as critically, the buzzing of an alarm clock is another sound that must be monitored. Persons who are deaf or hard of hearing can monitor this vital sound and be alerted to its presence through visual or tactile output. Adapted alarm clocks draw attention by triggering a lamp or vibrating signaler. When the alarm rings, it activates power to the built-in outlet, which can turn on a lamp or vibrator connected to the clock. Signaling systems are relatively inexpensive. They provide valuable assistance around the home, school, and office.

CAPTIONING SYSTEMS

Captioning systems make television programs more accessible to persons who are deaf or hard of hearing by providing text messages of dialog at the bottom

(usually the lower third) of the video screen. Not unlike subtitles found on foreign films, captioning offers a visual record of the spoken word.

There are two basic types of captioning: closed and open. Both closed and open captioning provide a text message on-screen. Closed captions require a decoder for the caption to be visible, whereas open captions do not need a decoder. As dictated by the Television Decoder Circuitry Act of 1990, television sets larger than thirteen inches sold in the United States beginning in 1993 must come equipped with a microchip to decode closed captioning.

Making Captioned Videotapes

Numerous companies that provide training videotapes are incorporating captioning into their products. By using a personal computer and two videocassette recorders, the open or closed captions can be added to existing videotapes.

First you create the text captions on a word-processing program or with the built-in text editor of the software. The system requires two videocassette recorders—one to play back the original and another to record the captioned version. Then the computer mixes the original videotape frames with the captioned text and transfers the newly captioned video image to the second video recorder.

ELECTRONIC AMPLIFICATION SYSTEMS

Amplification devices are among the most common adaptive technologies for persons who are hard of hearing. These devices boost sound energy, which allows persons with limited hearing to more easily perceive the spoken word, music, and other sounds. Electronic amplification systems can be used to increase the audibility of face-to-face communication, public gatherings, telephone calls, and television and radio programs.

Today's tiny amplification devices are designed to collect sound energy, amplify the signal, filter out unwanted information, and focus the boosted and clarified signal directly into the ear. These systems can partly compensate for hearing losses at various frequencies.

Amplification systems contain three basic components: a microphone, an amplifier, and a speaker. The microphone collects sound energy through a moving diaphragm. When the diaphragm is distorted by sound waves moving through the air, electrical pulses are created that produce an analog signal of the incoming sound wave. This electrical wave is then routed to the amplifier and the signal is increased. Next, the amplified signal is sent to the speaker, which directs the boosted sound energy directly into the ear. The net effect of this process is to make most sounds louder, thus easier to perceive. Two of the most common types of amplification systems in use today are hearing aids and assistive listening devices. Another system frequently employed by persons who are hard of hearing is the telephone amplification system.

Hearing Aids

Among the most common forms of adaptive technologies are hearing aids. These electronic amplification devices amplify sound energy and direct the boosted signal directly into the ear. Most hearing aids consist of a tiny molded plastic shell that is customized to fit inside the ear of the wearer. A microphone, a speaker, and an amplifier are all contained within the shell. You can adjust the volume level by turning a small control. Hearing aids can be used to amplify face-to-face conversations, telephone calls, and even public meetings and gatherings. Some hearing aids come equipped with a telecoil, which permits them to tune into assistive listening systems in auditoriums or public facilities. Digital hearing aids include technology that significantly improves the signal-to-noise ratio.

Assistive Listening Devices

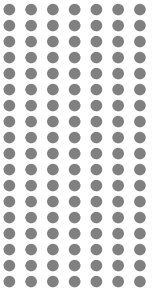
Assistive listening devices, based on the technology used in hearing aids, are used chiefly in public situations, such as meetings or conferences. Like hearing aids, assistive listening devices amplify sound energy and contain a microphone, an amplifier, and a speaker. In contrast to hearing aids, assistive listening devices consist of two separate units: a microphone-transmitter and a speaker-receiver, each about the size of a pack of playing cards. The transmitter and receiver communicate with one another through radio waves or infrared light. An assistive listening device filters out background noise within an auditorium by focusing the microphone on the lecturer. A microphone placed directly in front of a lecturer or worn on his or her clothing can more efficiently gather and amplify the speaker's words and overcome background noise than can a microphone placed in the middle of the same room. The improvement occurs because the microphone worn on the lecturer is much closer to the sound source and the sound does not have to travel far to reach the microphone. Thus, an assistive listening device is more efficient than a hearing aid at capturing sound energy and overcoming background noise.

Assistive listening devices can use a number of broadcast techniques to achieve their purpose. Some systems use infrared signals; others use some form of radio waves. The infrared waves that communicate between the transmitter and the receiver are similar to those of a television remote control and are invisible to the unaided eye. Infrared systems are useful in settings where several simultaneous performances take place, such as movie multiplexes, because infrared broadcasts are stopped by walls, unlike radio signals, which bleed through floors, ceilings, and walls. Radio-based systems are useful both indoors and out-of-doors, whereas infrared systems can receive interference from direct sunlight, which also contains infrared energy.

Telephone Amplification Systems

If you're mildly or moderately hard of hearing, the telephone need not present a barrier to communication. If the audio signal of your telephone simply isn't loud enough for comfort, you can use an electronic amplification system that attaches to your telephone. If you're purchasing a new telephone, you can choose one with built-in amplification circuitry. If you have limited but functional hearing, telephone amplification systems allow greater access to the telephone. Amplified telephone handsets attach to most telephones and have variable volume-adjustment controls that allow you to modify the sound level for comfortable listening. Some systems also offer filtering to boost specific frequencies to compensate for selective hearing loss at certain frequencies. Telephone amplification systems are simple to install, and some models come in the form of replacement handsets with built-in volume controls. These units are installed merely by unplugging the old handset and attaching the new one. Made of solid plastic, these devices are portable and can be carried in briefcase or purse.

A list of products for persons who are deaf or hard of hearing is presented in appendix D.



5

Technology for Persons with Motor Disabilities

The computer keyboard is the standard device for entering information and controlling your personal computer, which can create barriers for persons with motor disabilities. If you're an individual with a motor disability, the computer keyboard doesn't have to stand in the way of access to computers and information. The good news is that the computer keyboard can be adapted or bypassed to allow greater access.

In this chapter, the term *motor disability* is used to describe a variety of physical disabilities that may prevent or impair access to the computer keyboard. The focus is not on specific disabilities, but rather on how adaptive technology can be used to compensate for the effects of a disability.

Personal computers fitted with adaptive technology allow you to access computers and the Internet, to pursue educational and career goals, and to control the environment, including electronic equipment and electrical appliances. This chapter discusses adapted keyboards, alternative input devices, speech-recognition systems, and environmental control systems.

If you're unable to use a standard keyboard, you can use an adapted keyboard to provide a customized working environment. You can either replace your keyboard with a different model or use software to change the behavior of the keyboard you currently have. Hardware alternatives include templates for existing keyboards and specially manufactured keyboards that differ from those usually supplied with personal computers. Software alternatives include the built-in suite of access features found in computer operating systems such as Windows and the Macintosh, as well as other programs that alter the keyboard so it is more accessible. Alternative input devices allow you to point at commands or objects on the screen and select an option with a blink of an eye or an adapted switch. Other adapted input devices include systems that use Morse code or word prediction for operating personal computers. Speech

recognition systems permit you to control personal computers using spoken commands. Environmental control systems let you activate, control, and monitor electronic devices of all types around the home, school, or office. In the next sections, we will explore these technologies in greater detail.

ADAPTED KEYBOARDS

For persons unable to use the traditional computer keyboard, adapted keyboards allow greater access to personal computers. Adapted keyboards are input devices created to assist persons with motor disabilities. Adapted keyboards are also useful for individuals experiencing pain or having difficulty with coordination. Adapted keyboards can be used by persons who have control over one hand or control of just one finger. Some adapted keyboards are programmable, permitting you to rearrange the keyboard layout. Some can be used with one hand, a mouth-stick, or even with the feet. And some may be either larger or smaller than the keyboards that come with most computers.

The keys on a computer keyboard are merely mechanical switches that make electrical contact when pressed. Depending on their open or closed state, tiny switches imbedded in the keyboard send signals to the computer. To operate a keyboard effectively, you must have significant coordination and finger control. You must be able to strike the desired key without accidentally striking others and also be able to release the key quickly enough to prevent the key's action from repeating.

Many adapted keyboards can be installed in a few minutes with little advanced technical experience because they plug into the standard keyboard socket. Because many adapted keyboards attach directly to the computer, they do not use up system memory. Once the adapted keyboard is installed, your keystrokes are electronically sent to the computer just as if they were being sent by an original equipment keyboard. Numerous adapted keyboard products are currently available from a variety of vendors.

Keyboard Keyguards

Keyguards are plastic or metal templates that fit over a standard computer keyboard with a hole for each key. This keyboard adaptation helps prevent accidental keystrokes and provides a place for you to rest your hands for stability while typing. Some keyguards have key latches—levers that can hold down keys such as SHIFT and CONTROL—to eliminate the need to press two keys at once. Keyguards are made for individual models of computers and often are not interchangeable across specific brands of keyboards.

Keyboard Modification Software

Software packages can make the original equipment keyboard more accessible to persons with motor disabilities. Among these are macro software, which

saves many keystrokes, and sticky keys software, which addresses the need to depress two keys simultaneously. Some assistive software can allow the arrow keys to be used instead of the mouse, while others can filter out unwanted keystrokes.

Macros

Some software programs offer features that are useful to persons with disabilities even though many of those programs were not designed with such users in mind. Macro programs fit neatly into this category and are an inexpensive method of making software programs more accessible and easier to use. In basic terms, macro programs remember keystrokes and mouse movements and let you play them back whenever you need. You can assign a macro to almost any key on the keyboard and have it play back hundreds of keystrokes and mouse movements in exact sequence.

For example, using a macro software package, you can define the ALT+N keystroke as your macro. When ALT+N is struck, the macro automatically writes your name, address, and phone number into a document, saving dozens of keystrokes in the process. You can define almost any keystroke in this manner, further saving keystrokes. The macros you define are permanently stored on the computer's hard disk drive and can be used over and over again when necessary. The ability to define hundreds of macros can assist you for word processing, database management, spreadsheets, browsing, bookkeeping, programming, and even for games.

Macro software also allows you to redefine the keyboard by rearranging the keys into any pattern that is most convenient. By redefining a keyboard, you can turn complex keystrokes into easier ones. For example, if you cannot strike a particular key on the keyboard because of the key's position, you can write a macro to electronically strike that key when another key is pressed. If you are more familiar with a keyboard other than the one you are currently using, a macro package can rearrange the entire keyboard to suit your specific requirements. Then, the new keyboard layout definitions can be stored to a file and loaded into memory when the rearrangement is needed. If the time comes to restore the keyboard to its original configuration, that particular keyboard definition file can be loaded back into memory.

Many software programs come with macro capability. Unlike the macro programs that can control other software packages, these built-in macro programs are usually active only when the specific application is running in the computer's memory and is visible on-screen. Two examples of the many software packages that contain their own built-in macro languages are WordPerfect and Lotus 1-2-3.

Macro programs can be purchased from mail-order outlets or from local computer stores. These programs are relatively inexpensive and are compatible with most commercial software packages. Software catalogs are an appropriate place to look for macro software. Macro programs may also be down-

loaded from the Internet. The installation process, which is relatively simple, consists of creating a subdirectory on the hard disk and copying the software onto the main system drive. Remember, however, that the macro program and its set of configuration files for each application will consume disk space.

A word of caution is in order: Prior to purchasing a macro program, be sure to test the program with your adaptive equipment. Some macro programs may not be fully compatible with some forms of adaptive technology, such as some screen readers employed by persons with vision impairments. You should experiment with various macro programs to find one that is compatible with your specific adaptive technology. You should also avoid using reserved keystrokes that your adaptive technology and nonadaptive software programs use for their operation.

Key Modifier Software

Some keyboard sequences needed for input or computer control can present barriers for persons with motor disabilities. The most obvious example is using the SHIFT key to capitalize a letter or to send a command sequence. Barriers arise because such key sequences require two hands to execute. For example, to write a dollar sign, you must hold down a SHIFT key with one finger while simultaneously pressing the 4 key—an operation that requires the use of two fingers and both hands. If this operation could be transformed into two individual keystrokes, the process would be much more accessible to persons with motor disabilities. The good news is that sticky keys software can transform this multiple-key sequence into one that can be performed using one hand or one finger.

Modifier keys for performing command and control functions can also present barriers to users with motor disabilities. Such keys redefine the meaning of other keys on the keyboard. Modifier keys found on Windows-based computer systems are CTRL and ALT. The Macintosh has similar keys and also includes a key modifier called COMMAND, which can be used to send commands to the operating system or applications programs. Such keys send commands to the computer—they do not print letters or numbers. An example of this for the Windows platform is the CTRL+P combination (in which the CONTROL key is held down while the P key is depressed). This sequence tells the computer to print the current document, while ALT+F4 tells Windows programs to stop executing and unload from memory. The meanings of modifier keys are stable from one Windows program to another. Virtually all software packages incorporate these special command keys, and there is no way to avoid their use.

Sticky keys software addresses the keyboard barrier of commands that require two hands to execute. Because SHIFT, CTRL, and ALT keys must be used in combination with other keys and because they return to their up position when released, they can be difficult to operate by persons with motor disabilities. Sticky keys software can lock down such keys while you run your favorite applications programs.

Other forms of keyboard modification utilities can emulate the mouse or slow the effects of keys that repeat when accidentally struck. Like the keys of some electric typewriters, computer keys repeat their actions if they are held down for a length of time. For some persons with motor disabilities this feature could present a barrier. Adaptive software can address this issue by turning off or modifying the repeating functions of the keyboard.

Sticky keys and key-modification software packages are built directly into Windows and are thus available for just the cost of the operating system. Sticky keys and key-modification packages are memory-resident utilities. When a sticky keys program is loaded, the software takes inventory of all the keys on the keyboard, especially the status of the SHIFT, CONTROL, and ALT keys. When the SHIFT, CONTROL, or ALT key is struck, the sticky keys program locks it down as if it were being held down by finger pressure. For example, to type words in all capital letters with sticky keys software, you can lock down the SHIFT key by striking it twice. The SHIFT key will stay locked down until you strike it again to release it.

BUILT-IN ACCESS FEATURES

Microsoft Windows, Apple Macintosh, and Sun workstations include a suite of access features designed to assist persons with disabilities. The software is included with the respective operating system, available to any user who has a valid installation of that system. The suite of assistive programs is generally compatible with most applications software, but it is wise to verify that your applications will work across the board with those utilities. Documentation for the assistive programs is available in the help system that accompanies your personal computer. The accessibility utilities discussed below are typical of the built-in access features that come with Windows, Macintosh, and Unix.

BounceKeys is an appropriate utility for persons who have a tendency to strike the same key multiple times. The program will not accept two presses for the same key unless the keystrokes are spaced apart by the time interval that the user selects.

MouseKeys is a utility that works in concert with commercial applications software, such as word processors, databases, and spreadsheets. With this program the arrow keys located on the numeric keypad and the mathematical operator keys mimic the standard functions of the mouse. The arrow keys emulate the movement of the mouse, and the mathematical operator keys mimic the clicking of the mouse buttons.

RepeatKeys is a utility that turns off or adjusts the automatic-repeat feature found on most keyboards. Persons with motor disabilities may not have sufficient fine motor control to avoid the automatic repeat feature, which may result in long strings of unwanted characters in a document or many erroneous key commands issued to an application program.

SlowKeys slows down the response time for a key to become active. Some persons with motor disabilities accidentally strike unwanted keys on the way to a desired keystroke. These accidental keystrokes are typically of short duration, so they can be filtered out by the SlowKeys program. When SlowKeys is in use, a keystroke takes effect only if the key is held down longer than an accidental keystroke. The user can define the most appropriate time interval.

SerialKeys controls the keyboard and mouse functions using an adapted switch connected to the serial port. This allows you to run your computer using an external device, such as a communications device with its own keyboard. As a result, you can operate your computer using an adapted switch that fits your individual needs.

ToggleKeys uses a beep to indicate when CAPS LOCK, NUMBER LOCK, or SCROLL LOCK has been pressed. This program is useful when turning settings off and on, and provides audio confirmation of the process.

On-Screen Keyboard

Windows 2000 includes an on-screen keyboard to assist persons who have difficulty with the standard, physical keyboard. The on-screen keyboard is a software program that displays a graphical representation of a keyboard on the computer screen, allowing you to select any key by moving and clicking the mouse. Users who cannot click the mouse can activate keys simply by pausing the pointer over them, and users who cannot use any type of pointing device can use the on-screen keyboard by tapping a single key on the keyboard. You can use the on-screen keyboard to control programs, to enter documents and other information into the computer, and to communicate with others.

ALTERNATIVE INPUT SYSTEMS

When you type on the keyboard, characters automatically are sent to the keyboard buffer, a storage area (or holding tank) within main memory. However, a keyboard is not the only device capable of inserting data into this electronic storage area. An alternative input device can feed information into a computer by using a pathway that mimics the standard operation of an original equipment keyboard.

Alternative input technologies interface to the computer via circuit cards or through the serial interface port and use assistive software in their operation. These devices include adapted switches, scanning keyboards, and Morse code systems.

Adapted Switches and Scanning Keyboards

Alternative input devices often consist of both hardware and software. The hardware may consist of switches that interface to the computer, often

through the serial port or through an interface circuit card. The software convinces the computer that the keystrokes are coming from the original keyboard rather than from the adapted switch.

Adapted switches come in a number of different configurations. They may be controlled by hand or foot movements, breath, spoken commands, or even the wink of an eye. In fact, any reliable muscle movement can be used to flip an adapted switch. Thus, adapted switches are custom-fitted to the needs of the individual, depending on the person's ability and stamina for depressing a switch a number of times before becoming fatigued. Single switches can be purchased in a number of configurations, such as a pillow or a flexible rubber cylinder that activates when squeezed. Other styles and configurations of switches include chin switches activated by jaw movements, sip-and-puff switches activated by breath control, and eye-gaze switches activated by eye movements.

Head-mounted adapted switches allow you to control the computer by pointing at a scanning keyboard—a pictorial keyboard displayed on the screen. The scanning keyboard is displayed by software, and you can select the desired key by using an adapted switch attached to the headset. The keyboard displayed on the screen can be programmed to scan by lighting letters one at a time at a rate that you choose, or you can select any key you desire by pointing to that key. Head-mounted devices communicate with the computer using infrared signals or a low-powered laser. When the desired letter or item is illuminated, you can select that letter or item by closing the adapted switch. This process can be speeded up by using word prediction, described below.

Morse Code Systems

Another type of alternative input device is based on Morse code. These relatively inexpensive systems rely on the two-level binary code of dots and dashes for a simple, but often effective, method of data entry. Morse code can be employed to enter text into computers for most word processors, databases, spreadsheets, telecommunications packages, and other software. Morse code systems are readily interfaced to most personal computers through the standard serial or parallel ports. The systems consist of adapted switches and software. Morse code can be a fast and efficient method for entering data and issuing commands to the computer. These systems can also be used for person-to-person communication because many Morse systems can translate the dots and dashes into standard text or voice output; therefore, only the sender needs to learn Morse code.

Word-Prediction Software

Word-prediction software can speed up the data-entry process for an individual using a keyboard, an adapted switch, or another form of alternative input

device. The aim is to obtain the maximum data entry for the fewest number of keystrokes. As with macro software, single keystrokes under the proper software control can be programmed to perform multiple keystrokes.

Word-prediction software monitors the keyboard input and watches for selected characters in sequence. When the software recognizes an appropriate series of characters, it displays a menu of word choices on the video screen. Then you select one of the menu choices to complete the text-entry process. For example, if you enter the letter *a,* the word predictor might display a menu that looks something like the following:

A. apple
B. about
C. able

You then select from the possible word choices by keying the letter of the desired option. Word predictors typically use a disk-based dictionary to index the word choices and cross-reference the words with the abbreviations that trigger the menu choices. Many word predictors also contain a user-definable dictionary that allows individuals to add their own custom words and phrases. These programs work similarly to the spell-checking programs available with most commercial word-processing packages. Word-prediction software is intelligent and learns your vocabulary over time. Based on the frequency of certain words, the word predictor moves commonly used words to the top of the menu choices, permitting you to select words and phrases with increased speed.

SPEECH-RECOGNITION SYSTEMS

Computers that comprehend the spoken word conjure up images from science fiction, but such machines are a solid reality with today's technology. Although personal computers come equipped with keyboards for data entry, microphones rapidly are becoming standard equipment for many systems. Most computers today are shipped with built-in sound cards that permit voice synthesis and speech recognition.

Simply put, speech-recognition systems "listen" to spoken commands, process the verbal input, and send the commands to the computer as if they had been typed at the original keyboard. These systems are compatible with commercial software to create an interactive voice-response system for individuals with motor disabilities. As a result, they can speak to their computers to enter commands and data.

Speech-Recognition Hardware

To run a speech-recognition software program on your computer, you will need an industry standard sound card and a microphone. Since most personal computers manufactured today come bundled from the factory with built-in

sound cards, they are ready to run speech-recognition software right out of the box. If you don't have a sound card installed in your computer, it is relatively inexpensive to add one yourself or to have one installed at your local computer store. If you prefer to install a sound card yourself, it is not a difficult process, so long as you are comfortable with the task of opening your computer and plugging a card into the motherboard. Next you plug the microphone and speakers that came in the package into the sound card to complete the hardware installation. The next step is to install the driver software that came with the card. When that has been accomplished, you can install the speech-recognition software and begin the training process.

Training

Before most speech-recognition systems can work, they require training, a process that takes about an hour for most systems. The training process lets the speech-recognition system become familiar with your specific voice pattern and to store those patterns for future recognition. The training process involves speaking a list of words and phrases into the microphone and allowing the system to record them on the hard disk drive.

Most speech-recognition systems that are available today must be trained to recognize your voice before they can be put to use.

Speech-recognition products are cost-effective and have significantly decreased in price over the past few years. Systems are available for the Windows, Macintosh, Unix, and other computer platforms, making speech technology available on a wide variety of systems.

Speech on the Road

Speech-recognition systems are rapidly shrinking in size and increasing in performance, thanks to smaller and more powerful portable computer platforms. Speech-recognition systems can be used on desktop, notebook, and palmtop computer systems, allowing you to take your access technology to school, to the library, or to work. Speech recognition is also being deployed to the World Wide Web, allowing users to control Web sites using a standard telephone.

Speech recognition is a powerful adaptive technology for persons with motor disabilities. The technology was formerly one of the most expensive, but prices have decreased drastically and continue to fall. Speech recognition is appropriate for many users because it uses our hard-wired verbal-language ability. When properly trained and configured, speech-recognition systems can replace the traditional computer keyboard, allowing you to operate computers and other devices independently.

ENVIRONMENTAL CONTROL SYSTEMS

For persons with motor disabilities, controlling the environment can present significant barriers at home, at school, or on the job. Such barriers arise in the

operation of many different types of appliances, machines, and devices that are necessary for working, learning, and living independently.

Although adaptive technology designed to access personal computers has certainly come a long way over the past few years, few electronic devices and appliances are equipped right out of the box for persons with disabilities. Barriers are created by devices that require buttons to be pressed, switches to be switched, and controls to be manipulated because they call for at least some manual dexterity. What is needed is an alternative method for controlling these devices in a manner that users with motor disabilities find most natural and comfortable.

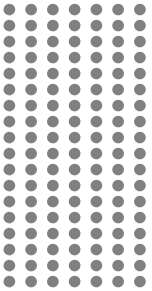
Environmental control systems permit persons with motor disabilities to control appliances and other devices using a personal computer or stand-alone control unit fitted with customized adaptive input/output systems. They gives users the ability to control electronic devices using, say, voice commands, an alternative keyboard, or other form of assistive technology. Environmental control systems can also be used in the household environment to control lights, heating, air-conditioning, appliances, alarm systems, doors, windows, draperies, and the like.

In simple terms, environmental control systems, both computer-based and stand-alone, consist of two basic components. The first component consists of a control panel that has been adapted with appropriate switches, pointer devices, or voice input/output to permit persons with motor and other disabilities access. The second component is a receiver station that the appliance plugs into. The receiver can turn on the desired appliance when it receives a signal from the master control panel. These signals can be transmitted to the receivers in several ways: through existing electrical wiring, through infrared signals, or through ultrasonic signals.

You can also use your personal computer to drive an environmental control system. Computer-based systems allow you to use your PC as the nerve center of the environmental control system. In this mode, your computer is responsible for controlling remote switches plugged into the system. These switches connect to your computer in the same way as a stand-alone control system, through the wiring in your home or office, through infrared, or through ultrasonic signals. You may think of this as a small computer network, with your PC communicating with remote devices over an established backbone.

A computer-based environmental control system gives you the power, Graphical User Interface, and flexibility of the PC platform. It also allows you to make backups of the system setups to more easily recover from hardware or software crashes. There are also stand-alone environmental control systems that are essentially dedicated devices. A variety of stand-alone and computer-based environmental control systems that allow persons with disabilities to control a single appliance or to control an entire home or office are available commercially.

A list of products for persons with motor disabilities is presented in appendix E.



6

Technologies for Persons with Speech Disabilities

The spoken word is the most basic form of communication and information exchange among our species. But if you have a disability that affects your capability to communicate verbally, assistive technology is often able to level the playing field and help compensate.

Some physical disabilities affect speech and result in an inability to speak, to speak at length, or to speak understandably to others. The good news is that modern computer-based alternative communications systems allow persons with speech disabilities to project their thoughts and expressions with a clear and portable electronic voice or through hard-copy print.

Devices designed to assist persons with speech disabilities are known as alternative, or augmentative, communications systems. In nontechnical terms, these devices essentially speak for the user with a synthesized or recorded voice at the press of a key. For example, when you press the Water Glass icon key, the system speaks "May I have a glass of water?" It's that simple. In this chapter, the term *alternative communication* is used for consistency.

The current generation of alternative communications devices includes both stand-alone units and computer-based systems. You can thus enjoy the flexibility of choosing among a variety of portable, dedicated devices or using your personal computer as a communications device. In the next sections, we'll discuss the basic features and attributes of alternative communications systems. The selection of an appropriate device should always be made with the guidance of a rehabilitation engineer, therapist, or team dedicated to alternative communication and adaptive technology.

THE EVALUATION PROCESS

As with any assistive technology, it is mandatory that you be evaluated by a professional to determine the appropriateness for the prescription of any

device. The evaluation is a screening process intended to learn if you are a candidate for assistive technology and which technology would be most beneficial if prescribed. The typical evaluation involves specialists from many different disciplines, including speech therapists, rehabilitation engineers, and other staff. It should be noted that some persons who may benefit from speech therapy may not require alternative communications systems as they may be able to speak on their own with some training and assistance.

When speech therapy has been ruled out, technology may be appropriate. But once any technology has been selected, it is mandatory to provide sufficient training and orientation to ensure a successful outcome. As with any form of technology, gaining proficiency can be a lifelong responsibility.

WHAT IS AN ALTERNATIVE COMMUNICATIONS DEVICE?

In its low-tech form, an alternative communications device consists of a notebook or board of pictures and symbols to communicate basic wants and needs, such as "I want a glass of water" or "It's time for dinner." Many communications devices today rely on computers and high-tech systems to help level the playing field for persons with speech disabilities. An electronic alternative communications device is essentially a computer filled with stored words and phrases that can be spoken aloud on command, a voice server. The device contains lists of words and phrases that can be spoken or printed at the press of a key or the click of a mouse. Many alternative communications devices are stand-alone products, similar to notebook computers. They are often battery powered and can be readily taken on the road to appointments or other social gatherings. These devices contain much of the same hardware found on a personal computer, including keyboard, visual display, memory, disk drive storage systems, memory card storage systems, and printer output ports.

Although there is a wealth of stand-alone alternative communications systems, there are also some computer-based systems. They consist of hardware and software that can be installed on your desktop or notebook computer and thus allow you to use your communications device from your own PC. These software systems are advanced forms of technology that take advantage of existing sound cards and software speech engines.

For our purposes, there are three basic classes of alternative communications devices: those that use speech-synthesis technology to speak words and phrases, those that employ digital recording and playback, and those that employ printouts or some form of video display.

Speech synthesis is the automatic generation of voice from a text string. It allows you to synthesize any word or phrase on demand in real time without having to record first. Other communications devices use digital recording and playback technology, which requires the assistance of a speaking person to record the sound snippets. Most alternative communications devices come with hundreds or thousands of preprogrammed words and phrases that can

be used right out of the box, so there's no need to have a friend or family member create new recording samples.

Many alternative communications devices employ multiple modes for output, such as text-to-speech synthesis, digital recording, and print techniques, which allows you to take advantage of a wide range of possibilities in a single device. In these cases, you can play back or print out a message with the press of a key. Having a choice of output is useful due to the inherent pros and cons of each system. Speech-synthesis systems may allow you to speak any word or combination of words without the need to record it first, but, unfortunately, synthesized speech is not as understandable as recorded human speech. On the other hand, although digitally recorded sound bites are clearer and more natural sounding, they need to be recorded first. Each has its place in your world of communications, and many units offer a combination of speech synthesis, digital playback, and printout modes.

You can use a communications device to speak with friends, family, and co-workers, and in any other situation where you need to communicate with others independently. You can even use a communications device to deliver a paper or presentation simply by loading the file containing the presentation document into your system. Many units are capable of accepting files created on a computer and can speak the file by words, lines, sentences, or paragraphs under user control.

Because system backup is important with any computer or similar device, communications devices allow you to store setups and word lists for backup or transfer to another device. Many models contain memory card readers that allow you to store fairly large vocabularies and retrieve them later as desired. A memory card reader can also be used to retain a backup of the device to recover from system crashes that could potentially destroy many hours of work.

As portability is often paramount when using a communications device, it is important that you explore the battery life statistics when considering obtaining a unit. See if you can purchase your unit with a fast-charge battery that recharges in only a few hours instead of overnight. Many communications devices run on battery power and, to increase their portability, can be recharged from standard house current.

Word Prediction and Abbreviation Expansion

Many systems offer word prediction and abbreviation expansion. Word prediction lets the computer do some of your typing with the help of a database of the words you use most often. The computer can automatically type your last name, for example, when you type in your first name. The device can also expand abbreviations to whole words and save you many keystrokes in the process. Thus, abbreviation expansion turns constructs like "ASAP" into "as soon as possible."

CONTROLLING A COMMUNICATIONS DEVICE

Alternative communications devices can be controlled by a number of methods, which makes them highly adaptable to a range of disabilities. They can be controlled from a standard keyboard, touch screen, alternative keyboard, or scanning keyboard. Some systems even let you connect to personal computers and operate your PC remotely.

Keyboards and Touch Screens

If you have a speech or language disability but no physical disability, you can use a more traditional keyboard mechanism to control your communications device. Depending on the exact configuration of your communications device, you may use a full-sized computer-style keyboard or a keyboard similar to those found on pocket calculators. You merely key in the words and phrases that you want spoken aloud or printed, and the device makes the desired verbalizations or printouts.

Touch screens are employed in some alternative communications devices. These control mechanisms live up to their name in that they allow you to touch a portion of the screen to obtain a desired result. For many individuals, touch screens can be a powerful and intuitive method of controlling a communications device. You point to a picture of a hamburger, for example, and the device says the word. It's that simple. But the real power of a touch screen is that there are no physical keys. Instead, pictures of keys are shown on the screen, and those pictures can be rearranged and regrouped at will.

Some touch screens allow you to have many different layers of keyboards grouped together for different activities. You can have keyboards organized in ways that suit your lifestyle. One keyboard can be grouped with food and beverage items, another with work-related words and phrases, all according to your requirements. The layers of keyboards permit the communications device to hold a great deal of information that is easily located and organized. And the theme keyboards can be constructed and accessed with just a few keystrokes.

Scanning Keyboards

As discussed in chapter 5, scanning keyboards are powerful technology for controlling personal computers and other devices. Alternative communications systems offer scanning keyboards as standard equipment or can readily accept the addition of a scanning keyboard. A scanning keyboard consists of two items: the scanning keyboard itself and a switch. The scanning keyboard is essentially a software program that displays a picture of the keyboard on a screen or visual display. The keyboard can be programmed to automatically highlight one character at a time at a user-defined rate. For example, one letter at a time becomes active every few seconds. To select one of the letters from the keyboard, you press the switch when the letter is highlighted and thus active.

A communications device equipped with a scanning keyboard allows you to select any word or phrase found on the keyboard by highlighting your selections one at a time. When the word or phrase becomes highlighted or active, you press a switch to tell the communications device to select or speak that object.

CONTROLLING A PERSONAL COMPUTER

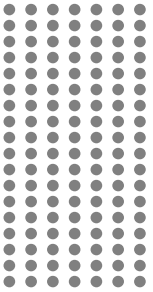
Many stand-alone alternative communications systems can help you control a desktop or notebook PC. You merely connect your communications device to your personal computer using an interface cable and load the appropriate software. Then the keyboard or adapted input device of your communications system takes control of your PC and all its software and operating system functions.

COMPUTERS AND ALTERNATIVE COMMUNICATION

You can use a desktop or notebook computer as an alternative communications device, much in the same manner you would use a stand-alone system. If your computer is equipped with a sound card or dedicated speech synthesizer, it can run a software-based alternative communications package. Software-based communications programs allow you to communicate with friends, family members, and co-workers using either your desktop or notebook computer. This allows you to communicate with others around the home, office, or classroom, or while traveling. Having your communications system readily available as part of your day-to-day computer setup may be of great value if you are proficient at using Windows or some other computer operating system. Many communications software programs come from the manufacturer with preprogrammed sound samples so you can start using them immediately. Many also take advantage of the new software-based speech engines and sound card technology, letting you use standard computer hardware rather than expensive and proprietary systems.

Numerous forms of alternative communications systems are available to assist persons with speech disabilities. This technology draws on the power of personal computers to expand the world of communications for numerous individuals.

A list of products for persons with speech disabilities is presented in appendix F.



7

Technologies for Persons with Learning Disabilities

The term *learning disabilities* has become almost commonplace, and society is growing to respect different learning styles. Learning disabilities is a broad subject, one that covers a great deal of ground. This chapter will focus on the various types of empowering technologies that are available to assist learning, organization, and memory, all of which can help persons with learning disabilities to compensate and succeed. The technologies discussed in this chapter can help with tasks such as reading, writing, and organization. The technologies include personal computers, speech synthesis, abbreviation expansion, word prediction, electronic books, scanners, speech recognition, note takers, organizers, and productivity software.

Although this chapter describes learning disabilities and the technologies that prove empowering, it is not intended as a thorough treatment on the subject. However, in a very meaningful way, this entire book should prove useful for persons with learning disabilities because there are no rules that restrict the deployment of a technology only to people having the disability for which it was originally designed. For example, there is little or no reason to hold back from using a screen reader to turn your computer into a talking computer, even though screen readers are intended chiefly for persons who are blind or have low vision, especially if you find the technology useful and empowering! By the same token, there is no reason not to use voice recognition to control your computer, even though the obvious population for this technology would be persons with motor disabilities.

This chapter also discusses the importance of the evaluation process and how to have adaptive technology written into a child's individualized education program at school. It also describes how to deploy adaptive technology and includes a brief examination of the importance of low-tech solutions.

WHAT IS A LEARNING DISABILITY?

The term *learning disability* is used very broadly to describe a number of conditions that affect individuals in their ability to learn or to process information. Learning disabilities, including attention deficit disorder (ADD), affect both children and adults, but many individuals can benefit from a professional evaluation and the application of assistive technology. Of course, it is important to recognize that technology is not a panacea, something that will erase a disability, but rather a tool that must be used wisely and judiciously. Sometimes the greatest wisdom is knowing when not to deploy any technology or when to apply a low-tech solution.

As stated earlier, learning disabilities can affect people in different ways, depending on the individual, the nature of the learning disability, and the task at hand. Learning disabilities can interfere with a person's ability to read, write, remember, compute, or process written or spoken information. Persons with attention deficit disorder may find it difficult to work on tasks that require concentration and remaining stationary for a period of time. Some learning disabilities can also affect an individual's social skills. According to the National Institutes of Health, learning disabilities can be broken down into several discrete categories: developmental speech and language disorders, academic skills disorders, and other disabilities that include coordination disorders and learning conditions not covered by the other categories. Each of these categories includes a number of more specific disorders, but full descriptions are beyond the scope of this chapter.

Learning disabilities take many different forms. For example, a person with one learning disability may have difficulty comprehending material in written form, but may quickly understand when the same text is spoken aloud. A person with a different learning disability may be unable to process spoken information, such as the information in a classroom lecture, but may benefit from reading a written transcription of the proceedings. The first person finds print a barrier, whereas the other strongly requires it. The point of this oversimplified example is that no two learners are alike, and a comprehensive evaluation process is everybody's best friend. In this chapter, we will focus on learning disabilities that affect the tasks of learning, writing, reading, and organization.

Learning disabilities are often categorized according to how they affect individuals' performance of such tasks as reading, writing, mathematics, speaking, remembering, and organizing. A learning disability may be compounded with a physical disability, such as low vision or limited fine motor control, which must also be considered when choosing a course of action.

THE EVALUATION PROCESS

As is the case with any disability, it is important to thoroughly evaluate a person with a learning disability before any adaptive technology is prescribed.

And, as with other disabilities, the first priority is to determine how the individual is affected by the learning disability when performing selected tasks. Those tasks, for the purposes of this overview, consist of reading, writing, mathematics, memory, and organizational skills. To be consistent, this chapter focuses on technologies that can assist in those areas.

The first step is to speak with the individual to determine how the learning disability affects his or her life. The evaluation focuses on how the disability affects the individual, the tasks the individual needs to perform, the environment in which those tasks are performed, any time limits or constraints on the task being performed, and the features of products that might prove beneficial. The evaluation also covers areas that may affect the consumer's ability to operate equipment, such as fine motor control or other skills and factors that will influence the determination of the most appropriate technology. The most powerful device in the world will do little good if an individual is unable to comprehend its functions and thus use it properly. We need to stress that technology should never be applied in a vacuum and that the user's voice must be in the forefront of any discussion.

Learning disabilities are identified in children by monitoring the passing of certain milestones in growth and development. These milestones include when a child first learns to walk, communicate with family members, behave curiously about his or her surroundings, and interact in general. A two-year delay in attaining any of these milestones may indicate that a child could have a learning disability.

When adults suspect that a child may have a learning disability, the best course of action is to have the child evaluated by a professional. The evaluation process will involve standardized testing to compare the child's abilities against children of similar age and intelligence. When a child is diagnosed with a learning disability, the next step is to implement a plan of action. The plan may call for help on many different levels, including medical, educational, and psychological. The purpose of the plan is to achieve specific goals, which can include improved independence, communication, schoolwork, or other goals important to the child and members of the family.

THE INDIVIDUALIZED EDUCATION PROGRAM

The Individualized Education Program (IEP) is a written agreement that describes the nature of the disability and the recommended technologies and services. The agreement is drawn up between the parents of the individual and the educational team at the school. To secure any necessary adaptive technology, it is important to have that technology written into the plan. This is a good time to gather and organize all paperwork pertaining to any evaluations the child may have undergone, as it may be required to document the nature and solution of the learning disability. The plan must include a timetable of short- and long-term educational services, as well as any adaptive technology

required. The plan should have a targeted outcome, with short- and long-term testing and milestones along the way to ensure the path to success.

DEPLOYING TECHNOLOGY

Once the individual has undergone a professional evaluation to determine the nature of the learning disability, there are numerous forms of adaptive technology that can be deployed. These technologies can consist of computer hardware, software only, or stand-alone devices. We stress that technology is not a cure-all, but many individuals are able to benefit from some form of either high or low technology. This section focuses on some forms of technology that can assist persons with learning disabilities.

Personal Computers

The personal computer is the platform from which many adaptive technologies derive, and numerous adaptive technologies are compatible with current PC systems. Using a personal computer equipped with various forms of adaptive technology can provide persons with learning disabilities a customized working environment that emphasizes their abilities rather than disabilities. Personal computers are capable of supporting a number of technologies, such as speech-synthesis systems, abbreviation-expansion and word-prediction software, electronic books, scanners, speech-recognition systems, and productivity software, that can be helpful to persons with learning disabilities. (There are also stand-alone examples of these technologies.)

Speech-Synthesis Systems

Speech-synthesis systems convert standard computers into talking computers capable of running commercial software or accessing the Internet. For persons with learning disabilities, speech synthesis provides an alternative to the written word, allowing them to access information audially rather than visually.

As we described in chapter 3, you need a sound card and speech engine to turn your computer into a talking PC. The sound card is a hardware device, equipped with jacks to install headphones or speakers. The sound card is responsible for running the speech engine, which is software that automatically converts text into speech output. Speech engines are capable of speaking many different languages and can be used for a variety of applications, such as entering text into a word-processing program, reading electronic books out loud, and browsing Web sites on the Internet. Speech synthesis is powerful technology for persons with learning disabilities because it allows users to hear their keystrokes as they are typed at the keyboard and to play back aloud any portion of the document being entered. Users who prefer information in an audio format rather than a visual one will find that speech synthesis allows them to focus on their abilities rather than their disabilities.

Abbreviation-Expansion and Word-Prediction Software

The technologies of abbreviation expansion and word prediction can also be used in conjunction with talking word-processing software. Abbreviation expansion is software that maintains an extensive database of words and phrases and their corresponding abbreviations. When the user types an abbreviation at the keyboard, the abbreviation-expansion software looks up that abbreviation in its database and types the whole word that corresponds to the abbreviation. Word-prediction software can also be used with word-processing programs to help compose documents. Word-prediction programs monitor what the user types, much like an abbreviation-expansion program, and maintain a database of the words and phrases used most often. When the user types a word at the keyboard, the word-prediction software provides a list of words that correspond with the initial entry.

Electronic Books

Both the computer and the publishing industries are interested in developing an accepted standard for publishing electronic texts for widespread distribution. Electronic books are powerful technology for persons with learning disabilities because they allow access to books in almost any desired format. Users can have electronic books spoken aloud through a speech-synthesis engine, display the text in enlarged type in print, or convert the document to braille. Electronic books are also easily stored on CD-ROM or floppy disks, and can be employed on desktop, notebook, and pocket computers.

Scanners

Scanners are hardware devices that plug into most personal computer platforms and allow users to scan printed and graphical material directly into a PC as if they had entered the information at the keyboard. A computer equipped with a scanner and optical character recognition software can scan printed books into almost any computer for use in many different ways. Once a book has been scanned and saved, a user can have the book read out loud through speech synthesis, print the text in enlarged type, or convert the document into braille using a braille translator.

Speech-Recognition Systems

Speech recognition lets users talk to a computer instead of typing and allows them to bypass the keyboard for data-entry and command and control functions. Speech-recognition systems let users dictate documents into a computer simply by speaking into a microphone attached to the sound card. Speech-recognition engines also allow users to control the operating system, applications programs, and other devices interfaced to the computer.

To perform speech recognition, a computer requires a sound card and speech-recognition software. Because speech recognition requires a significant amount of processor power, it may require a computer with significant resources. In general, a computer with at least 64 megabytes of memory and

a microprocessor of no less than 300 megahertz is required. Potential buyers should consult the manufacturer of a speech-recognition engine to determine the system requirements for optimum performance.

Productivity Software

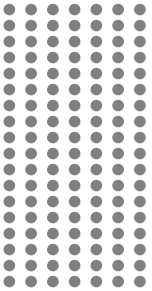
Productivity software is a broad category that offers a wide range of products to assist persons with learning disabilities. As the name implies, productivity software helps users be more productive at a given task. Project management software also helps users increase and focus their skills, guiding them to the successful completion for any project.

Note Takers and Organizers

For many individuals, note takers and organizers offer a great deal of assistance in a cost-effective package. A note taker is a portable computer-like device, capable of going with its user to school, work, or almost anywhere. The typical functions offered by most note takers include word processing, calendar, reminders, phone lists, calculators, and schedulers—features that can be used either at home or on the go.

Numerous adaptive technologies are available to assist persons with learning disabilities. A careful evaluation process that examines the individual, the tasks at hand, and the environment often leads to successful outcomes. For children with learning disabilities, it is important to have a correctly written Individualized Education Program in place at school to guide the achievement of specific long- and short-term educational goals. With adaptive technology in hand, you can increase your access to information and the world in general.

A list of products for persons with learning disabilities is presented in appendix G.



8

Foundations for Assistive Technology

Building a solid foundation is fundamental to the success of any project, and this certainly applies to the deployment of assistive technology. There are many important factors that must be considered long before any equipment is even procured. They include a thorough evaluation by trained assistive technology specialists and a plan for the future that includes competent training from certified instructors and access to technical support from skilled technicians.

For institutions deploying assistive technology, it is vital to construct a solid infrastructure to support the technology. This involves a broad-based plan of attack to gain as many allies as possible to support and nurture the effort. This includes consumers, as well as staff members. By embracing adaptive technology and universal design, the user base for a product or service expands, not the other way around.

THE ASSISTIVE TECHNOLOGY SPECIALIST

Given the abundance of adaptive technology available and the wide range of computer platforms, making decisions about assistive technology and compensatory strategies can often be a complex process. Assistive technology specialists (AT specialists) evaluate consumers and make specific adaptive technology recommendations to compensate for physical, sensory, learning, and other disabilities. In simple terms, a compensatory strategy is a plan to overcome the barriers that affect your independence. The strategy often includes assistive technology, but not always. Some compensatory strategies involve changing your work habits and finding new ways to accomplish a given task independently.

Assistive technology specialists select and deploy adaptive technology and customize the environment to provide a solid compensatory plan. AT specialists provide services for individuals and organizations alike. Schools, libraries, hospitals, rehabilitation agencies, and private companies often contract with AT specialists to make their facilities accessible for individuals with disabilities.

AT specialists often work under contract or as full-time employees for rehabilitation agencies, such as commissions for the blind, general rehabilitation agencies, or independent living centers, or for school systems. AT specialists offer a wide range of skills. Many concentrate on a distinct area of assistive technology and are recognized for their expertise with a specific population of consumers. Some AT specialists choose to focus on users with vision, motor, hearing, or learning disabilities, and others have broad knowledge of many disabilities and forms of assistive technology. Such differences are important to keep in mind when selecting an AT specialist. Be sure that the specialist you choose has experience working with the types of assistive technology you need.

The field of assistive technology is always looking for a few good men and women. If you're interested in becoming an AT specialist, there are many ways to gain the necessary skills. You can take classes at one of the many colleges and universities that offer courses on assistive technology and rehabilitation. Many colleges sponsor student centers and assistive technology computer labs for persons with disabilities, which can offer valuable experience to those interested in the AT field. You can also take part in certificate programs such as those offered by the California State University Center on Disabilities. You can find out more information about this program by pointing your browser to http://www.csun.edu/cod. The group Equal Access to Software and Information (EASI) offers distance learning classes that focus on adaptive technology, Web design, and other subjects at their Web site at http://www.rit.edu/~easi. The Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) in Washington, D.C., also offers an accreditation program for AT specialists and gives information about it at their Web site at http://www.resna.org.

If you're interested in becoming an AT specialist, it is strongly recommended that you have a technical background so that you can quickly learn about the many forms of computer-based assistive technology currently available. If you do not possess a technical background, there are many ways to gain one. Courses focusing on computer hardware and software are valuable foundations for the AT profession, especially if you plan to work with computers and other high-tech solutions.

The Computer Technology Industry Association's A+ certification program provides a solid grounding in basic computer hardware and software systems by showing you how to modify and upgrade computer platforms and how to work with the operating system and applications programs. You can find out more about the required coursework at http://www.comptia.com.

The duties of the AT specialist are important. The specialist is responsible for creating the tools that the individual will use to gain or regain his or her

independence. The specialist is responsible for evaluating the individual's needs, selecting the appropriate equipment, installing that equipment, and providing or arranging the training necessary for a successful outcome. The AT specialist should be persistent and curious and constantly seek the solution that awaits just over the horizon. The scientific method is a valuable partner when the specialist is working with any adaptive technology.

THE EVALUATION PROCESS

Task analysis is the first step for any adaptation. The AT specialist must first learn all the tasks that must be performed by the user before the provision of any technology is even considered. In an employment situation, the first step begins with the worker's job description, which delineates the duties and responsibilities in writing. For a student, the procedure begins with a list of tasks that are to be performed, such as taking class notes, reading textbooks, performing lab work, browsing the Web, and so forth.

The task analysis begins with a meeting of the AT specialist, the user, and any other interested parties. At the meeting, the participants begin to draw up a plan of attack. This is a time for give-and-take, with many questions to be asked and answered. The specialist must have a complete understanding of the user's abilities and aptitudes. In addition, the specialist must determine the job's duties, their priorities, and their time limits, if any. For example, the task of word processing is not difficult by itself, but the job grows more demanding when time constraints or other tasks are imposed. Such considerations should always be in the forefront when designing any adaptation.

Sample Adaptation

To illustrate, we'll consider a simplified job-site adaptation for an individual working in a customer service position. The worker is responsible for answering the telephone and providing customers with information about their accounts. The worker has low vision and uses a speech synthesizer and screen-reading software program to access the computer.

The job involves using a personal computer connected to a local area network. The network servers provide access to the company's client database. The database allows the worker to gain access to a customer's complete history, but little of that information is required in most cases. The worker interacts with customers and, using the company database, provides the information they request about their accounts. When the worker keys in a customer's account number, the database provides a screen with detailed account information, such as the customer's name, address, home phone number, work phone number, social security number, account balance, last payment, and whether the account is up-to-date. The worker must be able to quickly and accurately extract just the piece of information that is required, without having

to wade through all the other information on the screen. This makes it necessary to program the screen reader to provide specific pieces of information with a single keystroke. For example, the screen reader could read back the account balance when the worker strikes ALT+B, and could read back the amount of the last payment when the worker hits ALT+P. The TA specialist's goal is to maximize the worker's efficiency by programming the screen reader to provide just the information that is required for a specific task.

Low-Tech Solutions

With the current emphasis on computers and so-called high-technology solutions, we often forget that low tech can also empower individuals with disabilities. One of my favorite examples of this is how the Russian and American space programs each dealt with the problem of writing in zero gravity. In the weightless conditions of Earth orbit, ordinary ink-filled pens do not work. To ensure that American astronauts could write in space, the National Aeronautics and Space Administration spent millions of dollars developing a complex pen that worked in zero gravity by pumping ink to the pen's point. The Russians solved the same problem elegantly and cost-effectively by using pencils.

Confidentiality

Confidentiality is sacred whenever an AT specialist works with any consumer. To maintain high standards, the AT specialist must be constantly aware of ethical issues. The specialist must never discuss an individual's case with another person, unless specific written permission has been obtained. The AT specialist's ethics are similar to those followed by members of the medical profession and must never be violated.

TRAINING

Unfortunately, training is often the weakest link for most users of assistive technology. Although buyers may spend thousands of dollars on computers, software, and other peripherals, they almost always leave training as the last item on a shopping list—if it is even on the list. Training is an especially critical part of any adaptation because the user has to cope with adaptive and nonadaptive technology on the same system and must master more commands and peripherals than most computer users. Users therefore need to receive training on both the adaptive and nonadaptive aspects of their computer systems. We will focus on two types of training: classroom and one-on-one. Each method has strengths and weaknesses that should be considered in light of the student's expertise and the skills that need to be built. Classroom training is often most appropriate for individuals who have little experience, whereas one-on-one training can help experienced individuals reinforce old skills or build new ones.

Classroom Training

We are all familiar with classroom instruction from school or college days. The benefits of classroom training are many. In the classroom's group-training environment, students often learn as much from each other as they do from the instructor. Students can work in a hands-on environment with their actual equipment, guided all the way by instructors who are familiar with the subject. One of the most valuable benefits of classroom training is that it takes users away from their job sites and into an environment where they can learn without phones ringing or distractions from others.

If the user has little or no computer knowledge, then a full regimen of classroom training may be in order. This training should include an overview of the computer hardware, operating system, applications programs, and adaptive hardware and software.

Sometimes it is not possible for the user to be trained away from the place of employment. In those cases, the AT specialist must make recommendations to satisfy the needs of both the employer and the consumer. If a long classroom training period is not possible, then a combination of short classroom and one-on-one training might be a viable alternative.

One-on-One Training

One-on-one training can take place at the work site and can focus on specific tasks and skills the user requires. Such training has advantages and disadvantages that users should carefully consider.

The primary advantage of one-on-one training is that the instruction involves the actual equipment and procedures the worker must master for job proficiency. If the user needs to run a software package stored on the server of the network, then the actual network is available to practice on. In contrast, a classroom at an off-site training center may not permit access to the actual network where the applications reside. Such access becomes particularly valuable when a user must work with specially developed applications that are not commercially available, such as a proprietary database or some other mission-critical software package.

Following Up

It is important for the trainer or TA specialist to follow up on the user's progress after the job has been analyzed, the equipment has been installed, and the training has been completed. The purpose of a follow-up visit or visits is to determine how the adaptive equipment is working out and if there are any problems that need attention. This phase is also valuable for fine-tuning the adaptive or nonadaptive equipment to increase the user's efficiency at a given task. For example, the trainer or AT specialist can use this time to write macros or scripts to automate complex or repetitive procedures. This might also be a good time to provide some limited one-on-one training to close any gaps in the user's knowledge and to reinforce important skills.

Tutorials and Training Materials

A wealth of tutorials and training materials are on the market, and many are available in a variety of formats, such as audiocassettes, videotapes, braille, Web sites, CD-ROMs, and printed texts.

Selecting the format that is right for you is crucial. Each format has advantages, disadvantages, and adherents. You can use training materials to educate yourself before or during a training program. If you are a self-starter, you may want to utilize training materials and tutorials to learn new skills or augment existing ones. But always keep in mind that you will be best served if you carefully select the format most suitable to your learning style.

TECHNICAL SUPPORT

Technical support has become a common buzzword in the computer trade. It refers to assistance provided to the consumer after a computer system or other technological device has been procured. Technical support is a necessary form of support that often makes or breaks your ability to operate your computer and adaptive equipment successfully. No matter how much training you receive, you will always need to ask technical questions relating to your system, although you may have fewer questions as you gain confidence and experience.

There are many sources of technical support. You can obtain help from the manufacturer of your computer or adaptive equipment, outside contractors, special interest consumer groups, and from help screens found on most software applications.

Although many consumers are often unaware of the fact, they are often entitled to receive free technical support from the company that sold them their equipment. Some vendors may offer this support free of charge for a limited time period and offer extended support contracts for a nominal fee. It is unlikely that you will have a single source of technical support for your computer system and adaptive technology. Instead, you will probably have a separate source for each software program and for each hardware or adaptive device. Some vendors offer technical support only during standard hours, whereas others offer support twenty-four hours a day, seven days a week.

Warranty Cards

To ensure that you will receive technical support, you are encouraged to register your software and hardware with their manufacturers. Registering will enable you to take advantage of upgrades, maintenance agreements, and other improvements. Fill out your warranty cards and mail them to the manufacturers. Some software programs let you register online, using electronic mail or a Web site. Registration entitles you to use the vendors' technical support hotlines. Be sure to keep the hotline numbers in a safe place for ready reference.

Consumer Groups and Special Interest Groups

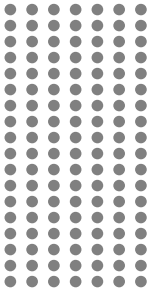
Consumer groups are widely available, cost-effective sources of technical support on a variety of subjects. People who have limited budgets but still need technical support can look to user groups or special interest groups for assistance. These groups are often sponsored by schools, companies, and other institutions. The members of special interest groups typically have a fondness for computers and are more than willing to share their knowledge with others.

The Internet offers a great deal of assistance that can take several forms. For example, you can join a mailing list to receive technical support. A mailing list is a group of users who share a common interest. Members send electronic mail messages to the list, which distributes the messages to all the other members. You can also receive help from Web sites that offer distance learning courses on a variety of subjects.

Online Help

One form of technical support is as close as your personal computer. Help screens are an integrated part of most computer operating systems, applications software, and adaptive products that enable you to receive help while running your computer. Microsoft Windows, Apple Macintosh, and the Unix environment offer built-in help systems, which we encourage you to explore using your adaptive equipment. Help screens can provide invaluable information when you need help while working on a task.

Assistive technology specialists blaze new trails toward greater accessibility and build bridges toward increased confidence and independence, but they cannot work alone. Strong training for users is just as necessary as selecting appropriate assistive technology. Users also need access to technical support to solve everyday technical problems. They can find additional support through good relationships with others who also utilize assistive technology and by consulting consumer and user groups. Good old-fashioned elbow grease goes a long way toward assuring success. If you are willing to expend the effort, you will be richly rewarded.



9

Accessing the Internet and Intranets

We have established that personal computers equipped with adaptive technology provide a launching pad of independence for persons with disabilities in the workplace, classroom, library, and home. This chapter shows you how to magnify the power of your computer by connecting to the Internet, an information backbone that links millions of computers around the globe and hosts a wealth of information on a virtually limitless number of topics. Intranets, which are private Internets, are also described, as they pertain to many organizations. The chapter also discusses Internet applications, such as the World Wide Web, electronic mail, newsgroups, online chat, mailing lists, and the importance of accessibility for those applications.

The Internet, to say the least, is a vast subject, and to say so has almost become a cliché. This chapter is intended as an overview of the Internet and does not attempt to cover every related topic in detail. Nonetheless, we hope it will serve as a representative summary of what the Internet and intranets have to offer and of the major accessibility issues related to Internet and intranet use.

WHY MAKE THE INTERNET AND INTRANETS ACCESSIBLE?

The Internet and intranets should be made accessible because creating an accessible environment is simply the right thing to do. Accessible information technology both empowers individuals with long-term disabilities to pursue employment and other goals and assists people dealing with more temporary conditions to remain employed and involved. It goes without saying that individuals unable to access information cannot fully participate in society, and inaccessible systems lead directly to lost opportunities and wasted potential.

Moreover, the law requires information technology to be made accessible. Public sector entities are bound by legislation to provide accessible working

environments and to procure information technology accessible for persons with disabilities. With all this in mind, let's take a closer look at the Internet, intranets, and some related accessibility issues.

DEFINITIONS

Before we proceed any further, let's define some basic terms. The Internet backbone is the road on which information travels and is the foundation of a hierarchy. Many applications reside atop this foundation and serve a wide variety of information to consumers. These applications include, but are not limited to, electronic mail, newsgroups, online chat rooms, instant messaging, mailing lists, and the World Wide Web.

The Internet

The Internet is an information network that spans the globe, permitting all connected to share information regardless of national borders. The Internet is, in a very real way, the message center for the global village. The Internet is responsible for an information revolution that has changed the way we interact with one another and has altered business, education, government, and even our leisure activities, arguably for the better. The Internet is a vast network that links millions of computers, empowering individuals to send, receive, and share information across town or the planet. In truth, the Internet is really a network of networks, all linked together for the sharing of information.

Intranets

Whereas the Internet is a public gathering place, intranets are private clubs, limited to the members of an organization. This limitation is a by-product of network security, which allows the system administrator to assign access rights and privileges to users or groups of users. Intranets consist of groups of computers linked together with a network operating system controlling the network as a whole. An intranet can be as small as two computers in the same room or as large as hundreds of computers separated by thousands of miles. Intranets offer groups the ability to share tremendous resources, including electronic mail, centralized databases and files, fax and print services, browsing, as well as access to the Internet. In fact, intranets support many of the same applications found on the broader Internet plus applications required by the enterprise.

Intranets are also referred to as local area networks or wide area networks, depending on their size and scope. It is common for most organizations to possess an intranet that contains databases including customer, financial, marketing, technical, and other information—the knowledge required to run the organization. Most colleges and universities have large intranets that can be

accessed by students and faculty. Home users are establishing intranets to share resources like printers and Internet access.

The Internet and intranets can be adapted for persons with disabilities with a large variety of adaptive equipment, including speech synthesizers, magnification software, braille printers, voice-recognition systems, adapted keyboards, and alternative input devices, to name a few.

HARDWARE REQUIREMENTS

What do you need to log on to the Internet or an intranet? In both cases, you need a computer platform of some kind and a network interface. The computer platform can be a desktop, notebook, or palmtop, or even a cell phone or other handheld device. The network interface that connects the computer platform to the Internet or intranet can be a network card, a modem, or a wireless connection. The interface allows the various computers to communicate with the network and provides access to all the network's resources.

ADAPTIVE TECHNOLOGY AND NETWORKS

The same assistive technology utilized to adapt stand-alone personal computers can also be used to provide equal access to networks like the Internet and intranets. As is the case with a stand-alone computer, any adaptive hardware is installed in the traditional manner, either plugged into the motherboard inside the unit or attached to an interface port as an external peripheral. Software is slightly different in that it may be installed on the computer itself or on the network server. Software installed on the network server is available to any computer belonging to the network. As we saw in chapters 3, 4, 5, 6, and 7, persons with disabilities can employ a wide variety of adaptive equipment to access computers, the Internet, and intranets.

THE WORLD WIDE WEB

The World Wide Web is a service that sits on top of the Internet backbone and allows the sharing of diverse information consisting of text, graphics, sound, and video. If you belong to an intranet, you may have access to the Web, provided your system administrator has given you appropriate access privileges. The Web is growing by leaps and bounds and shows little sign of slowing.

Web Sites

Web sites host electronic documents that often contain text, sound, and graphics. Web sites are capable of assuming many different forms, depending

on their function. You can access Web sites using a wide variety of hardware platforms. The most common method for accessing the Web is to use a desktop computer and a browser software program. You can also use portable devices such as notebooks, palmtops, and cellular telephones to access the Web.

Web sites offer a wide selection of content and services. You can use the Web to shop for merchandise, access electronic libraries, search for individuals, converse over the telephone, download software, take a college class, read the newspaper, search an encyclopedia, book hotel rooms and airlines tickets, participate in online chats, watch television programming, download and listen to music, and much more. The Web is a vast environment, filled with nearly limitless potential, and is expanding in scope every day.

WEB BROWSERS

Web browsers are software programs that allow you to point to Web sites and access their contents. When you type the address of a Web site into your browser, you are whisked to the target site. You are then free to interact with the site and access its contents. Browsers do more than just display text from Web sites, and many have both audio and video playback capability. Browsers are not limited to use on desktop computers and are available on a wide variety of Web-ready devices, such as some cellular phones and palmtop computers. Some browsers employ or support adaptive technologies, such as speech output and screen magnification, in conjunction with the standard Graphical User Interface.

What type of browser is best suited for your application? You can use a standard browser with your preferred adaptive equipment to surf the Web. You can also choose among browsers with built-in adaptive technology, depending on your specific requirements.

Internet Explorer

The Windows operating system comes equipped with Internet Explorer, a browser that lets you access information across the Internet or on your desktop. The browser is a product of Microsoft Corporation that has been modified to support adaptive technology. Internet Explorer contains Active Accessibility, a mechanism that allows the browser to communicate with adaptive equipment for persons with disabilities. Internet Explorer includes numerous keyboard shortcuts that allow you to open Web sites, navigate from link to link, and save and print information from Web sites without having to use the mouse. You can download Internet Explorer from http://www.microsoft.com.

Home Page Reader

International Business Machines (IBM) has created a talking browser to assist persons with vision impairments and other disabilities. Home Page Reader

consists of the Microsoft Internet Explorer browser and the IBM ViaVoice OutLoud text-to-speech engine. The talking browser allows persons with disabilities to browse Web sites using speech synthesis. Home Page Reader uses an unlimited-vocabulary speech engine to read Web sites aloud and requires a computer equipped with a sound card and speakers. For more information about Home Page Reader, point your browser to http://www.ibm.com/able.

How Browsers Work

Browsers are essentially document readers that take in files from an Internet or local Web site and display them as text, audio, and video on your computer display. Browsers understand a common language that allows developers to create Web sites that everyone can read.

HTML

The most common language that browsers understand is *HTML*, which stands for *HyperText Markup Language.* Although a complete description of HTML and other markup languages is beyond the scope of this book, you should at least be aware that HTML is the language of the World Wide Web and that it is the basic dialect that browsers comprehend. When you point your browser to a given Web site, the browser loads the HTML from the site and displays or voices the site according to the internal HTML formatting codes. Obviously, how a Web site is internally coded can greatly increase or decrease its overall accessibility.

URLs

Navigating the Web is fairly straightforward: You start your browser and type in the address of any desired Web site. If you enter the address of the site correctly, the site will appear on your screen or begin speaking, if you're using a talking browser.

The technical term for the address of a Web site is *URL*, which stands for *Uniform Resource Locator.* The URL tells you something about the site even before you visit it. The extension .com tells you that the site is a commercial one, whereas the suffix .edu tells you that the site is owned by an educational institution and .org tells you that the site is controlled by a nonprofit organization. These are the three most common suffixes for Web sites in place today, but more are being added.

Links

The dictionary defines the word *link* as a device for holding two or more individual objects together. In terms of the World Wide Web, that definition holds true. An important feature of Web sites is that they contain links. A link is a shortcut that lets you travel within a site or from one site to another. A Web site often contains numerous links that can take you deeper into the site itself or to other sites virtually instantly. You can activate a link by moving the

mouse to it and clicking. If you are unable to use the mouse, you can activate the link by moving to it with the TAB key and then using the ENTER key to select it.

SEARCH ENGINES

The World Wide Web is a vast space, which sometimes makes it difficult to locate specific information. Search engines let you find specific Web sites that match your search criteria. If you're looking for information on a given topic, a search engine can help you find lists of Web sites that focus on that topic. There are numerous search engines on the Internet, sites that allow you to hunt for text, audio, video, software, reference works, individuals, and more. Some commonly used search engines can be found at the following URLs:

http://www.yahoo.com
http://www.hotbot.com
http://www.lycos.com
http://www.webcrawler.com
http://www.google.com

WEB CONTENT ACCESSIBILITY GUIDELINES

It is an understatement to say that the design of a Web site directly affects its accessibility. The first step in designing a site is to become familiar with the guidelines that support Web accessibility. The practices for accessible Web design are well documented, and it is always much easier to create a Web site that is accessible from the start than to try to force accessibility after the site has been constructed. The World Wide Web Consortium's Web Accessibility Initiative has developed guidelines that apply to both the Internet and intranets. Those guidelines can be found at http://www.w3.org/wai.

Two other sources of information about accessible information technology are the CPB/WGBH National Center for Accessible Media (NCAM) and the Trace Research & Development Center at the University of Wisconsin–Madison. The National Center for Accessible Media is a research and development facility that works to make media accessible to underserved populations such as disabled persons, minority-language users, and people with low literacy skills. You can visit their Web site at http://ncam.wgbh.org. The Trace Center works to encourage companies to make their standard products more accessible and usable by people with disabilities of all types. Although the Trace Center is primarily involved in research and development, information that they have gathered for their own use and information pertaining to their research results are made available on their Web site at http://trace.wisc.edu.

Web Site Validation

Web site validators let you verify that a particular Web site is accessible, or not accessible for that matter. Validators are powerful tools for people who design Web sites, for consumers who wish to verify accessibility, and for anyone who needs to produce a quantitative evaluation of a Web site. As a consumer, you can use a Web site validator to identify sites that do not conform to accessibility standards and report them to the Webmasters who created them. Such reports are often powerful tools that can influence institutions to create Web sites that empower all individuals.

If you're a Web developer, you can use a validator to check your work. Once you have become familiar with the World Wide Web Consortium's accessibility guidelines, you should test your site for accessibility using a Web site validation program. Such a program sifts through the target site and provides a list of recommendations for fixing any accessibility problems encountered. Although validation software provides a fast and efficient way to evaluate a Web site, it is not infallible. Thus, to ensure accessibility, it is important to have actual users test your site.

Bobby

Bobby, a Web site validation software program that resides on the Web, is a quick and practical tool for determining if your site is accessible for persons with disabilities. The Bobby validators can also test Web sites for browser compatibility. Bobby tests any site against the World Wide Web Consortium's Web content accessibility guidelines and provides a report that reveals any accessibility problems it encounters.

Bobby can test any site on the Web. If you encounter a site that fails the Bobby validation test, you are encouraged to send the report to the Webmaster as notification that the site may not be accessible for persons with disabilities. For more information about Bobby, or to test a site on the Web, point your browser to http://www.cast.org/bobby.

SHARING RESOURCES

We have demonstrated that the Internet and intranets allow organizations to share resources and information. Such sharing occurs not only through the World Wide Web, but also through other distributed applications, such as electronic mail, online chat, newsgroups, instant messaging, and mailing lists.

Electronic Mail

E-mail is one of the most productive services offered by the Internet and intranets. If you belong to an intranet, you can send electronic mail to any user belonging to the system. You can also send e-mail to other users on dif-

ferent systems across the Internet. Unlike paper-based mail, electronic mail arrives virtually instantly, regardless of the distances involved. Electronic mail can also be used to send files and documents as attachments to e-mail messages.

Electronic mail is relatively easy to operate. The first step is to turn on your computer and start your e-mail software. The software will connect you to the Internet and open your e-mail box. If you're on an intranet, first log on to the network, then start your e-mail program.

Click on Compose a New Message and provide the address for the destination of the message. Then compose the message using the built-in editor provided by your e-mail program. The editor functions like a standard word-processing program. When the message is complete, you can click the mouse or punch the keyboard command to send the message.

The benefit of electronic mail is its high degree of accessibility. Electronic mail messages can be read easily by many forms of adaptive equipment, providing equal access to persons with a wide range of disabilities. For individuals who use adaptive equipment, electronic mail is a convenient method for sending text, sound, or graphics messages without having to journey to the post office to mail a letter. Electronic mail respects your privacy and frees you from having to rely on others to read your confidential correspondence.

Online Chat

The Internet and intranets permit human discourse in almost limitless proportions. Online chat is a powerful feature of the Internet and intranets that brings people together and permits them to share ideas and information across the office or around the world. Chat allows users to communicate with one another in real time by typing messages back and forth. These "conversations" can be private, or they can be conducted in a group setting, with each participant able to communicate with all the others. Online chat permits individuals to communicate regardless of the physical space or barriers that may separate them.

Newsgroups

Newsgroups are public bulletin boards that provide information on a wide variety of topics. Newsgroups allow messages to be grouped together into threads or categories, which enables you to follow a conversation from beginning to end. You can also search for specific information within a newsgroup. Newsgroups let you post and read messages in a forum where all participants interact as equals. Newsgroups are indexed by subject matter, and there are tens of thousands of newsgroups spanning the Internet. For persons with disabilities, newsgroups offer increased independence because they allow individuals to share knowledge and information on virtually any topic without restriction.

Instant Messaging

Instant messaging lets users send messages back and forth to one another across the Internet or an intranet. This technology has far-reaching implications

for persons with disabilities. It is particularly significant for persons who are deaf or hard of hearing and rely on text telephones (TTY) to communicate with others because, although both instant messaging and TTY are text-based systems, instant messaging is more widely available. You can use instant messaging on a desktop, notebook, or handheld computer.

Sending instant messages is simple. When you install the instant messenger software on your computer, you receive a user name and password. Once you have a user name, you can start sending and receiving messages. You merely compose and edit a message, provide the address of the recipient, click the Send button, and dispatch the message across the Internet to the destination user. The destination user then reads the message, enters a reply, clicks the Send button, and the response appears on your screen. It's that simple, and it greatly empowers persons with disabilities.

Mailing Lists

Internet mailing lists are powerful tools that let you communicate with a large or small group in a totally interactive format. The list is created by the list manager, who can grant or deny access to the list. You use your electronic mail program to send a message to the list in much the same way you would send e-mail to a friend. However, instead of typing in the e-mail address of your friend, you enter the address of the mailing list. When the list receives your message, it sends it to all the members of the list, including yourself. When others send messages to the list, those messages are sent to everyone on the list as well.

The Internet and intranets offer the potential for equal access to resources and information across an organization and around the globe. The Internet and intranets permit information to be shared by all consumers, disabled and nondisabled alike, according to each individual's wants and needs. The Internet is rapidly expanding across the planet, linking millions of individuals together. For persons with disabilities, the Internet and intranets create an environment in which all can interact as equals on a vast and level playing field.

10

Funding Adaptive Technology

Because adaptive devices can be costly and may thus be beyond the financial reach of some potential users, the acquisition of adaptive technology can sometimes lead to anxiety and frustration. Fortunately, numerous funding options are available from a wide variety of sources. A complete treatment of funding would fill a book by itself, but we hope this chapter will serve as a helpful overview of some of the major funding sources.

The Americans with Disabilities Act (ADA) proclaims important considerations about the provision of adaptive or assistive technology. Although the ADA is not a funding source, it issues a mandate to others to supply adaptive technologies by requiring that private and government employers provide "reasonable accommodations" to achieve equal access and compliance with the law. In many cases, the definition of such reasonable accommodations involves the provision of adaptive or assistive devices. In simple terms, the ADA states that an employer must provide reasonable accommodation to a new or existing disabled worker. This does not always translate into technology, but the provision of assistive technology is often the result.

However, technology does not have to be provided if its provision would impose an "undue burden" or "undue hardship" upon the provider. When a burden or hardship is not the case—which is typical—technology may be indicated.

This chapter presents common-sense, cost-saving suggestions and describes how to use personal, private-sector, and government-sector funding resources. Examples of funding providers are given for their model status. Consumers are encouraged to contact the various funding sources directly or to locate the equivalent of that funding source in their local area. Appendixes H and I list many organizations that can help persons with disabilities locate funding and other resources.

COST-SAVING IDEAS

Prior to purchasing adaptive technology, a user should do as much initial research as possible into both the companies and the equipment. A solid knowledge of the technology available will empower the user to choose the least-expensive device for the job. For example, given that software is often less expensive than hardware, a user should purchase adaptive software rather than hardware whenever possible. An example of this would be to choose a less-expensive software-based screen magnification program instead of a more expensive hardware-based magnification processor.

It is often less expensive to purchase a new or used computer with sufficient processor power, memory, and a sound card, rather than spending hundreds of dollars upgrading an aging PC.

Shareware, Freeware, and Demoware

It is also encouraged to use shareware, freeware, and demoware whenever possible to further cut costs. Shareware is available for downloading, which lets you try before you buy, and freeware is software offered without charge. Demoware also lets you try out software before you buy. Many commercially available programs have a demoware version, which is a fully functional copy, except that the program expires after a preset time interval. Using a demo can be an excellent way to see if a program meets your needs, and many vendors provide a demo version for you to test-drive before making a final purchase. Demoware can be a cost-effective way to try out a screen reader, magnification program, or other piece of adaptive software to see if it is really right for you. There are numerous sites on the Internet that offer shareware and freeware software. You can use any search engine to search for the terms *shareware* or *freeware* to be led to such sites. Among the more popular sites are http://www.shareware.com and http://www.download.com.

Other Ways to Cut Costs

As emphasized earlier, it is important to get as much hands-on experience with as many products as possible to judge the basic capabilities of each device. You should be familiar with more than just one device that seems to fit your individual needs to determine if a less-expensive device will suffice.

Another way to cut costs is to purchase less equipment at the outset. For example, a person who wants to purchase a computer system equipped with a speech synthesizer, braille printer, magnification system, optical scanner, modem, and laser printer could spend as much as $10,000, depending on the exact system configuration. But if the purchase is scaled back to a more affordable level, the person may be able to obtain a starter system—say, the computer with a speech synthesizer or braille printer—and then build up to the dream system.

Buyers should always be on the lookout for special deals, such as sales and special promotions. The time of year also can affect the price. For example, prices are usually lower before or just after the holiday season. And sales are not confined to the end-of-the-year holidays. Keep this in mind, as Father's or Mother's Day may spur vendors to offer sales on select systems. Purchasing discontinued products, such as last year's models, saves even more money.

Demonstration equipment is frequently less expensive than new devices, and it even may come with a full manufacturer's warranty. Although many buyers reject the notion out of hand, previously owned equipment can result in dramatic savings—as long as the equipment is purchased from a reputable private source or company. And just to be safe, someone who is not fully familiar with computer systems may find it wise to have a reliable, knowledgeable third party inspect the equipment first. Buyers can often find previously owned equipment through the local newspaper, and there are numerous buying guides offering used equipment. In addition, many brokers offer previously owned equipment at substantial cost savings.

PERSONAL SOURCES OF FUNDS

Individuals will have their own personal financial resources, and, obviously, such assets will vary greatly from one person to another. If the buyer has significant financial resources, it is a simple matter merely to write a check for any required adaptive technology. But since most people do not fit in this enviable category, other methods must be explored in earnest. Many purchasers of adaptive equipment have access to various sources of personal credit, including friends and family members who may be in a position to grant a loan or cash advance. Although this may not be an option for most consumers, it deserves mentioning as part of any funding plan.

Family and Friends

Family members or even friends may be sought out to provide low-interest loans. The loan might be worked out so that the borrower pays a small amount of interest with a long-term payment plan. If the borrower is working, such an arrangement often can be very successful. An individual who is not working full-time or who is on social security or some other form of assistance may explore the possibility of an outright grant of funds from a family member, although such an approach is not realistic for every individual.

LENDING INSTITUTIONS AND CREDIT UNIONS

Lending institutions such as banks, savings and loan institutions, credit unions, and finance companies are logical places to seek capital to finance adaptive technology. These lending institutions offer credit cards, cash loans, and other revolving loan programs.

Borrowers may have to prove employment or provide collateral to the lending institution. Consumers should consider that if they purchase adaptive equipment using a loan, they will have to pay back the loan along with any interest charges. Interest rates vary, and the final amount paid will depend on the amount borrowed, the interest rate, and the time taken to pay back the loan.

Would-be purchasers of technology sometimes encounter problems getting loans or opening charge accounts because of their credit histories, which may be spotty due to unemployment and the like. Before applying for credit, consumers should check their credit reports and work with the credit-reporting companies to correct any incorrect information. If that cannot be done, an individual can request a meeting with loan officers to explain any negative information. It is also vital to develop a good credit history by making regular payments on any existing loans or credit card charges to demonstrate to loan officers that a loan for adaptive equipment will be repaid.

Credit Cards

Credit cards can also be used to purchase both adaptive and nonadaptive technology. The consumer charges the amount of the purchase to the credit card, and interest is applied to the balance each month. As with bank loans, credit card companies will require that the applicant be employed.

The faster the consumer pays back the amount of the purchase, the lower the total amount of interest charges will be. Credit cards do not all charge the same rate of interest, so it is wise to shop around for the card with the most affordable interest rate. Some credit cards also have users' fees that consumers should be aware of when selecting which card to use.

Established vendors accept most of the major credit cards, including MasterCard, Visa, American Express, and Discover Card, but not all cards are accepted at all vendors. Consult with the individual vendor before planning to make a purchase by credit card.

If a vendor does not accept credit card purchases, the consumer may be able to make the purchase by using a cash advance from the credit card. The amount of cash advance the credit card allows depends on the user's line of credit or current balance on the account. However, the buyer should be aware that cash advances may entail higher interest rates and service charges with some cards.

Of course, consumers also may use a combination of cash and credit to purchase the desired equipment. In such cases, the consumer should assemble as much ready cash as possible and supplement it with funding from a credit card or other source.

GOVERNMENT-SPONSORED SOURCES OF FUNDS

Federal and state governments have long been sources of funding for adaptive technology. They are always good places to seek funding, especially if personal

resources are minimal or if the individual does not have a great deal of credit or a good credit history. The federal government sponsors numerous grant programs that offer different funding options to individuals. Some programs offer cash at low interest rates, and others offer actual equipment. Some grants are available only to low-income individuals, but others are not means-tested at all. Following are several government-sector funding sources.

The Federal Vocational Rehabilitation Program

Adaptive equipment needed for obtaining a job or attending school is often covered by the federally funded Vocational Rehabilitation Program. Local rehabilitation agencies or state rehabilitation commissions can provide further information. For example, a commission for the blind, a commission for the deaf, or a rehabilitation service agency are good places to find these programs. An individual can take advantage of these services by obtaining a letter of referral from a physician to prove the existence of a disability. Many such agencies can provide adaptive equipment and other services, but the specific services offered vary greatly from state to state. Examples of other services are funding for school or college, mobility and orientation, independent travel, and assistance around the home for daily living. An individual's personal income or finances are not a factor when applying for adaptive technology or rehabilitation engineering services to reach a vocational goal.

Medicaid

The federally funded Medicaid program offers opportunities for obtaining technology to persons with disabilities who are eligible for Medicaid services. If a physician deems that adaptive equipment is medically necessary, Medicaid may be required to provide adaptive technology to the individual. Under the Medicaid program, adaptive technology often can be classified as durable medical equipment. That term can encompass a wide variety of adaptive technology, including speech-synthesis systems for persons who are blind and communications devices for persons with speech disabilities. A great deal of persistence may be necessary, but many devices have been obtained through this resource. If a person can meet the definition of medical necessity, then adaptive equipment can be provided by Medicaid.

Special Education

Implemented in each state under the provisions of the federal Individuals with Disabilities Education Act (IDEA), the special education system is an important source for technology. Every student who qualifies for special education services by reason of a disability will have the nature and extent of those services determined by an Individualized Education Progam (IEP). If technology represents the best means for achieving or for setting realistic educational goals, its inclusion among IEP services is appropriate—and perhaps even

mandatory. That is, if a student needs adaptive technology to achieve his or her goals, then the school must provide the technology. That technology must be provided for both school and home use. Some school districts may resist supplying adaptive technology by denying there is a substantive need or by questioning the educational appropriateness of the equipment when, in reality, their resistance may be due to budgetary concerns. School districts that claim that technology is never appropriate for inclusion in special educational services are clearly misinformed about the requirements of the federal law. (See appendix J for a fact sheet summarizing key provisions of the IDEA regulations regarding assistive technology. For a broader view of disability rights laws, see appendix K.)

The Social Security Administration's PASS Program

The Social Security Administration is a source of funding for adaptive technology for persons with disabilities. The Plan for Achieving Self-Support (PASS) is available for recipients of supplemental security income; thus, it is aimed at low-income individuals. With its emphasis on self-support, the PASS program also can be used to purchase adaptive equipment or to start a small business. This plan is not widely known to the general public and may not be known to every Social Security representative. Individuals may have to aggressively seek out Social Security claims representatives who can guide them through the PASS process.

PASS allows users of adaptive equipment to save for their purchases by obtaining funds from Social Security. Individuals can save this money in a bank or other kind of interest-bearing account and not have it count against their current Social Security income. In other words, the money saved through PASS is invisible and will not result in cuts to Supplemental Security Income or Social Security disability insurance benefits. The plan can last for several years, allowing individuals to save thousands of dollars to put toward the purchase of expensive adaptive systems.

To apply to the program, an individual must write a detailed proposal outlining how much money must be saved, exactly what equipment will be purchased, and how the equipment will allow the person to become self-supporting or gainfully employed. If the individual can persuade the Social Security Administration that a particular piece of adaptive equipment will lead to self-sufficiency, there is a good chance the plan will be approved.

When the plan comes to completion, the consumer is free to expend the saved funds toward the purchase of appropriate adaptive equipment. If the plan is violated, the Social Security Administration can levy an overpayment against the consumer for all monies received. For more information about the PASS program, point your Web browser to the Social Security Web site at http://www.ssa.gov. You can also contact the Social Security Administration by phone at (800) 772-1213 (voice) or (800) 325-0775 (TTY).

The Assistive Technology Act of 1998

The Assistive Technology Act is a piece of federal legislation that is designed to provide funding for states to address the adaptive technology needs of persons with disabilities and for other purposes related to the provision of adaptive technology. The law provides grant money to states to streamline and simplify the provision of adaptive technology to individuals, and to help state and local agencies cooperate in the provision of adaptive technology services. The act also provides mechanisms for the demonstration of adaptive technologies to consumers by trained technicians and for the distribution of information about existing and emerging technologies and services. According to the act, adaptive or assistive technology is defined as any device or system that is used to maintain or increase the independence of a person with a disability. To locate the Tech Act Project in your state, consult appendix L. For more information about the Assistive Technology Act and for updates to appendix L, you can point your browser at the RESNA Web site at http://www.resna.org/ata. You can also contact RESNA by phone at (703) 524-6686 (voice), (703) 524-6639 (TTY), or (703) 524-6630 (fax).

Veterans Benefits

For veterans of the United States armed services, military insurance policies and the Department of Veterans Affairs often can provide adaptive equipment and other services. The department will supply training and other equipment as long as the disability is service-connected. If the disability is not service-connected, the department will treat individuals at its facilities on a space-available basis and on a sliding fee scale. The term *service-connected* is defined as "any disease or condition that can be directly traced to military service." For further information, readers can contact the local office of the Department of Veterans Affairs or the central office in Washington. For more information, you can point your browser at http://www.va.gov or call (202) 273-5400.

PRIVATE-SECTOR SOURCES OF FUNDS

The private sector offers many programs for consumers interested in financing adaptive technology. Such programs may provide helpful guidance, actual equipment, or low-interest loans to individuals.

Some of the programs are means-tested; that is, individuals must submit to a personal income review to determine if they qualify for funding. Other programs are not means-tested, and almost anyone can qualify for their funding. The following are several examples of private-sector sources of funds.

The Easter Seals Society

The Easter Seals Society is a national organization that sponsors various regional technology assistance centers. Each center is independent, and services

vary from state to state. Some states offer actual adaptive technology, whereas others offer engineering and training services only. Readers are advised to contact their local Easter Seals Society for specific information or to consult the national Web site at http://www.easterseals.org. You can also contact Easter Seals' national office by phone at (312) 726-6200 (voice), (312) 726-4258 (TTY), (312) 726-1494 (fax), or (800) 221-6827 (toll-free).

The International Association of Lions Clubs

The International Association of Lions Clubs is a service organization that can be found in most states and in many countries around the world. Local Lions Clubs frequently provide adaptive equipment to persons with disabilities. Although most of their donations have been focused on persons with vision impairments, the Lions Clubs also assist persons with other disabilities. Because policies differ from club to club, check with your local organization, visit the Lions International Web site at http://www.lions.org, or phone the organization's headquarters at (630) 571-5466.

Independent Living Centers

Independent Living Centers (ILCs) can also be a source for adaptive equipment and rehabilitation engineering services. You can locate the ILC in your area by contacting your local rehabilitation agency or commission.

A variety of funding sources are available for adaptive technology within the public and private sectors. You will find that researching your funding options will increase your chances of success. Consider committing your assistive technology strategies and options to writing. This will help you clarify your ideas and will prove invaluable when you are dealing with a funding source or other assistive technology provider. Individuals who complete the necessary homework are likely to increase their chances of success.

APPENDIX A

Microsoft Windows 98 Keyboard Guide

This document presents keyboard shortcuts and navigation for Microsoft® Windows® 98. For general Windows concepts and descriptions of the interface, consult Help or the documentation supplied with your operating system. Developers also may find useful information about keyboard shortcuts and navigation in *The Windows Interface Guidelines for Software Design* by Microsoft Press.

The conventions described in this document are supported by most applications designed for Windows 98. However, conventions do vary slightly between different applications and different contexts. Many Microsoft products have specific shortcut keys to make keyboard access convenient. Look for the phrases "keyboard shortcuts" or "keystroke shortcuts" in the application's Help index. Also, while we recommend that applications generate a warning sound when unsupported keystrokes are used, many do not.

Windows 98 provides Accessibility Options that can make typing easier for people who have difficulty using the keyboard or pressing more than one key at a time. For details, consult Help or the document "Customizing Windows 98 for People With Disabilities" available at http://www.microsoft.com/enable.

This version of the Windows 98 Keyboard Guide covers these topics:

- *Shortcut keys throughout Windows*

  For the purposes of this document, "shortcut keys" are the key combinations provided in Windows 98 or the application that perform specific actions, such as pressing buttons, opening applications, choosing menu items, moving the focus, etc. They can be referred to as "keyboard shortcuts," "hot keys," "keystroke shortcuts," "key combinations" or just "keys" in other documentation and Help.

- *Creating custom shortcut keys*

  "Custom shortcut keys" are key combinations you assign to shortcuts on your Windows taskbar and Start menu. They are also referred to as "hot keys" in other documentation and Help. Shortcuts themselves are files in the Desktop and Start folders and their icons on the desktop and taskbar. Custom shortcut keys can be used to launch applications from anywhere within Windows, without going through the taskbar or the Start menu.

1. SHORTCUT KEYS

1.1 General Windows Keys

The following keys work throughout Microsoft Windows.

F1
: Displays Help information for the active object or the window as a whole.

WINDOWS logo key or CTRL+ESC
: Opens the Start menu located on the taskbar.

CTRL+ALT+DELETE
: In Microsoft Windows, opens the Close Program dialog box, which contains a list box of applications to be closed and the command buttons End Task, Shut Down, and Cancel.

  In Microsoft Windows NT, opens the Windows NT Security dialog box, with the following options: Lock Workstation, Logoff, Shut Down, Change Password, Task Manager, and Cancel. If you are not logged on, opens the logon dialog box.

DELETE
: Deletes the selected item(s). If the items are files, moves them to the Recycle Bin.

SHIFT+DELETE
: Delete the selected item(s). If the items are files, destroys them immediately without moving them to the Recycle Bin.

CTRL+N
: Opens the New dialog box. (You also can choose the New command from the File menu.)

CTRL+O
: Opens the Open dialog box. (You also can choose the Open command from the File menu.)

CTRL+P
: Opens the Print dialog box. (You also can choose the Print command from the File menu.)

CTRL+S
: Opens the Save dialog box. (You also can choose the Save command from the File menu.)

CTRL+X
: Cuts the selected item(s) to the Clipboard. (You also can choose the Cut command from the Edit menu.)

CTRL+INSERT or CTRL+C
: Copies the selected item(s) to the Clipboard. (You also can choose the Copy command from the Edit menu.)

SHIFT+INSERT or CTRL+V
: Pastes the copied items(s) from the Clipboard. (You also can choose the Paste command from the Edit menu.)

ALT+BACKSPACE or CTRL+Z
: Undoes the last action. Note that not all actions, such as shutting down, can be undone. (You also can choose the Undo command from the Edit menu.)

ALT+SHIFT+BACKSPACE
: Redoes the previously undone action. (You also can choose the Redo command from the Edit menu.)

Windows logo key+M
: Minimizes all open windows. The keyboard focus goes to the least recently selected icon on the desktop. Add SHIFT to expand previously opened windows and return focus to the most recently used application.

Windows logo key+E
: Opens the Windows Explorer. (You also can choose the Windows Explorer command from the Program item in the Start menu.)

Windows logo key+F
: Opens the Find All Files dialog box. (You also can choose the Files Or Folders command from the Find item in the Start menu.)

Windows logo key+R
: Opens the Run dialog box. (You also can choose the Run command in the Start menu.)

Windows logo key+BREAK
: Opens the System Properties dialog box. (You also can choose the Systems item in Control Panel.)

Windows logo key+CTRL+F
: Opens the Find Computer dialog box. (You also can choose the Computer command from the Find item in the Start menu.)

Windows logo key+number
: Reserved for use by computer manufacturers.

SHIFT+F10 or Application key
(also the right mouse click)
: Opens the shortcut menu for the active item. This can be selected text, a toolbar button, a taskbar button, or other item.

SHIFT
: Press down and hold the SHIFT key while you insert a CD-ROM to bypass the AutoPlay feature. Hold down the SHIFT key while Microsoft Word is loading to suppress the AutoExec macro.

1.2 Selecting Items by Access Key or by Name

Most dialog box controls, menu titles, and menu items have underlined access keys. You can press ALT along with the access key to activate the control or menu anywhere within the active window. If an item doesn't have an underlined character, its access key is the first character in its name.

Access keys can sometimes be used without the ALT key for choosing controls or menu items. Use access keys without ALT to select items from an open menu. You can choose a dialog box control by typing its access key alone, except when the focus is on an edit box, a list box, or another control that expects typed characters. Therefore, using the ALT is a more reliable method.

Choosing controls in this way normally activates them, except when more than one item has the same access key. In that case, it will navigate to the next item assigned that key, but will not activate it. You must then press ENTER to activate it.

Within a list box, list view, tree view, or on the desktop, you can select an item by typing the first one or more characters in its name. Pressing the same character again will select the next item beginning with that character.

1.3 Desktop and Taskbar Navigation Keys

Depending on your setup, various items appear on your desktop when you start Microsoft Windows. For example, the My Computer icon provides access to a list of the drives and files on your computer. You can use the arrow keys to move from one icon to another, or you can select items by typing their names.

By default, the Start button and the taskbar are located at the bottom of your screen when you start Windows and are always visible when Windows is running. When you start a program or open a window, a button representing that program or window is displayed on the taskbar. When you close a window or quit a program, its button disappears from the taskbar. Status indicator icons, such as the time, are displayed at the rightmost end of the taskbar.

Windows logo key+M
: Minimizes all open windows. The keyboard focus goes to the most recently selected icon on the desktop. Add SHIFT to expand previously opened windows and return focus to the most recently used application.

ARROW KEY
: Selects the adjacent icon or taskbar button in the direction of the arrow.

Any printing character
: Selects the next icon with the specified name or initial letter.

Windows logo key or CTRL+ESC
: Opens the Start menu from the taskbar. When you use CTRL+ESC, you can press ESC again to place the keyboard focus on the Start button. When you use the Windows logo key, pressing ESC again closes the Start menu.

TAB
: Moves between the last selected icon on the desktop, the Start button on the taskbar, and the taskbar as a whole. There is no visual indication of the focus on the taskbar, but you can use the arrow keys to move between the taskbar buttons. You also can use SHIFT+F10 to bring up the shortcut menu for the taskbar.

Windows logo key+TAB
: Cycles through the taskbar buttons.

F2
: Rename a selected item. A bold rectangle appears around the title creating a text box. Type the new name and press ENTER. Press ESC to cancel. Some icons on the desktop cannot be renamed.

F3
: Opens the Find All Files dialog box.

It is often easier to use the Windows Explorer to manipulate objects that are on the desktop and in My Computer. The desktop is treated as the highest level directory on your computer in Windows Explorer, above the My Computer icon. Using the real desktop can be inconvenient because you have to minimize all other windows to be able to see it, but you can easily switch between the desktop group displayed in Windows Explorer and any other application windows with the following window manipulation keys.

Similarly, you don't have to use the taskbar except for the Start menu, which you always can open by pressing CTRL+ESC. The following section describes keystrokes for switching between windows that can be used in place of the taskbar buttons.

1.4 Window Manipulation Keys

Application windows contain running applications. At the top of the window is a title bar with the name of the application and the associated document. The title bar of the window you are currently using is usually a different color than those of the inactive windows. The application's menu bar is located directly below the title bar. Application windows can be positioned anywhere within the desktop borders. Since the active window always appears in the foreground it might overlap inactive windows, partially or completely obscuring them.

Windows can be arranged on the desktop through the taskbar shortcut menu. To reach this menu, use this sequence of keys: CTRL+ESC, ESC, TAB, SHIFT+F10. The following options are on the shortcut menu and may be reached using arrow keys or the underlined keys: Cascade Windows, Tile Windows Horizontally, Tile Windows Vertically, Minimize All Windows, Undo Minimize All, and Properties.

To move a window, choose the Move command from the Program menu on the left of the title bar (use ALT+SPACEBAR to open the Program menu). Use arrow keys to move the window, followed by ENTER to accept or ESC to cancel. To resize a window, choose the Size command from the Program menu, then use an arrow key to choose which window border you want to move, then move it with the appropriate arrow keys, and then press ENTER to accept or ESC to cancel.

ALT+F4
: Closes the active application window. (You also can choose the Close command from the Program menu of the active application.)

ALT+SPACEBAR
: Opens the Program menu from the leftmost icon on the title bar of the active window. The Program menu typically contains the following commands: Restore, Move, Size, Minimize, Maximize and Close.

ALT+TAB
: Switches to the most recently used application window. To select an application from a list, continue to hold ALT down and press TAB more than once to move through the list. Add SHIFT to reverse direction through the list.

ALT+ESC
: Switches keyboard focus to next application window, including minimized windows on the taskbar. Press ESC more than once to switch through successive windows and add SHIFT to reverse the direction.

ALT+ENTER
: Switches an MS DOS-based application between full-screen and windowed modes.

PRINT SCREEN
: Copies an image of the screen to the Windows Clipboard.

ALT+PRINT SCREEN
: Copies an image of the active window to the Windows Clipboard.

Applications can have multiple document windows. Document windows appear within application windows, and like application windows may tile or overlap. Document windows have their own title bars unless they are maximized. When maximized, they fill the application workspace and share the application window's title bar, and the document name is included with the name of the application on a shared title bar. The document window's document icon is added to the application menu bar on the far left. For example, in Microsoft Word the title bar says *"Microsoft* Word—Name of Document" when the document window is maximized. Commands that affect the application window affect the document window as well.

CTRL+F4
: Closes the active document window.

CTRL+F6
: Switches to next document window in the active application. Add SHIFT to switch to the previous document window.

ALT+HYPHEN
: Opens the Document menu from the leftmost icon on the title bar of the active document window. The Document menu typically contains the following commands: Restore, Move, Size, Minimize, Maximize and Close.

For some applications, the application and document windows can be divided into two or more separate viewing areas called panes. This is useful when moving or copying information from one document to another or from one part of a document to another. Panes also are used when viewing both the body of the documents and the footnotes or annotations.

To split a window into two panes, choose the Split command from the Window menu. The split bar appears in the middle of the window with the keyboard focus indicated by arrows. Move the split bar to the desired location using the arrow keys, then press ENTER to set the split bar in the desired location or ESC to cancel. Once the panes are displayed, you can use F6 or TAB to move between them in a clockwise direction; add SHIFT to reverse direction.

1.5 Menu Commands

Applications frequently include commands that are listed in menus. Menus are represented by names on a menu bar at the top of each application window. In Microsoft Windows, you select a menu, and then choose a command from that menu. Choosing the command initiates the action. An ellipsis (...) after the menu indicates that a dialog box will appear after the command is chosen to ask for

information that the application needs to carry out the command.

Windows logo key or CTRL+ESC
Opens the Start menu on the taskbar.

F10 or ALT
Activates the menu bar of the active window. The leftmost menu name is selected. (In a maximized document window, the leftmost menu has an icon instead of a name and there is no visual indication that it is selected.) Press F10 or ALT again to toggle the focus back to where it was previously.

LEFT ARROW or RIGHT ARROW
Moves the focus between menus on the menu bar in the direction of the arrow. If the original menu was open, the target menu is opened as well, and the first item in it gets the focus.

UP ARROW or DOWN ARROW
Opens the selected menu. DOWN ARROW selects the next command in the list. UP ARROW selects the previous command in the list.

ENTER
Opens the selected menu when focus is on the menu title, but activates a menu item when focus is on a menu item. If the selected menu item is unavailable, ENTER closes the menu.

ALT+SPACEBAR
Opens the Program menu from the leftmost icon on the title bar of the active window. The Program menu typically contains the following commands: Restore, Move, Size, Minimize, Maximize and Close.

ALT+HYPHEN
Opens the Document menu from the leftmost icon on the title bar of the active document window. The Document menu typically contains the following commands: Restore, Move, Size, Minimize, Maximize and Close.

ESC
Closes an open menu and moves the focus back to the parent menu if there is one. Otherwise it returns the focus to the menu title. If the focus was already on the menu title, focus moves back to wherever it was before activating the menu bar.

ALT+Any printing character
Chooses the menu with the underlined character (access key) on the main menu bar.

Any printing character
Chooses the command with the underlined character (access key) on an open menu.

SHIFT+F10 or Application key
(also the right mouse click)
Opens the shortcut menu for the active item. This can be selected text, a toolbar button, a taskbar button, or other item.

1.6 Windows Explorer Keys

The Windows Explorer displays the contents of a computer, drive or directory. The Windows logo key+E opens the Windows Explorer at any time, and it also can be started from Programs on the Start menu. It normally has two panes: the left pane displays a tree view of your folders and the right pane displays the contents of one folder.

Windows Explorer also can display a single pane, without the tree view. In this case it normally hides the toolbar unless you explicitly turn it on using the View menu. You can access the same information using the My Computer icon from the desktop, and in the standard Open and Save As dialog boxes.

The View menu offers a choice of icon displays:

- Large Icons view displays the contents of a drive or directory as large icons in horizontal rows.
- Small Icons view displays the same information in small icons in horizontal rows.
- List menu item displays directories and files as small icons in vertical columns.

- Details view displays files as a single column of icons with multiple columns of information about each file.

Files and folders can be moved or copied by using the Cut, Copy, and Paste commands from the Edit menu or by using shortcut keys. Moving a program icon does not change the performance of the program. Deleting a program icon does not delete all the files associated with the program, so you should install or delete programs using the Add/Remove Programs option in Control Panel.

1.6.1 View Control Keys

ARROW KEYS
: Select the next item in the indicated direction. Add SHIFT to select or deselect additional items. Add CTRL to move to the item without selecting it. In Details view there is only one column, so RIGHT and LEFT ARROW scrolls the window a small amount to the right or left. In List view the UP and DOWN ARROW keys wrap between columns.

PAGE UP or PAGE DOWN
: Moves to the bottom or top item on the screen. Use a second time to select the item one screen above or below. Add SHIFT to select additional items. Add CTRL to move to the item without selecting it.

HOME or END
: Selects the first or last item in the list. Add SHIFT to select or deselect additional items. Add CTRL to move to the item without selecting it.

Any printing character
: Selects the next icon with the specified name or initial letter. SPACE behaves this way when it is typed as part of a name—see section 1.2, "Selecting Items by Access Key or by Name."

ENTER
: Opens the selected item. This may open a new window, depending on the options you have selected. (You also can choose Open from the File menu.)

BACKSPACE
: Displays the contents of the parent directory. This may open a new window, depending on the options you have selected.

SPACE
: When typed alone, selects the current item if it is not already selected. Use after moving with the CTRL key to select separate groups of items.

CTRL+SPACE
: Selects or deselects the current item. Use after moving with the CTRL key to select separate groups of items.

SHIFT+SPACE
: Extends the selection to the current item. If you have already selected more than one item, it selects only the items from the first item you selected to the current item.

CTRL+Z
: Undoes the last action. Some actions cannot be undone. (You also can choose Undo from the Edit menu.)

CTRL+X
: Cuts the selected item(s) to the Clipboard. (You also can choose Cut from the Edit menu.)

CTRL+C
: Copies the selected item(s) to the Clipboard. (You also can choose Copy from the Edit menu.)

CTRL+V
: Pastes the copied item(s) from the Clipboard. (You also can choose Paste from the Edit menu.)

CTRL+A
: Selects all the items in the current window. (You also can choose Select All from the Edit menu.)

CTRL+G
: Opens the Go To Folder dialog box. (You also can choose Go To from the Tools menu.)

CTRL+F or F3
: Opens the Find All Files dialog box. (You also can choose Find from the Tools menu, then the Files Or Folders command.)

DELETE
Deletes the selected item(s) to the Recycle Bin. (You also can choose Delete from the File menu.)

SHIFT+DELETE
Delete the selected item(s) immediately without moving the item(s) to the Recycle Bin.

ALT+ENTER
Displays the properties of the selected item. (You also can choose Properties from the File menu.)

F2
Renames a selected item. A bold rectangle appears around the item. Type the new name and press ENTER. Press ESC to cancel. (You also can choose Rename from the File menu.)

F4
Opens the drop-down list box on the toolbar. Pressing F4 again moves the keyboard focus back to the previously used item.

F5
Refreshes the current window. (You also can choose Refresh from the View menu.)

F6 or TAB
Switches between panes and the toolbar.

ASTERISK (on the numeric keypad)
Expands everything under the current selection.

MINUS SIGN (on the numeric keypad)
Closes everything under the current selection.

PLUS SIGN (on the numeric keypad)
Expands everything under the current selection back to a previously opened state, or opens only one level if it has not previously been opened.

UP ARROW or DOWN ARROW
Selects the next visible object above or below.

PAGE UP or PAGE DOWN
Moves to the top or bottom item on the screen. Use a second time to move up or down one screen.

HOME or END
Selects the first or last item on the tree.

Any printing character
Selects the next icon with the specified name or initial letter. Repeating the character selects successive items beginning with the same character.

BACKSPACE
Chooses the parent directory.

1.6.2 Tree View Control Keys

Tree views display a set of objects as an indented outline based on their hierarchical relationships. For example, the All Folders pane in the Windows Explorer is a tree view. Files and folders can be moved or copied in tree view by using the Cut, Copy, and Paste commands. Tree view only supports single selection of items.

RIGHT ARROW
Opens a branch, or selects the first item in the branch.

LEFT ARROW
Closes a branch, or selects the parent of the current item.

1.7 Dialog Boxes

A dialog box is a window that appears temporarily on top of your application window to request information. Message boxes are simple dialog boxes that appear to display additional information, warnings, or to explain why a requested task could not be accomplished. Dialog boxes often contain groups of controls necessary to set options or settings for programs. A typical dialog box might contain some text, a set of radio buttons, and OK and Cancel buttons.

You can select or choose controls that have an access key in their titles by typ-

ing ALT+the underlined letter at any time when the dialog box is active. TAB moves the keyboard focus between controls, but which controls are included in the focus sequence, and the order of the sequence, may vary between applications. See section 3, "Keyboard Navigation," for a more detailed discussion of using TAB. Typically, items that cannot be changed are not visited by the TAB key. Arrow keys are used to move within a list box, groups of option controls, or groups of page tabs. Arrow keys can move the keyboard focus between other controls but this behavior is not reliable. Options that are unavailable appear dimmed and cannot be selected.

While the controls described here are typically found on dialog boxes, they also can occur in other contexts.

Command buttons (also known as push buttons) initiate an immediate action. One command button in each dialog box carries out the command you've chosen, using the information supplied in the dialog box. This normally is labeled "OK." Other command buttons let you cancel the command or choose from additional options.

Command buttons marked with an ellipsis (...) open another dialog box so you can provide more information or confirm an action. Command buttons marked with a pair of greater-than symbols (>>) expand the current dialog box to show more controls. Command buttons marked with an arrow display a menu.

A dark border initially indicates the default button. Press ENTER at any time to choose the button with a dark border. Use TAB to move the keyboard focus to the next control, and add SHIFT to reverse the direction. When you move the keyboard focus to a command button it temporarily takes the dark border, but when the keyboard focus is not on a command button the dark border returns to the default button. Press SPACEBAR to choose the command button you selected with TAB. Use ESC to immediately choose the Cancel button if there is one. Typing the access key for a command button will immediately carry out the command.

Check boxes may be selected or cleared to turn an option on or off. Check boxes may have two states (checked and unchecked) or three states (checked, unchecked, and indeterminate). Check boxes often are displayed in sets of related options; for example, in setting Font Effects in Microsoft Word, the check boxes offer Strikethrough, Superscript, Subscript, Hidden, Small caps, and All caps.

Use TAB to move between boxes and SPACE to change the check box to the next state. Typing the access key for a check box also will move the focus to the box and change its state.

Option controls (also known as radio buttons) are used to select only one option from a group of options. (Like check boxes, option buttons may represent two or three states.) Use the arrow keys to select the next or previous buttons within the group. In some applications, you can add CTRL to move to the button without selecting it, then use SPACEBAR to choose the currently selected option button. Typing the access key for an option control will also move the focus to the control and select it.

Tabbed pages are used to fit many options into a single dialog box. They appear visually similar to dividers from a notebook. Each page contains separate groups of controls such as check boxes or option controls. Use TAB to move the focus to the tab for the currently visible page. Typing the access key for a page tab also will move the focus to the tab and display its page.

CTRL+PAGE DOWN or CTRL+TAB

Switches to the next tab and displays the page.

CTRL+PAGE UP or CTRL+SHIFT+TAB
Switches to the previous tab and displays the page.

RIGHT ARROW or LEFT ARROW
When the focus is on a tab selector, chooses the next or previous tab in the current row and displays the page.

DOWN ARROW or UP ARROW
Chooses the tab in the next or previous row and displays the page.

Sliders appear as an indicator on a vertical or horizontal gauge. The slider both displays and sets a value from a continuous range, such as speed, brightness, or volume. Use TAB or the appropriate access key to move the focus to the slider.

RIGHT ARROW or DOWN ARROW
Selects the next higher setting.

LEFT ARROW or UP ARROW
Selects the next lower setting.

HOME or END
Selects the lowest or highest setting.

PAGE DOWN
Selects a somewhat lower or higher setting depending on the application. (This is the equivalent of pressing an arrow key many times.)

PAGE UP
Moves in the reverse of the PAGE DOWN.

Spin boxes appear as a text box with up and down arrows used to select from a list of fixed values. Use TAB to move the keyboard focus to the text box, then enter a valid value in the box or use the UP ARROW or DOWN ARROW keys to select the next higher or lower values.

List boxes display a column of available choices. If there are more choices than can fit in the open list box, moving the selection through the list will scroll more choices into view. Use TAB or type the appropriate access key to move the focus to the list box.

Single selection list boxes allow only one item to be selected from the list at a time. Items are selected when navigating to them, and moving to a second item will automatically deselect all other items.

Drop-down list boxes by default show only the selected item. There is a small button to the right of the control that shows a downward-pointing arrow. You can click the arrow to display more items from the list. You also can show or hide the list using ALT+DOWN ARROW, ALT+UP ARROW, or F4. In all other respects it behaves like a normal single-selection list box.

Extended selection list boxes support selecting single items, blocks of items, or combinations of the two. After selecting an item as in a single-selection list box, hold down SHIFT+Navigation keys to select or deselect more items.

Multiple selection list boxes typically have comparatively long lists and more of these items are expected to be chosen individually (not in blocks). Navigating to items does not automatically select them nor does selecting an item change the status of other selections. Press SPACEBAR to select or deselect an item.

Combo-boxes and *drop-down combo boxes* are list boxes with attached edit boxes. You can make your selection by either typing in the edit box or using the standard commands to select from the list.

UP ARROW or DOWN ARROW
Selects the previous or next item. In an extended selection list box, add SHIFT to select additional items and add CTRL to move to an item without selecting it. In a multiple selection list box, moves without changing the selection.

PAGE UP or PAGE DOWN
: Selects the item up or down one screen. In an extended selection list box, add SHIFT to select additional items and add CTRL to move to an item without selecting it. In a multiple selection list box, moves without changing the selection.

HOME or END
: Selects the first or last item in the list box. In an extended selection list box, add SHIFT to select additional items and add CTRL to move to an item without selecting it. In a multiple selection list box, moves without changing the selection.

Any printing character
: Moves to the next item matching the characters being typed. Use BACKSPACE to change. In a multiple selection list box, moves to an item without selecting it.

SPACEBAR or CTRL+SPACE
: Selects or deselects the current item in an extended-selection list box.

SHIFT+SPACE
: Extends the selection from the last selected item to the current item in an extended selection list box.

SHIFT+F8
: In extended selection list boxes, pressing SHIFT+F8 allows you to move without changing the selection. You can then press CTRL+SPACEBAR or SHIFT+SPACEBAR to select additional items. The list box returns to normal operation when you press SHIFT+F8 a second time or switch to another window or control.

Edit controls are rectangular boxes used for displaying or editing text. See the following section for more information. Use TAB or the appropriate access key to move the focus to the edit control and select the text.

1.8 Text Navigation and Editing Keys

When you open a document window in a word processing (or similar) program, a pointer appears in the upper-left corner of the window. The text you enter will appear at the pointer. In insertion mode, the new text is inserted into the existing text—the existing text is automatically pushed back to follow the new text. In overwrite mode, the new text overwrites the existing text. The following keys automatically scroll the window to keep the pointer in view when it is necessary. These keys also work in the text boxes of dialog boxes and list boxes.

INSERT
: Toggles between overtype and insertion modes. (Text boxes support only insert mode.)

ARROW KEY
: Moves the pointer one character in the direction of the ARROW KEY. If text is selected, moves the pointer to the end of the selection and deselects the text.

HOME or END
: Moves the pointer to the beginning or end of the current line.

PAGE UP or PAGE DOWN
: Moves the pointer up or down one screen or to the first or last line.

CTRL+RIGHT or CTRL+LEFT
: Moves the pointer to the beginning of the next or previous word.

CTRL+UP or CTRL+DOWN
: Moves the pointer to the beginning of the preceding or next paragraph. (Not supported in text boxes.)

CTRL+HOME or CTRL+END
: Moves the pointer to the beginning or the end of the document. (Not supported in text boxes.)

Press SHIFT with the text navigation keys listed above to select blocks of text for editing. For example, press SHIFT+END to select text from the pointer to the end

of the line. SHIFT toggles—you can use SHIFT plus the above navigation keys to both select and deselect text.

DELETE
Deletes the next character or the selected text.

BACKSPACE
Deletes the previous character or the selected text.

ALT+BACKSPACE or CTRL+Z
Undoes the last action.

CTRL+INSERT or CTRL+C
Copies the selected text to the Clipboard.

SHIFT+DELETE or CTRL+X
Cuts the selected text to the Clipboard.

SHIFT+INSERT or CTRL+V
Pastes copied text from the Clipboard.

1.9 Internet Explorer and Help Keys

Windows 98 includes a new Help facility, called HTML Help. Because Help is now displayed as Web pages, you can use many of the same keyboard shortcuts to display both Help topics and pages in Internet Explorer.

When a Web page or Help topic is displayed, TAB and SHIFT+TAB move through the links. The page scrolls automatically to keep the links in view.

TAB
Moves to next control, link, or page. Add SHIFT to reverse.

F6
Moves between panes in Help.

ALT+RIGHT ARROW
Displays the next page (the Forward button).

ALT+LEFT ARROW
Displays the previous page (the Back button).

SHIFT+F10
Displays a shortcut menu for a link.

CTRL+TAB
Moves forward between frames.

SHIFT+CTRL+TAB
Moves back between frames.

UP ARROW
Scrolls toward the beginning of a document.

DOWN ARROW
Scrolls toward the end of a document.

PAGE UP
Scrolls toward the beginning of a document in single screen increments.

PAGE DOWN
Scrolls toward the end of a document in single screen increments.

HOME
Moves to the beginning of a document.

END
Moves to the end of a document.

F5
Refreshes the current page.

ESC
Stops downloading a page or stops animation.

CTRL+O
Displays the Open dialog box, which you can use to go to a new location on the Internet.

CTRL+N
Opens a new window.

CTRL+S
Saves the current page.

CTRL+P
Prints the current page or active frame.

ENTER
Activates a selected link.

1.10 Accessibility Keys

Use the Control Panel or the Accessibility Wizard to turn on these keys in Microsoft Windows 98. Under Windows 95 and NT 4.0, these settings are changed only in Control Panel. Under Windows NT 3.5 and earlier versions of Windows and MS-DOS, the Accessibility features are not available until the Access Pack has been installed. Once Access Pack is installed, the hot keys are on by default. These features are not available in Windows NT 3.1.

Five taps on shift
: Toggles the StickyKeys feature on and off. Use StickyKeys if you want to use the SHIFT, CONTROL, or ALT keys one key at a time in combination with other keys.

LEFT ALT+LEFT SHIFT+NUM LOCK
: Toggles the MouseKeys feature on and off. Use MouseKeys if you want to control the mouse pointer with the numeric keypad.

Hold NUM LOCK for 5 seconds
: Toggles the ToggleKeys feature on and off. Use ToggleKeys if you want to hear tones when pressing CAPS LOCK, NUM LOCK and SCROLL LOCK.

Hold RIGHT SHIFT for 8 seconds
: Three beeps followed by a sliding beep signals eight seconds. Toggles the FilterKeys features (SlowKeys, BounceKeys and RepeatKeys) on and off. Use FilterKeys if you want Windows to ignore brief or repeated keystrokes or to slow the repeat rate. SlowKeys ignores keys that are pressed accidentally or for a short time. BounceKeys ignores keys that are pressed more than once too quickly. RepeatKeys adjusts or disables the keyboard repeat rate.

Hold RIGHT SHIFT for 12 seconds
: Three beeps followed by a sliding beep followed by a double beep signals twelve seconds. Turns on the BounceKeys feature with the most conservative settings.

Hold RIGHT SHIFT for 16 seconds
: Three beeps followed by a sliding beep followed by a double beep followed by a triple beep signals sixteen seconds. Turns the SlowKeys feature on with the most conservative settings.

LEFT ALT+LEFT SHIFT+PRINT SCREEN
: In Microsoft Windows 95, toggles the High Contrast Mode feature on and off. Use this option if you want Windows to display colors and fonts designed for easy reading.

  In Microsoft Windows NT 4.0, use Control Panel to select from several High Contrast schemes in the Appearance page under the Display option.

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2. CREATING CUSTOM SHORTCUT KEYS FOR APPLICATIONS OR DOCUMENTS

Custom shortcut keys provide easy access to the documents and programs you use most often. You can create shortcut items on your desktop or on your Start menu and then assign them custom shortcut keys. Typing a shortcut key at any time will switch to the application or document, or start it if it is not already running.

Both the icons on the desktop and the menu items on the Start menu are represented in Windows Explorer as the Desktop and Start menu folders in the Windows directory.

To create a shortcut and place it in the Start menu:

1. Press CTRL+ESC.

   Windows displays the Start menu.

2. Use arrow keys and enter to choose Programs from the Start menu.

   Windows displays the Programs menu.

3. Use arrow keys and ENTER to choose Windows Explorer from the Programs menu.

The Windows Explorer opens with the contents of "Start menu" in the Contents pane on the right.

- If it doesn't open with the contents of the Start menu, navigate to the Start menu file in your Windows directory, select it and press enter to display the contents in the right pane.

4. Press F6 and arrow keys.

   Use F6 to switch panes and the arrow keys to navigate to the program or document to which you are assigning a shortcut.

5. Press CTRL+C.

   The selected item is copied to the Clipboard.

6. Press CTRL+ESC.

   Windows displays the Start menu again.

7. Press ESC.

   The keyboard focus moves to the Start button on the taskbar.

8. Press SHIFT+F10.

   Windows displays the shortcut menu for the Start button.

9. Press E.

   Chooses the Explore command. A second copy of Windows Explorer opens with the contents of "Start menu" in the Contents pane on the right. Use TAB to move the keyboard focus to the first item in the pane.

10. Press ALT+E.

    Windows displays the Edit menu.

11. Press S.

    Chooses the Paste Shortcut command.

    - The new shortcut icon appears at the end of the list of icons in the Contents of the "Start menu" pane.

12. Press ALT+F and then C.

    Chooses Close from the File menu to close the second copy of the Windows Explorer. Repeat to close the first copy.

You also can place shortcuts on the desktop through the Windows Explorer by copying items to the Desktop group instead of the Start menu file.

To assign a shortcut key to a shortcut:

1. Select the shortcut on the desktop or in the Windows Explorer.

   You can assign shortcut keys only to shortcuts on the desktop or in the Start menu.

   - To assign shortcut keys to shortcuts on the Start menu you must go through Explorer.

2. Press ALT+ENTER.

   Displays the Properties sheet with the focus on the Shortcut Key edit box.

3. Press any key combination.

   - Enter your shortcut and it will appear in the edit box. CTRL+ALT will automatically be added to your key combination, for example, if you enter the letter "n" the shortcut key combination CRTL+ALT+N will be entered in the edit box. If you enter a key combination that contains CTRL or ALT (for example, CTRL+SHIFT+E) you will see CTRL+ALT briefly displayed and then your selection displayed. This is to ensure that shortcut keys include CTRL or ALT.

   - Shortcut keys must include CTRL or ALT, or both, and one other key. For example, CTRL+SHIFT+Y.

- You cannot use ESC, ENTER, TAB, SPACEBAR, PRINT SCREEN, or BACKSPACE. Be careful, because no other program will be able to use this key combination while it is defined as a shortcut key.
- Press BACKSPACE to delete an existing shortcut key or to change your entry in the text box.

4. Press ENTER.

   Chooses the OK button. Press ESC to cancel.

APPENDIX B

Apple Macintosh Keyboard Shortcuts

This appendix describes how to run the Apple Macintosh personal computer using the keyboard rather than the mouse. As is the case with Microsoft Windows, many of the Mac's operating system functions and applications programs can be successfully operated using the keyboard to assist persons with disabilities. The Mac also includes a suite of disability access functions, similar to those found on Windows-based platforms. The Macintosh includes many of the same standard keys found on Windows computers, except the Macintosh includes additional keys specific to the platform. The Windows platform uses CONTROL, SHIFT, and ALT as modifier keys. The Apple Macintosh uses CONTROL, SHIFT, COMMAND, and OPTION keys as modifiers. The COMMAND and OPTION keys can be held down with any other key, similar to CTRL and ALT on the Windows platform. This allows many aspects of the Macintosh operating system and applications programs to be controlled directly from the keyboard, not requiring the mouse. Below is a guide to Macintosh keyboard commands and other accessibility options.

MACINTOSH KEYBOARD GUIDE

The Apple Macintosh includes many keyboard commands that let you select and control programs and many basic functions of the computer. A plus sign (+) means that the keys are held down at the same time. These keyboard commands replace the mouse in many instances. This guide is copyright by Apple Computer, Inc., and was compiled from the Apple Web site at http://www.apple.com/disability.

Getting out of Freezes

POWER key
: Turns your computer on and off. Your work will be saved before the computer shuts down.

COMMAND+PERIOD
: Cancels an operation in progress.

COMMAND+OPTION+ESCAPE
: Forces a program to quit. Unsaved work will be lost.

COMMAND+OPTION+SHIFT+POWER key
: Restarts or shuts down the computer (on some models). Unsaved work will be lost.

COMMAND+CONTROL+POWER key
: Forces the computer to restart. Unsaved work will be lost.

Starting Up

To start up the computer with one of the options described below, hold down these keys while starting up. A plus sign (+) means the keys are held down at the same time.

COMMAND+OPTION
Rebuilds the Desktop file.

SHIFT
Turns off extensions in the Extensions folder.

OPTION
Closes all open windows in the Finder.

COMMAND+OPTION+P+R
Resets Chooser and Control panel settings stored in parameter RAM.

C
Starts up the computer from a CD.

COMMAND+OPTION+SHIFT+DELETE
Bypasses the startup disk when starting up.

Working with Languages

The shortcut keys listed below function only when WorldScript is installed, software that lets you use other languages on your computer, and is installed by Apple language kits. A plus sign (+) means the keys are held down at the same time.

COMMAND+SPACE
Rotates to the default keyboard layout or input method in the next script.

COMMAND+OPTION+SPACE
Rotates to the next keyboard layout or input method in the active script. Note: This shortcut is available, even without WorldScript installed, by selecting this option in the Keyboard Control panel.

Keyboard Shortcuts for the New Open Dialog Box

COMMAND+A
Selects all files that can be opened (if the Edit menu is active).

COMMAND+RIGHT ARROW
Expands the selected folder or volume.

COMMAND+LEFT ARROW
Collapses the selected folder or volume.

OPTION+RIGHT ARROW
Displays the next location in a historical sequence (similar to the "Forward" command in Web browsers).

OPTION+RIGHT ARROW
Displays the previous location in a historical sequence (similar to the "Back" command in Web browsers).

Opening Files

These shortcuts work in Open dialog boxes. A plus sign (+) means keys are held down together.

UP and DOWN ARROWS
Selects the item above or below the selected item.

Letter keys
Select an item in the active list whose name begins with the letters typed.

HOME
Moves to the top of the scrolling list.

END
Moves to the bottom of the scrolling list.

PAGE UP
Scrolls the list up one screen.

PAGE DOWN
Scrolls the list down one screen.

COMMAND+UP ARROW
Moves up one level in the file hierarchy.

COMMAND+D or COMMAND+SHIFT+UP ARROW
Changes current location to the desktop.

COMMAND+O or COMMAND+DOWN ARROW
Opens the selected folder or volume.

COMMAND+OPTION+O or OPTION+Open alias
Selects the original of an alias.

ENTER
Clicks the Open button.

ESC OR COMMAND+PERIOD
Closes the dialog box.

Saving Files

These shortcuts work in Save dialog boxes. A plus sign (+) means the keys are held down at the same time.

UP ARROW or DOWN ARROW
Selects the item above or below the selected item.

Letter keys
Selects an item in the active list whose name begins with the letters typed.

TAB
Moves to the next keyboard focus item.

HOME
Moves to the top of the scrolling list.

END
Moves to the bottom of the scrolling list.

PAGE UP
Scrolls the list up one screen.

PAGE DOWN
Scrolls the list down one screen.

COMMAND+UP ARROW
Moves up one level in the file hierarchy.

COMMAND+UP ARROW or
COMMAND+SHIFT+ARROW
Changes current location to the desktop.

COMMAND+O or COMMAND+DOWN ARROW
Opens the selected folder or volume.

COMMAND+OPTION+O or OPTION
Selects the original of an alias.

COMMAND+N
Creates a new folder.

COMMAND+S
Clicks the Save button (if it is active).

RETURN or ENTER
Clicks the default button (usually Save or Open).

ESC or COMMAND+PERIOD
Closes the dialog box.

OPTION+RIGHT ARROW
Displays the next location in a historical sequence (similar to the "Forward" command in Web browsers).

OPTION+LEFT ARROW
Displays the previous location in a historical sequence (similar to the "Back" command in Web browsers).

Taking Pictures of Your Screen

To create a picture file of all or parts of your screen, hold down these keys. (The file is saved on your startup disk.) A plus sign (+) means keys are held down together.

COMMAND+SHIFT+3
Creates a picture file of the entire screen.

COMMAND+SHIFT+4
Creates a picture file of a rectangular section of the screen. (After pressing and releasing the key combination, drag across the part of the screen you want to take a picture of.)

COMMAND+SHIFT+4+CAPS LOCK
Creates a picture file of a window. (After pressing and releasing the key combination, click the window you want to take a picture of.)

Note: To copy a section of the screen or a window to the Clipboard instead of saving it as a file, press the CONTROL key as you select the part of the screen or window.

Working with Icons

A plus sign (+) means keys are held down together.

Arrow keys
: Selects the icon above, below, to the left, or to the right of the selected icon.

Letter keys
: Selects the icon whose name begins with the letters typed.

TAB
: Selects the next icon alphabetically.

SHIFT+Click icon
: Selects all of the icons clicked.

Drag across icons
: Selects all icons in the group.

OPTION+Double-click icon
: Opens the icon and closes the window the icon is in.

OPTION+Drag icon to folder
: Copies the icon to the folder.

RETURN
: Highlights the name of the selected icon.

COMMAND+Drag icon(s)
: Aligns selected icon(s) to the nearest gridpoint.

COMMAND+OPTION+Drag icon
: Creates an alias of the icon.

COMMAND+DELETE
: Moves selected icons to the Trash.

Working with Windows

A plus sign (+) means keys are held down together.

OPTION+Click close box
: Closes all disk and folder windows.

OPTION +Click collapse box
: Collapses all disk and folder windows.

COMMAND+W
: Closes the frontmost window, or collapses a pop-up window to its tab state at the bottom of the screen.

COMMAND+SHIFT+W
: Closes the frontmost window and converts it from a pop-up window to a normal Finder window.

COMMAND+OPTION+SHIFT+W
: Closes all open windows and converts them from pop-up windows to normal Finder windows.

OPTION+Click zoom box
: Enlarges a window to the full size of the screen.

OPTION+Switch programs
: Hides the windows of the previous program.

COMMAND +Drag window
: Moves a window without making it active.

COMMAND +Press window's title
: Displays a pop-up menu of folders to which the current folder belongs.

COMMAND+RIGHT ARROW
: In a list view, expands the contents of the selected folder(s).

COMMAND+LEFT ARROW
: In a list view, collapses the contents of the selected folder(s).

OPTION+Expand folder
: In a list view, expands the contents of the folder and all folders contained within it.

OPTION+Collapse folder
: In a list view, collapses the contents of the folder and all folders contained within it.

APPENDIX C

Products for Persons with Vision Impairments

This appendix provides a list of products and their vendor contact information. Here's a brief description of the information shown below. *Product* shows the name of the adaptive product or device. *Type* denotes the category of the product: screen reader, TTY, braille display, keyboard emulator, CCTV, voice recognition, alternative keyboard, communication, and so forth. *Class* indicates whether the product is either hardware or software. Some hardware products may also include a software component. *Platform* shows which computer operating system is supported: Windows, DOS, Macintosh, Unix, or stand-alone. Stand-alone products can often connect to PCs but can also operate independently. Vendor indicates the manufacturer's name, and *Address* provides the manufacturer's mailing address. The voice phone, fax, and TTY numbers of manufacturers are also provided. The e-mail contact and Web site for the manufacturer are also supplied. No endorsements are intended by inclusion on this list. Similarly, lack of inclusion does not imply a lack of endorsement. Due to space limitations and the fact that there are literally tens of thousands of adaptive products on the market, this list is intended to serve as a representative sample of some of the solutions that are available. For additional product information, point your browser to http://www.abledata.com to browse the over 25,000 products found in the AbleData online database.

PRODUCT: Braille Overlays for Intellikeys
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road, Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Tactile Overlays for Intellikeys
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road, Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Alva 544
TYPE: Braille Display
CLASS: Hardware
PLATFORM: Windows
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street, Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: Alva 570
TYPE: Braille Display
CLASS: Hardware
PLATFORM: Windows
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street
Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: Alva Delphi 440
TYPE: Braille Display
CLASS: Hardware
PLATFORM: PC, Unix/Linux
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street
Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: Alva Delphi 480
TYPE: Braille Display
CLASS: Hardware
PLATFORM: PC, Unix/Linux
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street
Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: Alva Delphi Braille Display
TYPE: Braille Display
CLASS: Hardware
PLATFORM: PC
VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: BookWorm
TYPE: Braille Display
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Braille Window
TYPE: Braille Display
CLASS: Hardware
PLATFORM: PC
VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: PowerBraille 40/65/80
TYPE: Braille Display
CLASS: Hardware
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Type Lite
TYPE: Braille Display
CLASS: Hardware
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716

PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: BrlKeys
TYPE: Braille Keyboard Emulator
CLASS: Software
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: Braille Blazer
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Braille Bookmaker Express 100, Express 150
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: Braille-n-Print Slimline
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: ET
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: Juliet
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: Marathon
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: Mountbatten Brailler
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: Mac/PC

VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: Paragon
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: Plate Embossing Device PED-30
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: Romeo
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: Thomas
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: TranSend LT with Ink Printer
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Enabling Technologies
ADDRESS: 1601 Northeast Braille Plaza
Jensen Beach, FL 34957
PHONE: (561) 225-3687
FAX: (561) 225-3299
E-MAIL: enabling@brailler.com
WEB: http://www.brailler.com

PRODUCT: VersaPoint
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: VersaPoint Duo
TYPE: Braille Printer
CLASS: Hardware
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Duxbury
TYPE: Braille Translator

CLASS: Software
PLATFORM: PC
VENDOR: Duxbury Systems, Inc.
ADDRESS: 435 King Street
Littleton, MA 01460
PHONE: (978) 486-9766
FAX: (978) 486-9712
E-MAIL: duxbury@world.std.com
WEB: http://www.duxburysystems.com

PRODUCT: MegaDots
TYPE: Braille Translator
CLASS: Software
PLATFORM: PC
VENDOR: Duxbury Systems, Inc.
ADDRESS: 435 King Street
Littleton, MA 01460
PHONE: (978) 486-9766
FAX: (978) 486-9712
E-MAIL: duxbury@world.std.com
WEB: http://www.duxburysystems.com

PRODUCT: Aladdin
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Telesensory
ADDRESS: 520 Almanor Avenue
Sunnyvale, CA 94086
PHONE: (408) 616-8700
FAX: (408) 616-8720
E-MAIL: info@telesensory.com
WEB: http://www.telesensory.com

PRODUCT: Aladdin Rainbow
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Telesensory
ADDRESS: 520 Almanor Avenue
Sunnyvale, CA 94086
PHONE: (408) 616-8700
FAX: (408) 616-8720
E-MAIL: info@telesensory.com
WEB: http://www.telesensory.com

PRODUCT: Flipper
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Enhanced Vision Systems, Inc.
ADDRESS: 2130 Main Street
Suite 250
Huntington Beach, CA 92648
PHONE: (800) 440-9476
FAX: (714) 374-1821
E-MAIL: sales@enhancedvision.com
WEB: http://www.enhancedvision.com

PRODUCT: FlipperPort
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Enhanced Vision Systems, Inc.
ADDRESS: 2130 Main Street
Suite 250
Huntington Beach, CA 92648
PHONE: (800) 440-9476
FAX: (714) 374-1821
E-MAIL: sales@enhancedvision.com
WEB: http://www.enhancedvision.com

PRODUCT: Jordy
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Enhanced Vision Systems, Inc.
ADDRESS: 2130 Main Street
Suite 250
Huntington Beach, CA 92648
PHONE: (800) 440-9476
FAX: (714) 374-1821
E-MAIL: sales@enhancedvision.com
WEB: http://www.enhancedvision.com

PRODUCT: Max
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Enhanced Vision Systems, Inc.
ADDRESS: 2130 Main Street

Suite 250
Huntington Beach, CA 92648
PHONE: (800) 440-9476
FAX: (714) 374-1821
E-MAIL: sales@enhancedvision.com
WEB: http://www.enhancedvision.com

PRODUCT: MaxPort
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Enhanced Vision Systems, Inc.
ADDRESS: 2130 Main Street
Suite 250
Huntington Beach, CA 92648
PHONE: (800) 440-9476
FAX: (714) 374-1821
E-MAIL: sales@enhancedvision.com
WEB: http://www.enhancedvision.com

PRODUCT: Outlook Color
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Telesensory
ADDRESS: 520 Almanor Avenue
Sunnyvale, CA 94086
PHONE: (408) 616-8700
FAX: (408) 616-8720
E-MAIL: info@telesensory.com
WEB: http://www.telesensory.com

PRODUCT: Ovac Color-Eye
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ovac, Inc.
ADDRESS: 67-555 East Palm Canyon Drive
Unit C-103
Cathedral City, CA 92234
PHONE: (800) 325-4488
FAX: (760) 321-9711
E-MAIL: info@ovac.com
WEB: http://www.ovac.com

PRODUCT: Ovac Flex-Eye
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ovac, Inc.
ADDRESS: 67-555 East Palm Canyon Drive
Unit C-103
Cathedral City, CA 92234
PHONE: (800) 325-4488
FAX: (760) 321-9711
E-MAIL: info@ovac.com
WEB: http://www.ovac.com

PRODUCT: Ovac Golden Eye
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ovac, Inc.
ADDRESS: 67-555 East Palm Canyon Drive
Unit C-103
Cathedral City, CA 92234
PHONE: (800) 325-4488
FAX: (760) 321-9711
E-MAIL: info@ovac.com
WEB: http://www.ovac.com

PRODUCT: Ovac Zacc
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ovac, Inc.
ADDRESS: 67-555 East Palm Canyon Drive
Unit C-103
Cathedral City, CA 92234
PHONE: (800) 325-4488
FAX: (760) 321-9711
E-MAIL: info@ovac.com
WEB: http://www.ovac.com

PRODUCT: Ovac Zoom-Eye
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ovac, Inc.
ADDRESS: 67-555 East Palm Canyon Drive
Unit C-103
Cathedral City, CA 92234
PHONE: (800) 325-4488
FAX: (760) 321-9711
E-MAIL: info@ovac.com
WEB: http://www.ovac.com

PRODUCT: Ovac Zoom-Flex
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ovac, Inc.
ADDRESS: 67-555 East Palm Canyon Drive
Unit C-103
Cathedral City, CA 92234
PHONE: (800) 325-4488
FAX: (760) 321-9711
E-MAIL: info@ovac.com
WEB: http://www.ovac.com

PRODUCT: Tvi Zoom
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: VideoEye
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: VideoEye Corp.
ADDRESS: 10211 West Emerald Street
Boise, ID 83704
PHONE: (800) 416-0758
FAX: (208) 658-1762
E-MAIL: jwelch@videoeyecorp.com
WEB: http://www.videoeyecorp.com

PRODUCT: ClearView On-Screen Magnifier
TYPE: CCTV
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Optelec
ADDRESS: 6 Liberty Way
Westford, MA 01886
PHONE: (800) 828-1056
FAX: (508) 692-6073
E-MAIL: sales@optelec.com
WEB: http://www.optelec.com

PRODUCT: Artic Duo MAGnifico
TYPE: Magnification
CLASS: Software
PLATFORM: PC
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Artic Magnum95
TYPE: Magnification
CLASS: Software
PLATFORM: PC
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Biggy
TYPE: Magnification
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: BigShot Screen Magnifier
TYPE: Magnification
CLASS: Software
PLATFORM: Windows
VENDOR: Ai Squared
ADDRESS: P.O. Box 669
Manchester, VT 05255-0669
PHONE: (802) 362-3612
FAX: (802) 362-1670
E-MAIL: zoomtext@aisquared.com
WEB: http://www.aisquared.com

PRODUCT: MAGIC
TYPE: Magnification
CLASS: Software
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Magnum Deluxe
TYPE: Magnification
CLASS: Software
PLATFORM: DOS/3.1
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Screen Magnifier OS/2
TYPE: Magnification
CLASS: Software
PLATFORM: OS/2
VENDOR: IBM Special Needs Center
ADDRESS: P.O. Box 1328
Boca Raton, FL 33429
PHONE: (800) 426-4832
E-MAIL: snsinfo@us.ibm.com
WEB: http://www.ibm.com/able

PRODUCT: Super Vista and Vista PCI
TYPE: Magnification
CLASS: Hardware
PLATFORM: PC
VENDOR: Telesensory
ADDRESS: 520 Almanor Avenue
Sunnyvale, CA 94086
PHONE: (408) 616-8700
FAX: (408) 616-8720
E-MAIL: info@telesensory.com
WEB: http://www.telesensory.com

PRODUCT: ZoomText
TYPE: Magnification
CLASS: Software
PLATFORM: Windows
VENDOR: Ai Squared
ADDRESS: P.O. Box 669
Manchester, VT 05255-0669
PHONE: (802) 362-3612
FAX: (802) 362-1670
E-MAIL: zoomtext@aisquared.com
WEB: http://www.aisquared.com

PRODUCT: ZoomText for DOS
TYPE: Magnification
CLASS: Software
PLATFORM: DOS
VENDOR: Ai Squared
ADDRESS: P.O. Box 669
Manchester, VT 05255-0669
PHONE: (802) 362-3612
FAX: (802) 362-1670
E-MAIL: zoomtext@aisquared.com
WEB: http://www.aisquared.com

PRODUCT: inLarge
TYPE: Magnification
CLASS: Software
PLATFORM: Mac
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street
Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: Artic BraillePAD
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Artic Brailledesk 2000
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Artic ERGOBraille
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Artic SQWERT
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Artic TransType 2000
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Braille Lite 2000
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific
com

PRODUCT: Braille'n Speak 2000
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific
com

PRODUCT: Braille-Note
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: Type 'n Speak 2000
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901

E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Voice-Note
TYPE: Note Taker
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: HumanWare, Inc.
ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: Kurzweil 1000
TYPE: Optical Character Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Lernout & Hauspie
ADDRESS: 52 Third Avenue
Burlington, MA 01803
PHONE: (781) 203-5000
FAX: (781) 238-0986
E-MAIL: sales@lhsl.com
WEB: http://www.lhsl.com

PRODUCT: Kurzweil 3000
TYPE: Optical Character Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Lernout & Hauspie
ADDRESS: 52 Third Avenue
Burlington, MA 01803
PHONE: (781) 203-5000
FAX: (781) 238-0986
E-MAIL: sales@lhsl.com
WEB: http://www.lhsl.com

PRODUCT: Open Book
TYPE: Optical Character Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Reading Advantage
TYPE: Optical Character Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Telesensory
ADDRESS: 520 Almanor Avenue
Sunnyvale, CA 94086
PHONE: (408) 616-8700
FAX: (408) 616-8720
E-MAIL: info@telesensory.com
WEB: http://www.telesensory.com

PRODUCT: Reading Edge
TYPE: Optical Character Recognition
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Telesensory
ADDRESS: 520 Almanor Avenue
Sunnyvale, CA 94086
PHONE: (408) 616-8700
FAX: (408) 616-8720
E-MAIL: info@telesensory.com
WEB: http://www.telesensory.com

PRODUCT: Simon
TYPE: Optical Character Recognition
CLASS: Hardware
PLATFORM: Windows
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: VIP
TYPE: Optical Character Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Jbliss Imaging Systems
ADDRESS: P.O. Box. 1746
Los Altos, CA 94023

PHONE: (408) 246-5783
FAX: (408) 246-5735
E-MAIL: info@jbliss.com
WEB: http://www.jbliss.com

PRODUCT: Vera
TYPE: Optical Character Recognition
CLASS: Hardware
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Artic Business Vision
TYPE: Screen Reader
CLASS: Software
PLATFORM: PC
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: Artic WinVision
TYPE: Screen Reader
CLASS: Software
PLATFORM: PC
VENDOR: Artic Technologies
ADDRESS: 55 Park Street
Troy, MI 48083
PHONE: (248) 588-7370
FAX: (248) 588-2650
E-MAIL: info@artictech.com
WEB: http://www.artictech.com

PRODUCT: JAWS for Windows
TYPE: Screen Reader
CLASS: Software
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Screen Reader DOS
TYPE: Screen Reader
CLASS: Software
PLATFORM: PC
VENDOR: IBM Special Needs Center
ADDRESS: P.O. Box 1328
Boca Raton, FL 33429
PHONE: (800) 426-4832
E-MAIL: snsinfo@us.ibm.com
WEB: http://www.ibm.com/able

PRODUCT: Screen Reader OS/2
TYPE: Screen Reader
CLASS: Software
PLATFORM: OS/2
VENDOR: IBM Special Needs Center
ADDRESS: P.O. Box 1328
Boca Raton, FL 33429
PHONE: (800) 426-4832
E-MAIL: snsinfo@us.ibm.com
WEB: http://www.ibm.com/able

PRODUCT: SpeakUp
TYPE: Screen Reader
CLASS: Software
PLATFORM: UNIX
VENDOR: Speakup.Org
E-MAIL: kirk@braille.uwo.ca
WEB: http://www.Linux-speakup.org

PRODUCT: Vocal-Eyes
TYPE: Screen Reader
CLASS: Software
PLATFORM: DOS
VENDOR: GW Micro, Inc.
ADDRESS: 725 Airport North Office Park
Fort Wayne, IN 46825
PHONE: (219) 489-3671
FAX: (219) 489-2608
E-MAIL: support@gwmicro.com
WEB: http://www.gwmicro.com

PRODUCT: WiVox
TYPE: Screen Reader
CLASS: Software
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Window Bridge 2000
TYPE: Screen Reader
CLASS: Software
PLATFORM: PC
VENDOR: Syntha-voice Computers, Inc.
ADDRESS: 304-800 Queenston Road
Stoney Creek, ON L8G 1A7
Canada
PHONE: (800) 263-4540
FAX: (905) 662-0568
E-MAIL: help@synthavoice.com
WEB: http://www.synthavoice.com

PRODUCT: Window-Eyes
TYPE: Screen Reader
CLASS: Software
PLATFORM: PC
VENDOR: GW Micro, Inc.
ADDRESS: 725 Airport North Office Park
Fort Wayne, IN 46825
PHONE: (219) 489-3671
FAX: (219) 489-2608
E-MAIL: support@gwmicro.com
WEB: http://www.gwmicro.com

PRODUCT: XVI-SB
TYPE: Screen Reader
CLASS: Software
PLATFORM: Unix
VENDOR: Beam, Ltd.
ADDRESS: Northavon Business Center
Dean Road
Yate, NA BS37 5NH England
PHONE: 44-01454-324512
FAX: 44-01454-313172
E-MAIL: beam@beam.demon.co.uk
WEB: http://www.beam.demon.co.uk

PRODUCT: outSpoken Ensemble
TYPE: Screen Reader
CLASS: Software
PLATFORM: Mac
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street
Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: outSpoken for Windows+
TYPE: Screen Reader
CLASS: Software
PLATFORM: Mac
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street
Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: outSpoken for Macintosh
TYPE: Screen Reader
CLASS: Software
PLATFORM: Mac
VENDOR: ALVA Access Group, Inc.
ADDRESS: 436 14th Street
Suite 700
Oakland, CA 94612
PHONE: (888) 318-2582
FAX: (510) 451-0878
E-MAIL: info@aagi.com
WEB: http://www.aagi.com

PRODUCT: TeleBraille
TYPE: TTY/Braille
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901

E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: Home Page Reader
TYPE: Talking Browser
CLASS: Software
PLATFORM: PC
VENDOR: IBM Special Needs Center
ADDRESS: P.O. Box 1328
Boca Raton, FL 33429
PHONE: (800) 426-4832
E-MAIL: snsinfo@us.ibm.com
WEB: http://www.ibm.com/able

PRODUCT: pwWebSpeak
TYPE: Talking Browser
CLASS: Software
PLATFORM: PC
VENDOR: Productivity Works
ADDRESS: 7 Belmont Circle
Trenton, NJ 08618
PHONE: (609) 984-8044
FAX: (609) 984-8048
E-MAIL: info@prodworks.com
WEB: http://www.prodworks.com

APPENDIX D

Products for Persons Who Are Deaf or Hard of Hearing

This appendix provides a list of products and their vendor contact information. Here's a brief description of the information shown below. *Product* shows the name of the adaptive product or device. *Type* denotes the category of the product: screen reader, TTY, braille display, keyboard emulator, CCTV, voice recognition, alternative keyboard, communication, and so forth. *Class* indicates whether the product is either hardware or software. Some hardware products may also include a software component. *Platform* shows which computer operating system is supported: Windows, DOS, Macintosh, Unix, or stand-alone. Stand-alone products can often connect to PCs but can also operate independently. *Vendor* indicates the manufacturer's name, and *Address* provides the manufacturer's mailing address. The voice phone, fax, and TTY numbers of manufacturers are also provided. The e-mail contact and Web site for the manufacturer are also supplied. No endorsements are intended by inclusion on this list. Similarly, lack of inclusion does not imply a lack of endorsement. Due to space limitations and the fact that there are literally tens of thousands of adaptive products on the market, this list is intended to serve as a representative sample of some of the solutions that are available. For additional product information, point your browser to http://www.abledata.com to browse the over 25,000 products found in the AbleData online database.

PRODUCT: Alert Master
TYPE: Alarm
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Auditech
ADDRESS: P.O. Box 821105
Vicksburg, MS 39182-1105
PHONE: (800) 229-8293
TTY: (800) 229-8293
FAX: (800) 221-8639
E-MAIL: auditech@magnolia.net
WEB: http://www.auditechusa.com

PRODUCT: Wireless Doorbell
TYPE: Alarm
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Auditech
ADDRESS: P.O. Box 821105
Vicksburg, MS 39182-1105
PHONE: (800) 229-8293
TTY: (800) 229-8293
FAX: (800) 221-8639
E-MAIL: auditech@magnolia.net
WEB: http://www.auditechusa.com

PRODUCT: AudioLink
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Cheetah International, Inc.
ADDRESS: 40 North Swan Road
Suite 112
Tucson, AZ 85711
PHONE: (800) 869-6986
TTY: (800) 869-6986
FAX: (520) 886-6286

E-MAIL: support@caption.com
WEB: http://www.caption.com

PRODUCT: CAPtivator Offline
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Cheetah International, Inc.
ADDRESS: 40 North Swan Road
Suite 112
Tucson, AZ 85711
PHONE: (800) 869-6986
TTY: (800) 869-6986
FAX: (520) 886-6286
E-MAIL: support@caption.com
WEB: http://www.caption.com

PRODUCT: CAPtivator Online
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Cheetah International, Inc.
ADDRESS: 40 North Swan Road
Suite 112
Tucson, AZ 85711
PHONE: (800) 869-6986
TTY: (800) 869-6986
FAX: (520) 886-6286
E-MAIL: support@caption.com
WEB: http://www.caption.com

PRODUCT: Dynacaption
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Image Logic
ADDRESS: 6807 Brennon Lane
Chevy Chase, MD 20815-3255
PHONE: (301) 907-8891
TTY: (301) 907-8891
FAX: (301) 652-6584
E-MAIL: imagelogic@ibm.net
WEB: http://www.imagelogic.com

PRODUCT: EEG Character Generator Decoder
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: EEG EN255 Line 21 Smart Encoder
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: Infosign
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: Stand-Alone
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: Link Decoder
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: Link PCE 845 Line 21 Encoder
TYPE: Captioning

CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: Norpak Line 21 Encoders, Decoders, Data Encoder
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: Noteview
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: RapidCaption
TYPE: Captioning
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: RapidPrint
TYPE: Captioning
CLASS: Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: RapidText
TYPE: Captioning
CLASS: Software
PLATFORM: Stand-Alone
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: SimulView
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Cheetah International, Inc.
ADDRESS: 40 North Swan Road
Suite 112
Tucson, AZ 85711
PHONE: (800) 869-6986
TTY: (800) 869-6986
FAX: (520) 886-6286
E-MAIL: support@caption.com
WEB: http://www.caption.com

PRODUCT: Softouch Encoder/Decoder
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Rapidtext
ADDRESS: 1801 Dove Street
Suite 101
Newport Beach, CA 92660
PHONE: (949) 399-9200
E-MAIL: info@rapidtext.com
WEB: http://www.rapidtext.com

PRODUCT: StudioCaption
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Image Logic
ADDRESS: 6807 Brennon Lane
Chevy Chase, MD 20815-3255
PHONE: (301) 907-8891
TTY: (301) 907-8891
FAX: (301) 652-6584
E-MAIL: imagelogic@ibm.net
WEB: http://www.imagelogic.com

PRODUCT: Total Access
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Cheetah International, Inc.
ADDRESS: 40 North Swan Road
Suite 112
Tucson, AZ 85711
PHONE: (800) 869-6986
TTY: (800) 869-6986
FAX: (520) 886-6286
E-MAIL: support@caption.com
WEB: http://www.caption.com

PRODUCT: TurboCAT
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Cheetah International, Inc.
ADDRESS: 40 North Swan Road
Suite 112
Tucson, AZ 85711
PHONE: (800) 869-6986
TTY: (800) 869-6986
FAX: (520) 886-6286
E-MAIL: support@caption.com
WEB: http://www.caption.com

PRODUCT: TurboSquish
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Cheetah International, Inc.
ADDRESS: 40 North Swan Road
Suite 112
Tucson, AZ 85711
PHONE: (800) 869-6986
TTY: (800) 869-6986
FAX: (520) 886-6286
E-MAIL: support@caption.com
WEB: http://www.caption.com

PRODUCT: Vidicaption
TYPE: Captioning
CLASS: Hardware/Software
PLATFORM: PC
VENDOR: Image Logic
ADDRESS: 6807 Brennon Lane
Chevy Chase, MD 20815-3255
PHONE: (301) 907-8891
TTY: (301) 907-8891
FAX: (301) 652-6584
E-MAIL: imagelogic@ibm.net
WEB: http://www.imagelogic.com

PRODUCT: HyperSign Jr.
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: PC
VENDOR: Trinity Software
ADDRESS: 607 Tenney Mountain Highway
Suite 215
Plymouth, NH 03264-9955
PHONE: (800) 352-1282
FAX: (603) 536-9951
E-MAIL: trsoft@lr.net
WEB: http://www.trinitysoftware.com/speech/index.html

PRODUCT: HyperSign: Personal Version
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: PC
VENDOR: Trinity Software
ADDRESS: 607 Tenney Mountain Highway
Suite 215
Plymouth, NH 03264-9955
PHONE: (800) 352-1282
FAX: (603) 536-9951
E-MAIL: trsoft@lr.net
WEB: http://www.trinitysoftware.com/speech/index.html

PRODUCT: HyperSign: Teacher Version
TYPE: Evaluation/Training

CLASS: Software
PLATFORM: PC
VENDOR: Trinity Software
ADDRESS: 607 Tenney Mountain Highway
Suite 215
Plymouth, NH 03264-9955
PHONE: (800) 352-1282
FAX: (603) 536-9951
E-MAIL: trsoft@lr.net
WEB: http://www.trinitysoftware.com/speech/index.html

PRODUCT: Companion FM System
TYPE: Listening Device
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Auditech
ADDRESS: P.O. Box 821105
Vicksburg, MS 39182-1105
PHONE: (800) 229-8293
TTY: (800) 229-8293
FAX: (800) 221-8639
E-MAIL: auditech@magnolia.net
WEB: http://www.auditechusa.com

PRODUCT: MicroLoop II
TYPE: Listening Device
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Auditech
ADDRESS: P.O. Box 821105
Vicksburg, MS 39182-1105
PHONE: (800) 229-8293
TTY: (800) 229-8293
FAX: (800) 221-8639
E-MAIL: auditech@magnolia.net
WEB: http://www.auditechusa.com

PRODUCT: ADA Compliance Kit
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Auditech
ADDRESS: P.O. Box 821105
Vicksburg, MS 39182-1105
PHONE: (800) 229-8293
TTY: (800) 229-8293
FAX: (800) 221-8639
E-MAIL: auditech@magnolia.net
WEB: http://www.auditechusa.com

PRODUCT: Compact/C
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: EZcom Pro
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: EZcom Pro/C
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: Minicom
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone

VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: Miniprint
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: Supercom
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: Superprint
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: Superprint Pro80
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: Uniphone
TYPE: TTY
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Ultratec, Inc.
ADDRESS: 450 Science Drive
Madison, WI 53711
PHONE: (608) 238-5400
TTY: (608) 238-5400
FAX: (608) 238-3008
E-MAIL: service@ultratec.com
WEB: http://www.ultratec.com

PRODUCT: TeleBraille
TYPE: TTY/Braille
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

APPENDIX E

Products for Persons with Motor Disabilities

This appendix provides a list of products and their vendor contact information. Here's a brief description of the information shown below. *Product* shows the name of the adaptive product or device. *Type* denotes the category of the product: screen reader, TTY, braille display, keyboard emulator, CCTV, voice recognition, alternative keyboard, communication, and so forth. *Class* indicates whether the product is either hardware or software. Some hardware products may also include a software component. *Platform* shows which computer operating system is supported: Windows, DOS, Macintosh, Unix, or stand-alone. Stand-alone products can often connect to PCs but can also operate independently. *Vendor* indicates the manufacturer's name, and *Address* provides the manufacturer's mailing address. The voice phone, fax, and TTY numbers of manufacturers are also provided. The e-mail contact and Web site for the manufacturer are also supplied. No endorsements are intended by inclusion on this list. Similarly, lack of inclusion does not imply a lack of endorsement. Due to space limitations and the fact that there are literally tens of thousands of adaptive products on the market, this list is intended to serve as a representative sample of some of the solutions that are available. For additional product information, point your browser to http://www.abledata.com to browse the over 25,000 products found in the AbleData online database.

PRODUCT: 101 Animations
TYPE: Alternative Keyboard
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: DARCI TOO
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: PC
VENDOR: WesTest Engineering Corporation
ADDRESS: 810 W. Shepard Lane
Farmington, UT 84025
PHONE: (801) 451-9191
FAX: (801) 451-9393
E-MAIL: engineering@westest.com
WEB: http://www.westest.com

PRODUCT: Darci Card with Morse/Plus
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: PC
VENDOR: WesTest Engineering Corporation
ADDRESS: 810 W. Shepard Lane
Farmington, UT 84025
PHONE: (801) 451-9191
FAX: (801) 451-9393
E-MAIL: engineering@westest.com
WEB: http://www.westest.com

PRODUCT: Darci Card with Super Scan
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: PC
VENDOR: WesTest Engineering Corporation
ADDRESS: 810 W. Shepard Lane
Farmington, UT 84025
PHONE: (801) 451-9191
FAX: (801) 451-9393
E-MAIL: engineering@westest.com
WEB: http://www.westest.com

PRODUCT: Enlarged/Reduced Keyboard
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Flexiboard
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: LINK
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: My First Keyboard
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: AlphaTalker II
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Delta Talker
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Freestyle
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Infra-Link Telephone
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Director II
TYPE: Environmental Control Unit
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: MultiPhone
TYPE: Environmental Control Unit
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Page Turner BLV-6
TYPE: Environmental Control Unit
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: 2 + 2
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: EvaluWare
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Joystick and Mouse Trainer
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169

E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Stages
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: OnScreen
TYPE: Keyboard Emulator
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: WiVik 2-0
TYPE: Keyboard Emulator
CLASS: Software
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: WiVik REP
TYPE: Keyboard Emulator
CLASS: Software
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: WiVik2 REP
TYPE: Keyboard Emulator
CLASS: Software
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: WiVik2 with Scanning
TYPE: Keyboard Emulator
CLASS: Software
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: EyeWare
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Headmaster 2000
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691

PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Headmaster Plus
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: Mac/PC/SUN
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Headmaster Plus Remote Adapter
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Ion
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: PC
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: JOUSE
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Joystick SAM
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Switch-Adapted Mouse
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: textHELP! Read 2 Write
TYPE: Productivity
CLASS: Software
PLATFORM: PC
VENDOR: textHELP! Systems, Ltd.
ADDRESS: 25 Randalstown Road
Antrim, BT41 4LJ N. Ireland
PHONE: (888) 333-9907 (U.S. toll-free voice mail)
FAX: (887) 631-5991 (U.S. toll-free fax)
E-MAIL: info@texthelp.com
WEB: http://www.texthelp.com

PRODUCT: textHELP! Type 2 Talk
TYPE: Productivity
CLASS: Software

PLATFORM: PC
VENDOR: textHELP! Systems, Ltd.
ADDRESS: 25 Randalstown Road
Antrim, BT41 4LJ N. Ireland
PHONE: (888) 333-9907 (U.S. toll-free voice mail)
FAX: (887) 631-5991 (U.S. toll-free fax)
E-MAIL: info@texthelp.com
WEB: http://www.texthelp.com

PRODUCT: Adult Switch and Touch Window Progressions
TYPE: Switch
CLASS: Software
PLATFORM: Apple II
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: BIG Baby Buttons
TYPE: Switch
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Build-A-Scene
TYPE: Switch
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Children's Switch Progressions
TYPE: Switch
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: CrossScanner
TYPE: Switch
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Early and Advanced Switch Games
TYPE: Switch
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: P.I.A.F.
TYPE: Switch
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: HumanWare, Inc.

ADDRESS: 6245 King Road
Loomis, CA 95650
PHONE: (800) 722-3393
FAX: (916) 652-7296
E-MAIL: info@humanware.com
WEB: http://www.humanware.com

PRODUCT: Switches
TYPE: Switch
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Teenage Switch Progressions
TYPE: Switch
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: L&H Dragon Naturally Speaking
TYPE: Voice Recognition
CLASS: Software
PLATFORM: PC
VENDOR: L&H Dragon Systems, Inc.
ADDRESS: 320 Nevada Street
Newton, MA 02160
PHONE: (888) 343-3773
FAX: (617) 527-0372
E-MAIL: info@dragonsys.com
WEB: http://www.dragonsys.com

PRODUCT: Now You're Talking on the Web
TYPE: Voice Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Lernout & Hauspie
ADDRESS: 52 Third Avenue
Burlington, MA 01803
PHONE: (781) 203-5000
FAX: (781) 238-0986
E-MAIL: sales@lhsl.com
WEB: http://www.lhsl.com

PRODUCT: PowerSecretary
TYPE: Voice Recognition
CLASS: Software
PLATFORM: Mac
VENDOR: L&H Dragon Systems, Inc.
ADDRESS: 320 Nevada Street
Newton, MA 02160
PHONE: (888) 343-3773
FAX: (617) 527-0372
E-MAIL: info@dragonsys.com
WEB: http://www.dragonsys.com

PRODUCT: ViaVoice
TYPE: Voice Recognition
CLASS: Software
PLATFORM: PC
VENDOR: IBM Special Needs Center
ADDRESS: P.O. Box 1328
Boca Raton, FL 33429
PHONE: (800) 426-4832
E-MAIL: snsinfo@us.ibm.com
WEB: http://www.ibm.com/able

PRODUCT: Voice Express
TYPE: Voice Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Lernout & Hauspie
ADDRESS: 52 Third Avenue
Burlington, MA 01803
PHONE: (781) 203-5000
FAX: (781) 238-0986
E-MAIL: sales@lhsl.com
WEB: http://www.lhsl.com

PRODUCT: ProtoType
TYPE: Word Prediction
CLASS: Hardware
PLATFORM: PC
VENDOR: Zygo Industries

ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: KeyREP
TYPE: Writing
CLASS: Software
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

APPENDIX F

Products for Persons with Speech Disabilities

This appendix provides a list of products and their vendor contact information. Here's a brief description of the information shown below. *Product* shows the name of the adaptive product or device. *Type* denotes the category of the product: screen reader, TTY, braille display, keyboard emulator, CCTV, voice recognition, alternative keyboard, communication, and so forth. *Class* indicates whether the product is either hardware or software. Some hardware products may also include a software component. *Platform* shows which computer operating system is supported: Windows, DOS, Macintosh, Unix, or stand-alone. Stand-alone products can often connect to PCs but can also operate independently. *Vendor* indicates the manufacturer's name, and *Address* provides the manufacturer's mailing address. The voice phone, fax, and TTY numbers of manufacturers are also provided. The e-mail contact and Web site for the manufacturer are also supplied. No endorsements are intended by inclusion on this list. Similarly, lack of inclusion does not imply a lack of endorsement. Due to space limitations and the fact that there are literally tens of thousands of adaptive products on the market, this list is intended to serve as a representative sample of some of the solutions that are available. For additional product information, point your browser to http://www.abledata.com to browse the over 25,000 products found in the AbleData online database.

PRODUCT: LINK
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Casi-Cam
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Delta Talker
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: EZ Keys for Windows
TYPE: Communication
CLASS: Software
PLATFORM: PC
VENDOR: Words +, Inc.
ADDRESS: 1220 W. Avenue J
Lancaster, CA 93534-2902
PHONE: (661) 723-6523
FAX: (661) 723-2114
E-MAIL: support@words-plus.com
WEB: http://www.words-plus.com

PRODUCT: Freedom 2000
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Words +, Inc.
ADDRESS: 1220 W. Avenue J
Lancaster, CA 93534-2902
PHONE: (661) 723-6523
FAX: (661) 723-2114
E-MAIL: support@words-plus.com
WEB: http://www.words-plus.com

PRODUCT: Freestyle
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@
assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: HandsOFF
TYPE: Communication
CLASS: Software
PLATFORM: PC
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Liberator II
TYPE: Communication
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Lightwriter SL25
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Lightwriter SL35
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Lightwriter SL5
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Lightwriter SL55
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Lightwriter SL56
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Lightwriter SL85
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Macaw
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: MessageMate
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Words +, Inc.
ADDRESS: 1220 W. Avenue J
Lancaster, CA 93534-2902
PHONE: (661) 723-6523
FAX: (661) 723-2114
E-MAIL: support@words-plus.com
WEB: http://www.words-plus.com

PRODUCT: Mini-Message Mate
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Words +, Inc.
ADDRESS: 1220 W. Avenue J
Lancaster, CA 93534-2902
PHONE: (661) 723-6523
FAX: (661) 723-2114
E-MAIL: support@words-plus.com
WEB: http://www.words-plus.com

PRODUCT: Multi-Level MessageMate 40
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Words +, Inc.
ADDRESS: 1220 W. Avenue J
Lancaster, CA 93534-2902
PHONE: (661) 723-6523
FAX: (661) 723-2114
E-MAIL: support@words-plus.com
WEB: http://www.words-plus.com

PRODUCT: Parakeet 15
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Parakeet 5
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: PictoCOM II SE
TYPE: Communication
CLASS: Software
PLATFORM: Mac/PC
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Point to Pictures
TYPE: Communication
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Sidekick
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Spectra
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Communication Devices, Inc.
ADDRESS: 4830 Industrial Way West
Coeur d'Alene, ID 83815
PHONE: (800) 604-6559
FAX: (208) 765-1529
E-MAIL: sales@comdevices.com
WEB: http://www.comdevices.com

PRODUCT: Spell-A-Word
TYPE: Communication
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Talking Screen for Windows
TYPE: Communication
CLASS: Software
PLATFORM: PC
VENDOR: Words +, Inc.
ADDRESS: 1220 W. Avenue J
Lancaster, CA 93534-2902
PHONE: (661) 723-6523
FAX: (661) 723-2114
E-MAIL: support@words-plus.com
WEB: http://www.words-plus.com

PRODUCT: Vanguard
TYPE: Communication
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Windbag
TYPE: Communication
CLASS: Software
PLATFORM: PC
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Director II
TYPE: ECU
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: MultiPhone
TYPE: ECU
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@
assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: EvaluWare
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@
assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Pronunciation Screening Test
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Trinity Software
ADDRESS: 607 Tenney Mountain Highway
Suite 215
Plymouth, NH 03264-9955
PHONE: (800) 352-1282
FAX: (603) 536-9951
E-MAIL: trsoft@lr.net
WEB: http://www.trinitysoftware.
com/speech/index.html

PRODUCT: Speech Viewer
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: PC
VENDOR: IBM Special Needs Center
ADDRESS: P.O. Box 1328
Boca Raton, FL 33429
PHONE: (800) 426-4832
E-MAIL: snsinfo@us.ibm.com
WEB: http://www.ibm.com/able

PRODUCT: Speech Works: Personal
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac/PC
VENDOR: Trinity Software
ADDRESS: 607 Tenney Mountain Highway
Suite 215
Plymouth, NH 03264-9955
PHONE: (800) 352-1282
FAX: (603) 536-9951
E-MAIL: trsoft@lr.net
WEB: http://www.trinitysoftware.
com/speech/index.html

PRODUCT: Speech Works: Professional
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac/PC
VENDOR: Trinity Software
ADDRESS: 607 Tenney Mountain Highway
Suite 215
Plymouth, NH 03264-9955
PHONE: (800) 352-1282

FAX: (603) 536-9951
E-MAIL: trsoft@lr.net
WEB: http://www.trinitysoftware.com/speech/index.html

PRODUCT: Stages
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: EyeWare
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Winspeak
TYPE: Speech Software
CLASS: Software
PLATFORM: PC
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: Adult Switch and Touch Window Progressions
TYPE: Switch
CLASS: Software
PLATFORM: Apple II
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Switches
TYPE: Switch
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: ProtoType
TYPE: Word Prediction
CLASS: Hardware
PLATFORM: PC
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

APPENDIX G

Products for Persons with Learning Disabilities

This appendix provides a list of products and their vendor contact information. Here's a brief description of the information shown below. *Product* shows the name of the adaptive product or device. *Type* denotes the category of the product: screen reader, TTY, braille display, keyboard emulator, CCTV, voice recognition, alternative keyboard, communication, and so forth. *Class* indicates whether the product is either hardware or software. Some hardware products may also include a software component. *Platform* shows which computer operating system is supported: Windows, DOS, Macintosh, Unix, or stand-alone. Stand-alone products can often connect to PCs but can also operate independently. *Vendor* indicates the manufacturer's name, and *Address* provides the manufacturer's mailing address. The voice phone, fax, and TTY numbers of manufacturers are also provided. The e-mail contact and Web site for the manufacturer are also supplied. No endorsements are intended by inclusion on this list. Similarly, lack of inclusion does not imply a lack of endorsement. Due to space limitations and the fact that there are literally tens of thousands of adaptive products on the market, this list is intended to serve as a representative sample of some of the solutions that are available. For additional product information, point your browser to http://www.abledata.com to browse the over 25,000 products found in the AbleData online database.

PRODUCT: 101 Animations
TYPE: Alternative Keyboard
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Intellikeys
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: IntelliTools, Inc.
ADDRESS: 1720 Corporate Circle
Petaluma, CA 94954
PHONE: (800) 899-6687
FAX: (707) 773-2001
E-MAIL: info@intellitools.com
WEB: http://www.intellitools.com

PRODUCT: LINK
TYPE: Alternative Keyboard
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Blocks in Motion
TYPE: Authoring
CLASS: Software
PLATFORM: Mac
VENDOR: Don Johnston Incorporated
ADDRESS: 26799 West Commerce Drive
Volo, IL 60073
PHONE: (800) 999-4660
FAX: (847) 740-7326
E-MAIL: info@donjohnston.com
WEB: http://www.donjohnston.com

PRODUCT: Intellipics
TYPE: Authoring
CLASS: Software
PLATFORM: Mac/PC
VENDOR: IntelliTools, Inc.
ADDRESS: 1720 Corporate Circle
Petaluma, CA 94954
PHONE: (800) 899-6687
FAX: (707) 773-2001
E-MAIL: info@intellitools.com
WEB: http://www.intellitools.com

PRODUCT: Point to Pictures
TYPE: Communication
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Spell-A-Word
TYPE: Communication
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: AlphaSmart 3000
TYPE: Computer Companion
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: AlphaSmart, Inc.
ADDRESS: 20400 Stevens Creek Boulevard
Suite 300
Cupertino, CA 95014
PHONE: (888) 274-0680
FAX: (408) 252-9409
E-MAIL: info@alphasmart.com
WEB: http://www.alphasmart.com

PRODUCT: DreamWriter
TYPE: Computer Companion
CLASS: Hardware
PLATFORM: Stand-Alone
VENDOR: NTS Computer Systems, Ltd.
ADDRESS: 11491 Kingston Street
Maple Ridge, BC Canada
V2X OY6
PHONE: (800) 663-7163
FAX: (604) 465-3323
E-MAIL: info@dreamwriter.com
WEB: http://dreamwriter.com

PRODUCT: 2 + 2
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Access to Math
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Don Johnston Incorporated
ADDRESS: 26799 West Commerce Drive
Volo, IL 60073
PHONE: (800) 999-4660
FAX: (847) 740-7326

E-MAIL: info@donjohnston.com
WEB: http://www.donjohnston.com

PRODUCT: EvaluWare
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Simon Skills Pack
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Don Johnston Incorporated
ADDRESS: 26799 West Commerce Drive
Volo, IL 60073
PHONE: (800) 999-4660
FAX: (847) 740-7326
E-MAIL: info@donjohnston.com
WEB: http://www.donjohnston.com

PRODUCT: Stages
TYPE: Evaluation/Training
CLASS: Software
PLATFORM: Mac
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Switch-Adapted Mouse
TYPE: Mouse Emulator
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Kurzweil 3000
TYPE: Optical Character Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Lernout & Hauspie
ADDRESS: 52 Third Avenue
Burlington, MA 01803
PHONE: (781) 203-5000
FAX: (781) 238-0986
E-MAIL: sales@lhsl.com
WEB: http://www.lhsl.com

PRODUCT: WYNN
TYPE: Optical Character Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Freedom Scientific, Inc.
ADDRESS: 11800 31st Court North
St. Petersburg, FL 33716
PHONE: (800) 444-4443
FAX: (813) 528-8901
E-MAIL: info@freedomscientific.com
WEB: http://www.freedomscientific.com

PRODUCT: textHelp! Read 2 Write
TYPE: Productivity
CLASS: Software
PLATFORM: PC
VENDOR: textHelp! Systems, Ltd.
ADDRESS: 25 Randalstown Road
Antrim, BT41 4LJ N. Ireland
PHONE: (888) 333-9907 (U.S. toll-free voice mail)
FAX: (887) 631-5991 (U.S. toll-free fax)
E-MAIL: info@texthelp.com
WEB: http://www.texthelp.com

PRODUCT: textHelp! Type 2 Talk
TYPE: Productivity
CLASS: Software
PLATFORM: PC

VENDOR: textHelp! Systems, Ltd.
ADDRESS: 25 Randalstown Road
Antrim, BT41 4LJ N. Ireland
PHONE: (888) 333-9907 (U.S. toll-free voice mail)
FAX: (887) 631-5991 (U.S. toll-free fax)
E-MAIL: info@texthelp.com
WEB: http://www.texthelp.com

PRODUCT: Adult Switch and Touch Window Progressions
TYPE: Switch
CLASS: Software
PLATFORM: Apple II
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Children's Switch Progressions
TYPE: Switch
CLASS: Software
PLATFORM: Mac/PC
VENDOR: RJ Cooper & Associates
ADDRESS: 27601 Forbes Road
Suite 39
Laguna Niguel, CA 92677
PHONE: (800) 752-6673
FAX: (949) 582-3169
E-MAIL: info@rjcooper.com
WEB: http://www.rjcooper.com

PRODUCT: Switches
TYPE: Switch
CLASS: Hardware
PLATFORM: Mac/PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Home Page Reader
TYPE: Talking Browser
CLASS: Software
PLATFORM: PC
VENDOR: IBM Special Needs Center
ADDRESS: P.O. Box 1328
Boca Raton, FL 33429
PHONE: (800) 426-4832
E-MAIL: snsinfo@us.ibm.com
WEB: http://www.ibm.com/able

PRODUCT: L&H Dragon Naturally Speaking
TYPE: Voice Recognition
CLASS: Software
PLATFORM: PC
VENDOR: L&H Dragon Systems, Inc.
ADDRESS: 320 Nevada Street
Newton, MA 02160
PHONE: (888) 343-3773
FAX: (617) 527-0372
E-MAIL: info@dragonsys.com
WEB: http://www.dragonsys.com

PRODUCT: Now You're Talking on the Web
TYPE: Voice Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Lernout & Hauspie
ADDRESS: 52 Third Avenue
Burlington, MA 01803
PHONE: (781) 203-5000
FAX: (781) 238-0986
E-MAIL: sales@lhsl.com
WEB: http://www.lhsl.com

PRODUCT: Voice Express
TYPE: Voice Recognition
CLASS: Software
PLATFORM: PC
VENDOR: Lernout & Hauspie
ADDRESS: 52 Third Avenue
Burlington, MA 01803
PHONE: (781) 203-5000
FAX: (781) 238-0986
E-MAIL: sales@lhsl.com
WEB: http://www.lhsl.com

PRODUCT: Intellitalk
TYPE: Word Prediction
CLASS: Software
PLATFORM: Mac/PC
VENDOR: IntelliTools, Inc.
ADDRESS: 1720 Corporate Circle
Petaluma, CA 94954
PHONE: (800) 899-6687
FAX: (707) 773-2001
E-MAIL: info@intellitools.com
WEB: http://www.intellitools.com

PRODUCT: ProtoType
TYPE: Word Prediction
CLASS: Hardware
PLATFORM: PC
VENDOR: Zygo Industries
ADDRESS: P.O. Box 1008
Portland, OR 97207
PHONE: (503) 684-6006
FAX: (503) 684-6011
E-MAIL: zygo@zygo-usa.com
WEB: http://www.zygo-usa.com

PRODUCT: SoothSayer
TYPE: Word Prediction
CLASS: Software
PLATFORM: PC
VENDOR: Applied Human Factors
ADDRESS: P.O. Box 781976
San Antonio, TX 78278
PHONE: (210) 408-0098
FAX: (210) 408-0097
E-MAIL: sales@ahf-net.com
WEB: http://www.ahf-net.com

PRODUCT: WriteAway
TYPE: Word Prediction
CLASS: Software
PLATFORM: PC
VENDOR: Assistive Technology, Inc.
ADDRESS: 7 Wells Avenue
Newton, MA 02459
PHONE: (800) 793-9227
FAX: (617) 641-9191
E-MAIL: customercare@
assistivetech.com
WEB: http://www.assistivetech.com

PRODUCT: Co:Writer
TYPE: Writing
CLASS: Software
PLATFORM: Mac/PC
VENDOR: Don Johnston Incorporated
ADDRESS: 26799 West Commerce Drive
Volo, IL 60073
PHONE: (800) 999-4660
FAX: (847) 740-7326
E-MAIL: info@donjohnston.com
WEB: http://www.donjohnston.com

PRODUCT: Dr. Peet's Talk Writer
TYPE: Writing
CLASS: Software
PLATFORM: Mac/PC
VENDOR: About Interest-Driven
Learning
ADDRESS: 4617 Saxon Drive
New Smyrna Beach, FL 32169
PHONE: (800) 245-5733
FAX: (904) 426-0100
E-MAIL: wpeet@drpeet.com
WEB: http://www.drpeet.com

PRODUCT: KeyREP
TYPE: Writing
CLASS: Software
PLATFORM: PC
VENDOR: Prentke Romich Company
ADDRESS: 1022 Heyl Road
Wooster, OH 44691
PHONE: (800) 262-1984
FAX: (330) 263-4829
E-MAIL: info@prentrom.com
WEB: http://www.prentrom.com

PRODUCT: Write:OutLoud
TYPE: Writing
CLASS: Software
PLATFORM: Mac/PC
VENDOR: Don Johnston Incorporated
ADDRESS: 26799 West Commerce Drive
Volo, IL 60073
PHONE: (800) 999-4660
FAX: (847) 740-7326
E-MAIL: info@donjohnston.com
WEB: http://www.donjohnston.com

APPENDIX H

National Resources for Persons with Disabilities

This appendix was compiled by the National Information Center for Children and Youth with Disabilities, P.O. Box 1492, Washington, DC 20013-1492. You can contact them by electronic mail at nichcy@aed.org, on the World Wide Web at http://www.nichcy.org, or by phone at (800) 695-0285 (Voice/TTY).

CLEARINGHOUSES

Center on Positive Behavioral Interventions and Support
1761 Alder Street
1235 University of Oregon
Eugene, OR 97403-5262
(541) 346-2505
E-mail: pbis@oregon.uoregon.edu
Web: http://www.pbis.org

Clearinghouse on Disability Information
Office of Special Education and Rehabilitative Services
Room 3132, Switzer Building
330 C Street, S.W.
Washington, DC 20202-2524
(202) 205-8241 (Voice/TTY)

DB-LINK
National Information Clearinghouse on Children Who Are Deaf-Blind
345 N. Monmouth Avenue
Monmouth, OR 97361
(800) 438-9376 (Voice);
(800) 854-7013 (TTY)
E-mail: dblink@tr.wou.edu
Web: http://www.tr.wou.edu/dblink

ERIC Clearinghouse on Disabilities and Gifted Education
Council for Exceptional Children (CEC)
1110 N. Glebe Road, Suite 300
Arlington, VA 22201-5704
(800) 328-0272 (Voice/TTY)
E-mail: ericec@cec.sped.org
Web: http://ericec.org

HEATH Resource Center (National Clearinghouse on Postsecondary Education for Individuals with Disabilities)
One Dupont Circle, N.W., Suite 800
Washington, DC 20036-1193
(800) 544-3284; (202) 939-9320 (Voice/TTY)
E-mail: heath@ace.nche.edu
Web: http://www.heath-resource-center.org

Laurent Clerc National Deaf Education Center and Clearinghouse
KDES PAS-6
800 Florida Avenue, N.E.
Washington, DC 20002-3695
(202) 651-5051; (202) 651-5052 (TTY)
E-mail: clearinghouse.infotogo@gallaudet.edu
Web: http://clerccenter.gallaudet.edu

National Clearinghouse for Alcohol and Drug Information (NCADI)
P.O. Box 2345
Rockville, MD 20847-2345
(800) 729-6686; (301) 468-2345;
(800) 487-4899 (TTY)
Publications available in Spanish

E-mail: info@health.org
Web: http://www.health.org

National Clearinghouse for Professions in Special Education
Council for Exceptional Children and Education for Children with Disabilities
Council for Exceptional Children
1110 N. Glebe Road, Suite 300
Arlington, VA 22201-5704
(800) 641-7824; (703) 264-9474 (Voice);
(703) 264-9480 (TTY)
E-mail: ncpse@cec.sped.org
Web: http://www.specialedcareers.org

National Diabetes Information Clearinghouse
One Information Way
Bethesda, MD 20892
(301) 654-3327
Publications available in Spanish
E-mail: ndic@info.niddk.nih.gov
Web: http://www.niddk.nih.gov/health/diabetes/ndic.htm

National Digestive Diseases Information Clearinghouse
Two Information Way
Bethesda, MD 20892
(301) 654-3327
Publications available in Spanish
E-mail: nddic@info.niddk.nih.gov
Web: http://www.niddk.nih.gov/health/digest/nddic.htm

National Health Information Center
P.O. Box 1133
Washington, DC 20013-1133
(800) 336-4797; (301) 565-4167
E-mail: nhicinfo@health.org
Web: http://nhic-nt.health.org

National Heart, Lung, and Blood Institute Information Center
P.O. Box 30105
Bethesda, MD 20824-0105
(800) 575-9355; (301) 592-8573
E-mail: NHLBIinfo@rover.nhlbi.nih.gov
Web: http://www.nhlbi.nih.gov

National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse
1 AMS Circle
Bethesda, MD 20892-3675
(877) 226-4267; (301) 495-4484 (Voice);
(301) 565-2966 (TTY)
Spanish speaker on staff
E-mail: NAMSIC@mail.nih.gov
Web: http://www.nih.gov/niams

National Institute on Deafness and Other Communication Disorders Clearinghouse
One Communication Avenue
Bethesda, MD 20892-3456
(800) 241-1044 (Voice);
(800) 241-1055 (TTY)
E-mail: nidcdinfo@nidcd.nih.gov
Web: http://www.nidcd.nih.gov

National Kidney and Urologic Diseases Information Clearinghouse
Three Information Way
Bethesda, MD 20892
(301) 654-3327
E-mail: nkudic@info.niddk.nih.gov
Web: http://www.niddk.nih.gov/health/kidney/nkudic.htm

National Lead Information Center
8601 Georgia Avenue, Suite 503
Silver Spring, MD 20910
(800) 424-5323
E-mail: hotline.lead@epa.gov
Web: http://www.epa.gov/lead/nlic.htm

National Maternal and Child Health Clearinghouse
2070 Chain Bridge Road, Suite 450
Vienna, VA 22182-2536
(888) 434-4624; (703) 821-8955
Publications available in Spanish
Spanish speaker on staff
E-mail: nmchc@circsol.com
Web: http://www.nmchc.org

National Organization for Rare Disorders (NORD)
P.O. Box 8923
New Fairfield, CT 06812-8923
(800) 999-6673; (203) 746-6518 (Voice);
(203) 746-6927 (TTY)
E-mail: orphan@rarediseases.org
Web: http://www.rarediseases.org

National Rehabilitation Information Center (NARIC)
1010 Wayne Avenue, Suite 800
Silver Spring, MD 20910-3319
(800) 346-2742; (301) 562-2403 (Voice);
(301) 495-5626 (TTY)
Web: http://www.naric.com

Research and Training Center on Family Support and Children's Mental Health
Portland State University
P.O. Box 751
Portland, OR 97207-0751
(800) 547-8887; (503) 725-4040 (Voice);
(503) 725-4165 (TTY)
E-mail: caplane@rri.pdx.edu
Web: http://www.rtc.pdx.edu

Research and Training Center on Independent Living
University of Kansas
4089 Dole Building
Lawrence, KS 66045-2930
(785) 864-4095 (Voice/TTY)
E-mail: rtcil@kuhub.cc.ukansas.edu
Web: http://www.lsi.ukans.edu/rtcil/catalog1.htm

ORGANIZATIONS

Alexander Graham Bell Association for the Deaf and Hard of Hearing
3417 Volta Place, N.W.
Washington, DC 20007
(202) 337-5220 (Voice);
(202) 337-5221 (TTY)
E-mail: info@agbell.org
Web: http://www.agbell.org

Alliance for Technology Access
2175 East Francisco Boulevard, Suite L
San Rafael, CA 94901
(800) 455-7970; (415) 455-4575 (Voice);
(415) 455-0491 (TTY)
E-mail: atainfo@ataccess.org
Web: http://www.ataccess.org

American Anorexia Bulimia Association
165 West 46 Street, #1108
New York, NY 10036
(212) 575-6200
E-mail: amanbu@aol.com
Web: http://www.aabainc.org

American Brain Tumor Association
2720 River Road
Des Moines IA 60018
(847) 827-9910; (800) 886-2282 (Patient Services)
E-mail: info@abta.org
Web: http://www.abta.org

American Council of the Blind
1155 15th Street, N.W., Suite 720
Washington, DC 20005
(800) 424-8666; (202) 467-5081
E-mail: ncrabb@erols.com
Web: http://www.acb.org

American Council on Rural Special Education (ACRES)
Kansas State University
2323 Anderson Avenue, Suite 226
Manhattan, KS 66502
(785) 532-2737
E-mail: acres@ksu.edu
Web: http://www.ksu.edu/acres

American Diabetes Association
1701 N. Beauregard Street
Alexandria, VA 22311
(800) 342-2383; (703) 549-1500
E-mail: customerservice@diabetes.org
Web: http://www.diabetes.org

American Foundation for the Blind (AFB)
11 Penn Plaza, Suite 300
New York, NY 10001
(800) 232-5463; (212) 502-7662 (TTY)
Publications available in Spanish
E-mail: afbinfo@afb.org
Web: http://www.afb.org

American Heart Association—National Center
7272 Greenville Avenue
Dallas, TX 75231
(800) 242-8721; (214) 373-6300
E-mail: inquire@amhrt.org
Web: http://www.americanheart.org

American Lung Association
1740 Broadway
New York, NY 10019
(800) 586-4872; (212) 315-8700
E-mail: info@lungusa.org
Web: http://www.lungusa.org

American Occupational Therapy Association (AOTA)
4720 Montgomery Lane
P.O. Box 31220
Bethesda, MD 20824-1220
(301) 652-2682 (Voice)
Web: http://www.aota.org

American Physical Therapy Association (APTA)
1111 North Fairfax Street
Alexandria, VA 22314
(800) 999-2782; (703) 684-2782 (Voice); (703) 683-6748 (TTY)
E-mail: practice@apta.org
Web: http://www.apta.org

American Society for Deaf Children
P.O. Box 3355
Gettysburg, PA 17325
(800) 942-2732; (717) 334-7922 (Voice/TTY)
E-mail: ASDC1@aol.com
Web: http://www.deafchildren.org

American Speech-Language-Hearing Association (ASHA)
10801 Rockville Pike
Rockville, MD 20852
(800) 498-2071 (Voice/TTY); (301) 571-0457 (TTY)
Publications available in Spanish
Spanish speaker on staff
E-mail: actioncenter@asha.org
Web: http://www.asha.org

American Therapeutic Recreation Association
1414 Prince Street, Suite 204
Alexandria, VA 22314
(703) 683-9420
E-mail: atra@atra-tr.org
Web: http://www.atra-tr.org

Angelman Syndrome Foundation
414 Plaza Drive, Suite 209
Westmont, IL 60559
(800) 432-6435; (630) 734-9267
E-mail: asf@adminsys.com
Web: http://www.angelman.org

Anxiety Disorders Association of America
11900 Parklawn Drive, #100
Rockville, MD 20852-2624
(301) 231-9350
E-mail: AnxDis@adaa.org
Web: http://www.adaa.org

Aplastic Anemia & MDS International Foundation, Inc.
P.O. Box 613
Annapolis, MD 21404-0613
(800) 747-2820; (410) 867-0242
E-mail: aamdsoffice@aol.com
Web: http://www.aamds.org

The Arc (formerly the Association for Retarded Citizens of the U.S.)
1010 Wayne Avenue, Suite 650
Silver Spring, MD 20910
(301) 565-3842
E-mail: Info@thearc.org
Web: http://www.thearc.org

Asthma and Allergy Foundation of America
1233 20th Street, N.W., Suite 402
Washington, DC 20036
(800) 727-8462; (202) 466-7643
E-mail: info@aafa.org
Web: http://www.aafa.org

Autism Society of America
7910 Woodmont Avenue, Suite 300
Bethesda, MD 20814-3015
(800) 328-8476; (301) 657-0881
Publications available in Spanish
Web: http://www.autism-society.org

Brain Injury Association (formerly the National Head Injury Foundation)
105 North Alfred Street
Alexandria, VA 22314
(800) 444-6443; (703) 236-6000
Publications available in Spanish
E-mail: FamilyHelpline@biausa.org
Web: http://www.biausa.org

Center for Mental Health Services Knowledge Exchange Network
P.O. Box 42490
Washington, DC 20015
Publications available in Spanish
(800) 789-2647; (301) 443-9006 (TTY)
E-mail: ken@mentalhealth.org
Web: http://www.mentalhealth.org

Center for Universal Design
North Carolina State University School of Design
Box 8613
Raleigh, NC 27695-8613
(800) 647-6777; (919) 515-3082 (Voice/TTY)
E-mail: cahd@ncsu.edu
Web: http://www.design.ncsu.edu/cud

Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD)
8181 Professional Place, Suite 201
Landover, MD 20785
(301) 306-7070; (800) 233-4050 (to request information packet)
E-mail: national@chadd.org
Web: http://www.chadd.org

Children's Craniofacial Association
P.O. Box 280297
Dallas, TX 75243-4522
(800) 535-3643; (972) 994-9902
E-mail: contactcca@ccakids.com
Web: http://www.ccakids.com

Children's Liver Alliance
3835 Richmond Avenue, Suite 190
Staten Island, NY 10312-3828
(718) 987-6200
E-mail: Livers4Kids@earthlink.net
Web: http://livertx.org

Chronic Fatigue and Immune Dysfunction Syndrome Association
P.O. Box 220398
Charlotte, NC 28222-0398
(800) 442-3437; (704) 365-9755
E-mail: info@cfids.org
Web: http://www.cfids.org

Council for Exceptional Children (CEC)
1110 N. Glebe Road, Suite 300
Arlington, VA 22201-5704
(703) 620-3660 (Voice);
(703) 264-9446 (TTY)
E-mail: cec@cec.sped.org
Web: http://www.cec.sped.org

Craniofacial Foundation of America
975 East Third Street
Chattanooga, TN 37403
(800) 418-3223; (423) 778-9192
E-mail: farmertm@erlanger.org
Web: http://www.erlanger.org/cranio

Disability Statistics Rehabilitation, Research and Training Center
3333 California Street, Room 340
University of California at San Francisco
San Francisco, CA 94118
(415) 502-5210 (Voice);

(415) 502-5217 (TTY)
E-mail: distats@itsa.ucsf.edu
Web: http://dsc.ucsf.edu

Easter Seals—National Office
230 West Monroe Street, Suite 1800
Chicago, IL 60606
(800) 221-6827; (312) 726-6200 (Voice);
(312) 726-4258 (TTY)
E-mail: info@easter-seals.org
Web: http://www.easter-seals.org

Eating Disorders Awareness and Prevention, Inc. (EDAP)
603 Stewart Street, Suite 803
Seattle, WA 98101
(800) 931-2237; (206) 382-3587
E-mail: info@edap.org
Web: http://www.edap.org

Epilepsy Foundation—National Office
4351 Garden City Drive, 5th Floor
Landover, MD 20785-4941
(800) 332-1000; (301) 459-3700
Publications available in Spanish
Spanish speaker on staff
E-mail: postmaster@efa.org
Web: http://www.efa.org

FACES: The National Craniofacial Association
P.O. Box 11082
Chattanooga, TN 37401
(800) 332-2372; (423) 266-1632
E-mail: faces@faces-cranio.org
Web: http://www.faces-cranio.org

Family Resource Center on Disabilities
20 East Jackson Boulevard, Room 900
Chicago, IL 60604
(800) 952-4199 (Voice/TTY; toll-free in IL only);
(312) 939-3513 (Voice);
(312) 939-3519 (TTY)

Family Village (a global community of disability-related resources)
Waisman Center
University of Wisconsin–Madison
1500 Highland Avenue
Madison, WI 53705-2280
Web: http://www.familyvillage.wisc.edu

Family Voices (a national coalition speaking for children with special health care needs)
P.O. Box 769
Algodones, NM 87001
(888) 835-5669; (505) 867-2368
E-mail: kidshealth@familyvoices.org
Web: http://www.familyvoices.org

Father's Network
16120 N.E. 8th Street
Bellevue, WA 98008-3937
(425) 747-4004, ext. 218
E-mail: jmay@fathersnetwork.org
Web: http://www.fathersnetwork.org

Federation of Families for Children's Mental Health
1101 King Street, Suite 420
Alexandria, VA 22314
(703) 684-7710
Publications available in Spanish
E-mail: ffcmh@ffcmh.com
Web: http://www.ffcmh.org

Foundation for Ichthyosis & Related Skin Types
P.O. Box 669
Ardmore, PA 19003
(800) 545-3286; (610) 789-3995
E-mail: ICHTHYOSIS@aol.com
Web: http://www.libertynet.org/~ichthyos

The Genetic Alliance (formerly the Alliance of Genetic Support Groups)
4301 Connecticut, N.W., Suite 404
Washington, DC 20008
(800) 336-4363; (202) 966-5557
E-mail: info@geneticalliance.org
Web: http://www.geneticalliance.org

Head Start Bureau
Administration on Children, Youth and Families

U.S. Department of Health & Human Services
P.O. Box 1182
Washington, DC 20013
Web: http://www.acf.dhhs.gov/programs/hsb

Huntington's Disease Society of America
158 West 29th Street, 7th Floor
New York, NY 10001-5300
(800) 345-HDSA; (212) 242-1968
E-mail: hdsainfo@hdsa.org
Web: http://www.hdsa.org

Hydrocephalus Association
870 Market Street, #705
San Francisco, CA 94102
(415) 732-7040
E-mail: hydroassoc@aol.com
Web: http://www.hydroassoc.org

Independent Living Research Utilization Project
The Institute for Rehabilitation and Research
2323 South Sheppard, Suite 1000
Houston, TX 77019
(713) 520-0232 (Voice);
(713) 520-5136 (TTY)
E-mail: ilru@ilru.org
Web: http://www.ilru.org

International Dyslexia Association (formerly the Orton Dyslexia Society)
Chester Building, #382
8600 LaSalle Road
Baltimore, MD 21286-2044
(800) 222-3123; (410) 296-0232
E-mail: info@interdys.org
Web: http://www.interdys.org

International Resource Center for Down Syndrome
Keith Building
1621 Euclid Avenue, Suite 514
Cleveland, OH 44115
(216) 621-5858; (800) 899-3039 (toll-free in OH only)
E-mail: hf854@cleveland.freenet.edu

International Rett Syndrome Association
9121 Piscataway Road, Suite 2B
Clinton, MD 20735-2561
(800) 818-7388; (301) 856-3334
E-mail: irsa@rettsyndrome.org
Web: http://www.rettsyndrome.org

Learning Disabilities Association of America (LDA)
4156 Library Road
Pittsburgh, PA 15234
(888) 300-6710; (412) 341-1515;
(412) 341-8077
Publications available in Spanish
E-mail: vldanatl@usaor.ne
Web: http://www.ldanatl.org

Leukemia & Lymphoma Society (formerly Leukemia Society of America)
600 Third Avenue
New York, NY 10016
(800) 955-4LSA; (212) 573-8484
E-mail: infocenter@leukemia-lymphoma.org
Web: http://www.leukemia-lymphoma.org

Little People of America—National Headquarters
P.O. Box 745
Lubbock, TX 79408
(888) LPA-2001
Spanish speaker on staff
E-mail: LPADataBase@juno.com
Web: http://www.lpaonline.org

March of Dimes Birth Defects Foundation
1275 Mamaroneck Avenue
White Plains, NY 10605
(914) 428-7100; (888) 663-4637
Publications available in Spanish
Spanish speaker on staff
E-mail: resourcecenter@modimes.org
Web: http://www.modimes.org

Muscular Dystrophy Association (MDA)
3300 East Sunrise Drive
Tucson, AZ 85718

(800) 572-1717; (520) 529-2000
Publications available in Spanish
Spanish speaker on staff
E-mail: mda@mdausa.org
Web: http://www.mdausa.org

National Alliance for the Mentally Ill (NAMI)
Colonial Place Three
2107 Wilson Boulevard, Suite 300
Arlington, VA 22201-3042
(800) 950-6264; (703) 524-7600;
(703) 516-7991 (TTY)
Publications available in Spanish
Spanish speaker on staff
E-mail: namiofc@aol.com
Web: http://www.nami.org

National Association of Private Schools for Exceptional Children (NAPSEC)
1522 K Street, N.W., Suite 1032
Washington, DC 20005
(202) 408-3338
E-mail: napsec@aol.com
Web: http://www.napsec.com

National Association of Protection and Advocacy Systems (NAPAS)
900 Second Street, N.E., Suite 211
Washington, DC 20002
(202) 408-9514 (Voice);
(202) 408-9521 (TTY)
E-mail: napas@earthlink.net
Web: http://www.protectionandadvocacy.com

National Association of the Deaf
814 Thayer Avenue, Suite 250
Silver Spring, MD 20910
(301) 587-1788; (301) 587-1789 (TTY)
E-mail: nadinfo@nad.org
Web: http://www.nad.org

National Ataxia Foundation
2600 Fernbrook Lane, Suite 119
Minneapolis, MN 55447
(612) 553-0020
E-mail: naf@mr.net
Web: http://www.ataxia.org

National Attention Deficit Disorder Association
1788 Second Street, Suite 200
Highland Park, IL 60035
E-mail: mail@add.org
Web: http://www.add.org

National Brain Tumor Foundation
414 13th Street, Suite 700
Oakland, CA 94612
(800) 934-2873; (510) 839-9777
E-mail: nbtf@braintumor.org
Web: http://www.braintumor.org

National Center for Learning Disabilities (NCLD)
381 Park Avenue South, Suite 1401
New York, NY 10016
(212) 545-7510; (888) 575-7373
Web: http://www.ncld.org

National Chronic Fatigue Syndrome and Fibromyalgia Association (NCFSFA)
P.O. Box 18426
Kansas City, MO 64133
(816) 313-2000
E-mail: NCFSFA@aol.com

National Council on Independent Living
1916 Wilson Boulevard, Suite 209
Arlington, VA 22201
(703) 525-3406; (703) 525-4153 (TTY)
E-mail: ncil@ncil.org
Web: http://www.ncil.org

National Down Syndrome Congress
7000 Peachtree-Dunwoody Road, N.E.
Lake Ridge 400, Office Building 5
Suite 100
Atlanta, GA 30328
(800) 232-6372; (770) 604-9500
Parent packet available in Spanish
Spanish speaker on staff
E-mail: NDSCcenter@aol.com
Web: http://www.ndsccenter.org

National Down Syndrome Society
666 Broadway, 8th FloorNew York, NY 10012-2317
(800) 221-4602; (212) 460-9330
E-mail: info@ndss.org
Web: http://www.ndss.org

National Federation for the Blind
1800 Johnson Street
Baltimore, MD 21230
(410) 659-9314
E-mail: nfb@iam.digex.net
Web: http://www.nfb.org

National Fragile X Foundation
1441 York Street, Suite 303
Denver, CO 80206
(800) 688-8765; (303) 333-6155
E-mail: natlfx@sprintmail.com
Web: http://www.nfxf.org

National Library Service for the Blind and Physically Handicapped
The Library of Congress
1291 Taylor Street, N.W.
Washington, DC 20542
(800) 424-8567; (202) 707-5100 (Voice); (202) 707-0744 (TTY)
Publications available in Spanish
E-mail: nls@loc.gov
Web: http://www.loc.gov/nls

National Limb Loss Information Center
Amputee Coalition of America
900 East Hill Avenue, Suite 285
Knoxville, TN 37915
(888) 267-5669; (423) 524-8772
E-mail: ACAOne@aol.com
Web: http://www.amputee-coalition.org

National Mental Health Association
1021 Prince Street
Alexandria, VA 22314-2971
(800) 969-6642; (703) 684-7722; (800) 433-5959 (TTY)
Publications available in Spanish
E-mail: nmhainfo@aol.com
Web: http://www.nmha.org

National Multiple Sclerosis Society
733 Third Avenue
New York, NY 10017
(800) 344-4867; (212) 986-3240
E-mail: info@nmss.org
Web: http://www.nmss.org

National Neurofibromatosis Foundation
95 Pine Street, 16th Floor
New York, NY 10005
(800) 323-7938; (212) 344-6633
E-mail: nnff@nf.org
Web: http://www.nf.org

National Organization on Fetal Alcohol Syndrome (NOFAS)
216 G Street, N.E.
Washington, DC 20002
(800) 666-6327; (202) 785-4585
E-mail: nofas@erols.com
Web: http://www.nofas.org

National Parent Network on Disabilities
1130 17th Street. N.W., Suite 400
Washington, DC 20036
(202) 463-2299 (Voice/TTY)
E-mail: npnd@cs.com
Web: http://www.npnd.org

National Parent to Parent Support and Information System, Inc.
P.O. Box 907
Blue Ridge, GA 30513
(800) 651-1151; (706) 374-3822
E-mail: nppsis@ellijay.com
Web: http://www.nppsis.org

National Patient Air Transport Hotline
P.O. Box 1940
Manassas, VA 20108-0804
(800) 296-1217
E-mail: npathmsg@aol.com
Web: http://www.npath.org

National Resource Center for Paraprofessionals in Education and Related Services

6526 Old Main Hill
Utah State University
Logan, UT 84322-6526
(435) 797-7272
E-mail: info@nrcpara.org
Web: http://www.nrcpara.org

National Reye's Syndrome Foundation
P.O. Box 829
Bryan, OH 43506
(800) 233-7393; (419) 636-2679
E-mail: nrsf@reyessyndrome.org
Web: http://www.reyessyndrome.org

National Scoliosis Foundation
5 Cabot Place
Stoughton, MA 02072
(800) 673-6922; (781) 341-6333
E-mail: scoliosis@aol.com

National Sleep Foundation
1522 K Street, N.W., Suite 500
Washington, DC 20005
(202) 347-3471
E-mail: nsf@sleepfoundation.org
Web: http://www.sleepfoundation.org

National Spinal Cord Injury Association
8300 Colesville Road, Suite 551
Silver Spring, MD 20910
(800) 962-9629; (301) 588-6959
E-mail: nscia2@aol.com
Web: http://www.spinalcord.org

National Stuttering Association
5100 E. La Palma Avenue, Suite 208
Anaheim Hills, CA 92807
(800) 364-1677; (714) 693-7480
E-mail: nsastutter@aol.com
Web: http://www.nsastutter.org

National Tuberous Sclerosis Association
8181 Professional Place, Suite 110
Landover, MD 20785-2226
(800) 225-6872; (301) 459-9888
E-mail: ntsa@ntsa.org
Web: http://www.ntsa.org

Neurofibromatosis, Inc.
8855 Annapolis Road, Suite 110
Lanham, MD 20706-2924
(800) 942-6825; (301) 577-8984
E-mail: NFInc1@aol.com
Web: http://www.nfinc.org

Obsessive Compulsive Foundation, Inc.
337 Notch Hill Road
North Branford, CT 06471
(203) 315-2190
E-mail: info@ocfoundation.org
Web: http://www.ocfoundation.org

Osteogenesis Imperfecta Foundation
804 Diamond Avenue, Suite 210
Gaithersburg, MD 20878
(800) 981-BONE; (301) 947-0083
E-mail: bonelink@aol.com
Web: http://www.oif.org

Parents Helping Parents: The Parent-Directed Family Resource Center for Children with Special Needs
3041 Olcott Street
Santa Clara, CA 95054
(408) 727-5775
Publications available in Spanish
Spanish speaker on staff
E-mail: info@php.com
Web: http://www.php.com

Pathways Awareness Foundation
123 North Wacker Drive
Chicago, IL 60606
(800) 955-2445; (312) 236-7411 (TTY)
Brochure and video available in Spanish
Web: http://www.pathwaysawareness.org

Prader-Willi Syndrome Association
5700 Midnight Pass Road, Suite 6
Sarasota, FL 34242
(800) 926-4797; (941) 312-0400
E-mail: pwsausa@aol.com
Web: http://www.pwsausa.org

President's Committee's Job Accommodation Network
West Virginia University
918 Chestnut Ridge Road, Suite 1
P.O. Box 6080
Morgantown, WV 26506-6080
(800) 526-7234 (Voice/TTY);
(800) 232-9675 (Voice/TTY, information on the ADA)
E-mail: jan@.icdi.wvu.edu
Web: http://www.jan.wvu.edu

Recording for the Blind and Dyslexic
The Anne T. Macdonald Center
20 Roszel Road
Princeton, NJ 08540
(800) 221-4792; (609) 452-0606
E-mail: custserv@rfbd.org
Web: http://www.rfbd.org

Registry of Interpreters for the Deaf
8630 Fenton Street, Suite 324
Silver Spring, MD 20910
(301) 608-0050 (Voice/TTY)
E-mail: info@rid.org
Web: http://www.rid.org

RESNA (Rehabilitation Engineering and Assistive Technology Society of North America)
1700 N. Moore Street, Suite 1540
Arlington, VA 22209-1903
(703) 524-6686 (Voice);
(703) 524-6639 (TTY)
E-mail: natloffice@resna.org
Web: http://www.resna.org

Sibling Information Network
A. J. Pappanikou Center
University of Connecticut
249 Glenbrook Road, U64
Storrs, CT 06269-2064
(860) 486-4985

Special Olympics International
1325 G Street, N.W., Suite 500
Washington, DC 20005
(202) 628-3630
Publications available in Spanish and French
Spanish-French speaker on staff
E-mail: specialolympics@msn.com
Web: http://www.specialolympics.org

Spina Bifida Association of America
4590 MacArthur Boulevard, N.W.
Suite 250
Washington, DC 20007-4226
(800) 621-3141; (202) 944-3285
Publications available in Spanish
E-mail: sbaa@sbaa.org
Web: http://www.sbaa.org

Stuttering Foundation of America
3100 Walnut Grove Road, #603
P.O. Box 11749
Memphis, TN 38111
(800) 992-9392
E-mail: stuttersfa@aol.com
Web: http://www.stuttersfa.org

TASH (formerly the Association for Persons with Severe Handicaps)
29 W. Susquehanna Avenue, Suite 210
Baltimore, MD 21204
(410) 828-8274 (Voice);
(410) 828-1306 (TTY)
E-mail: info@tash.org
Web: http://www.tash.org

Technical Assistance Alliance for Parent Centers (the Alliance)
PACER Center
8161 Normandale Boulevard
Minneapolis, MN 55437-1044
(888) 248-0822; (952) 838-9000;
(952) 838-0190 (TTY)
Spanish speaker on staff
E-mail: alliance@taalliance.org
Web: http://www.taalliance.org

Tourette Syndrome Association
42-40 Bell Boulevard
Bayside, NY 11361
(800) 237-0717; (718) 224-2999
E-mail: tourette@ix.netcom.com
Web: http://tsa.mgh.harvard.edu

Trace Research & Development Center
S-151 Waisman Center
1500 Highland Avenue
University of Wisconsin–Madison
Madison, WI 53705-2280
(608) 262-6966; (608) 262-5408 (TTY)
E-mail: info@trace.wisc.edu
Web: http://trace.wisc.edu

United Cerebral Palsy Association, Inc.
1660 L Street, N.W., Suite 700
Washington, DC 20036
(202) 776-0406; (800) 872-5827;
(202) 973-7197 (TTY)
Publications available in Spanish
E-mail: ucpnatl@ucpa.org
Web: http://www.ucpa.org

Vestibular Disorders Association
P.O. Box 4467
Portland, OR 97208-4467
(800) 837-8428; (503) 229-7705
E-mail: veda@vestibular.org
Web: http://www.vestibular.org

Williams Syndrome Association, Inc.
P.O. Box 297
Clawson, MI 48017-0297
(248) 541-3630

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NATIONAL RESOURCES

February 2001

A publication of: NICHCY, National Information Center for Children and Youth with Disabilities, P.O. Box 1492, Washington, DC 20013-1492; 1-800-695-0285 (Voice/TTY); (202) 884-8200 (Voice/TTY); E-mail: nichcy@aed.org; Web: www.nichcy.org

APPENDIX I

National Toll-Free Phone Numbers for Persons with Disabilities

This appendix was compiled by the National Information Center for Children and Youth with Disabilities, P.O. Box 1492, Washington, DC 20013. It is a selected list of toll-free numbers of national organizations concerned with disability and children's issues. Inclusion on this list does not imply endorsement by NICHCY or the Office of Special Education Programs. There are also many national disability organizations providing services and information which do not have toll-free numbers. If you would like additional help in locating assistance, contact NICHCY at nichcy@aed.org, on the World Wide Web at http://www.nichcy.org, or by phone at (800) 695-0285 (Voice/TTY).

Note: Telephone numbers are designated either voice (V) or text telephone (TTY), indicating their accessibility to TTY users.

AIDS

CDC National Prevention Information Network
(800) 458-5231 (V; English/Spanish)
(800) 243-7012 (TTY)

CDC National STD and AIDS Hotline
(800) 342-2437 (V)
(800) 344-7432 (V; Spanish)
(800) 243-7889 (TTY)

Hemophilia and AIDS/HIV Network for Dissemination of Information
(800) 424-2634 (V)

HIV/AIDS Treatment Information Service
(800) 448-0440
(888) 480-3739 (TTY)

IDS Clinical Trials Information Services
(800) 874-2572
(888) 480-3739 (TTY)

National Pediatric and Family HIV Resource Center
(800) 362-0071

ALCOHOL AND OTHER DRUG ABUSE

American Council for Drug Education
(800) 378-4435

Families Anonymous
(800) 736-9805

National Council on Alcoholism and Drug Dependence
(800) 622-2255

National Institute on Drug Abuse Helpline
(800) 662-4357 (V)

OSAP National Clearinghouse for Alcohol and Drug Information
(800) 729-6686 (V)
(800) 487-4889 (TTY)

AMERICANS WITH DISABILITIES ACT (ADA)

ADA in Action
(800) 949-4232

Disability and Business Technical Assistance Centers
(800) 949-4232

Disability Rights Education and Defense Fund ADA Technical Assistance Information Line
(800) 466-4232 (V/TTY)

Equal Employment Opportunity Commission
(800) 669-3362 (V)
(800) 800-3302 (TTY)

Job Accommodation Network
(800) 526-7234 (V/TTY)
(800) 232-9675 (V/TTY; ADA Information)

U.S. Architectural and Transportation Barriers Compliance Board—Access Board
(800) 872-2253 (V)
(202) 272-5449 (TTY)
(800) 993-2822 (TTY)

U.S. Department of Housing and Urban Development—HUD User
(800) 245-2691 (V)

ASSISTIVE TECHNOLOGY/DEVICES

AAT Advanced American Telephone
(800) 233-1222 (V)
(800) 896-9032 (TTY)

AbleNet
(800) 322-0956 (V)

Alliance for Technology Access
(800) 455-7970

Chrysler Corporation Automobility Program
(800) 255-9877

IBM Special Needs Systems
(800) 426-4832 (V)
(800) 426-4833 (TTY)

TECHKNOWLEDGE
(800) 726-9119
(404) 894-4960 (V; Atlanta Metro Area)

BLINDNESS/VISUAL IMPAIRMENTS

American Council of the Blind
(800) 424-8666 (V/TTY)

American Foundation for the Blind
(800) 232-5463

American Printing House for the Blind
(800) 223-1839

Blind Children's Center
(800) 222-3566 (V)

The Foundation Fighting Blindness
(888) 394-3937 (V)
(800) 683-5551 (TTY)

Hadley School for the Blind
(800) 323-4238 (V)

Library Reproduction Service (LRS)
(800) 255-5002

Lighthouse National Center for Vision and Child Development
(800) 334-5497 (V)
(212) 821-9713 (TTY)

National Association for Parents of Children with Visual Impairments
(800) 562-6265

National Library for the Blind and Physically Handicapped
(800) 424-8567

(800) 424-9100 (TTY; English)
(800) 345-8901 (TTY; Spanish)

Prevent Blindness America
(800) 221-3004 (V)

Recording for the Blind
(800) 803-7201 (V)

BURNS

Phoenix Society for Burn Survivors
(800) 888-2876 (V)

CANCER

American Cancer Society
(800) 227-2345

Cancer Information and Counseling Line
(800) 525-3777 (V)

Candlelighters Childhood Cancer Foundation
(800) 366-2223 (V)

National Brain Tumor Foundation
(800) 934-2873

National Cancer Information Service
(800) 422-6237 (V; English/Spanish)
(800) 332-8615 (TTY)

CHILD ABUSE

Clearinghouse on Child Abuse and Neglect/Family Violence Information
(800) 394-3366 (V)

Prevent Child Abuse America
(800) 244-5373

CHILD CARE

National Resource Center for Health and Safety in Child Care
(800) 598-5437

COMMUNICATION DISORDERS

Communication Aid Manufacturers' Association
(800) 441-2262

National Center for Stuttering
(800) 221-2483

National Institute on Deafness and Other Communication Disorders Clearinghouse
(800) 241-1044 (V)
(800) 241-1055 (TTY)

National Stuttering Association
(800) 364-1677

CRANIOFACIAL SYNDROMES

Children's Craniofacial Association
(800) 535-3643 (V)

FACES—National Craniofacial Association
(800) 332-2373 (V)

DEAFNESS/HEARING IMPAIRMENTS

American Society for Deaf Children
(800) 942-2732 (V/TTY)

Better Hearing Institute
(800) 327-9355 (V/TTY)

Deafness Research Foundation
(800) 535-3323 (V/TTY)
(212) 684-6559 (V/TTY; in NY)

Hear Now
(800) 648-4327 (V/TTY)

John Tracy Clinic
(800) 522-4582 (V/TTY)
(213) 748-5481 (V; in 213 area)
(213) 747-2924 (TTY; in 213 area)

National Cued Speech Association
(800) 459-3529

National Hearing Aid Society
(800) 521-5247

National Information Clearinghouse on Children Who are Deaf-Blind (DB-LINK)
(800) 438-9376 (V)
(800) 854-7013 (TTY)

National Institute on Deafness and Other Communication Disorders Clearinghouse
(800) 241-1044 (V)
(800) 241-1055 (TTY)

DISABILITY AWARENESS

Kids on the Block
(800) 368-5437

EDUCATION

American Association for Vocational Instructional Materials
(800) 228-4689 (V)

American School Counselor Association
(800) 306-4722

Association for Childhood Education International
(800) 423-3563 (V)

National Center for School Leadership
(800) 643-3205 (V)

Urban Special Education Leadership Collaborative
(800) 225-4276

U.S. Office of Educational Research and Improvement
(800) 424-1616 (V)

EMPLOYMENT

Equal Employment Opportunity Commission
(800) 669-3362 (V)
(800) 800-3302 (TTY)

Job Accommodation Network
(800) 526-7234 (V/TTY)
(800) 232-9675 (V/TTY; ADA Information)

FINANCIAL COUNSELING

National Foundation for Consumer Credit
(800) 388-2227 (V)

HOSPICE

Children's Hospice International
(800) 242-4453 (V/TTY)

HOSPICELINK
(800) 331-1620

INFORMATION SERVICES

ABLEDATA/National Rehabilitation Information Clearinghouse
(800) 227-0216 (V/TTY)

ACCESS ERIC
(800) 538-3742 (V)

Easter Seals—National Office
(800) 221-6827 (V)
(312) 726-4258 (TTY)

ERIC Clearinghouse on Disabilities and Gifted Education
(800) 328-0272 (V/TTY)

The Genetic Alliance
(800) 336-4363

National Clearinghouse for Professions in Special Education
(800) 641-7824
(703) 264-9480 (TTY)

National Information Center for Children and Youth with Disabilities (NICHCY)
(800) 695-0285 (V/TTY)

National Information Clearinghouse for Infants with Disabilities and Life Threatening Conditions
(800) 922-9234, ext. 201 (V/TTY)
(800) 922-1107, ext. 201 (V/TTY; in SC)

ODPHP National Health Information Center
(800) 336-4797 (V)

Office of Minority Health Resource Center
(800) 444-6472 (V)

Zero to Three/National Center for Infants, Toddlers, and Families
(800) 899-4301

LITERACY

Laubach Literacy
(888) 528-2224

National Contact Hotline
(800) 228-8813; (800) 552-9097

MEDICAL/HEALTH DISORDERS

American Association of Kidney Patients
(800) 749-2257 (V)

American Brain Tumor Association
(800) 886-2282

American Cancer Society
(800) 227-2345

American Diabetes Association
(800) 582-8323 (V)

American Heart Association
(800) 242-8721

American Kidney Fund
(800) 638-8299 (V)

American Liver Foundation
(800) 223-0179 (V)

American Lung Association
(800) 586-4872

Aplastic Anemia & MDS International Foundation
(800) 747-2820

Asthma and Allergy Foundation of America
(800) 727-8462

Chronic Fatigue and Immune Dysfunction Syndrome Association
(800) 442-3437 (V)

Crohn and Colitis Foundation of America
(800) 932-2423

Eating Disorders Awareness and Prevention
(800) 931-2237

Family Voices: A National Coalition Speaking for Children with Special Health Care Needs
(888) 835-5669

Federal Hill-Burton Free Hospital Care Program
(800) 638-0742 (V)
(800) 492-0359 (V; in MD)

Foundation for Ichthyosis and Related Skin Types
(800) 545-3286

Leukemia and Lymphoma Society (formerly the Leukemia Society of America)
(800) 955-4572 (V)

Lupus Foundation of America
(800) 558-0121 (V)
(800) 558-0231 (V; Spanish)

National Brain Tumor Foundation
(800) 943-2873

National Heart, Lung, and Blood Institute Information Center
(800) 575-9355

National Lymphedema Network
(800) 541-3259

Shriners Hospital for Crippled Children
(800) 237-5055 (V)

Sickle Cell Disease Association of America
(800) 421-8453 (V)

United Ostomy Association
(800) 826-0826 (V)

Vestibular Disorders Association
(800) 837-8428

MENTAL HEALTH

National Alliance for the Mentally Ill
(800) 950-6264 (V)

National Mental Health Association
(800) 969-6642 (V)
(800) 433-5959 (TTY)

National Mental Health Consumer Self-Help Clearinghouse
(800) 553-4539

Research and Training Center on Family Support and Children's Mental Health
(800) 547-8887

NUTRITION

Beech-Nut Nutrition Hotline
(800) 523-6633 (V)

Gerber Parents Resource Center
(800) 443-7237 (V)

PHYSICAL DISABILITIES

Christopher Reeve Paralysis Foundation
(800) 225-0292

Human Growth Foundation
(800) 451-6434 (V)

Muscular Dystrophy Association
(800) 572-1717

National Library Services for the Blind and Physically Handicapped
(800) 424-8567
(202) 707-0744 (TTY)

National Limb Loss Information Center
(888) 267-5669

National Spinal Cord Injury Hotline
(800) 526-3456 (V)

Pathways Awareness Foundation
(800) 955-2445 (V)

RARE SYNDROMES

The Genetic Alliance
(800) 336-4363 (V)

National Organization for Rare Disorders
(800) 999-6673 (V/TTY)

RECREATION

Adventures in Movement for the Handicapped, Inc.
(800) 332-8210 (V)

Magic Foundation
(800) 362-4423 (V)

North American Riding for the Handicapped, Inc.
(800) 369-7433 (V)

Sunshine Foundation
(800) 767-1976 (V)

REHABILITATION

ABLEDATA
(800) 227-0216 (V/TTY)

Children's Resource Line
(800) 638-8864 (V)

National Clearinghouse of Rehabilitation Training Materials
(800) 223-5219 (V/TTY)

RESPIRATORY DISORDERS

National Heart, Lung and Blood Institute Information Center
(800) 575-9355

National Jewish Center for Immunology and Respiratory Medicine—LUNGLINE
(800) 222-5864 (V)

RESPITE CARE

Access to Respite Care and Help (ARCH) National Resource Center, National Respite Locator Service
(800) 773-5433 (V)

RURAL

ERIC Clearinghouse on Rural Education and Small Schools
(800) 624-9120 (V)

Rural Institute on Disabilities (Montana Univ. Affiliated Program)
(800) 732-0323

SPECIFIC DISABILITIES

American Association on Mental Retardation
(800) 424-3688 (outside DC area)
(202) 387-1968 (in DC)

Angelman Syndrome Foundation
(800) 747-2820

Aplastic Anemia & MDS International Foundation
(800) 747-2820

Autism Society of America
(800) 3-AUTISM

Brain Injury Association
(800) 444-6443 (V)

Children and Adults with Attention Deficit Disorder (CHADD)
(800) 233-4050

Cleft Palate Foundation
(800) 242-5338

Cooley's Anemia Foundation
(800) 522-7222 (V)

Cornelia de Lange Syndrome Foundation
(800) 223-8355 (V)
(800) 753-2357 (V; in CT)

Crohn's and Colitis Foundation of America
(800) 245-4372

Cystic Fibrosis Foundation
(800) 344-4823 (V)

Epilepsy Foundation—National Office
(800) 332-1000 (V)

Huntington's Disease Society of America
(800) 245-4372

International Dyslexia Association
(formerly the Orton Dyslexia Society)
(800) 222-3123 (V)

International Rett Syndrome Association
(800) 818-7388

Learning Disabilties Association
(888) 300-6710

Lyme Disease Foundation
(800) 886-5963

National Center for Learning Disabilities
(888) 575-7373

National Center for Stutttering
(800) 221-2483

National Down Syndrome Congress
(800) 232-6372 (V)

National Down Syndrome Society
(800) 221-4602 (V)

National Fragile X Foundation
(800) 688-8765 (V)

National Lymphedema Network
(800) 541-3259

National Multiple Sclerosis Society
(800) 532-7667 (V)

National Neurofibromatosis Foundation
(800) 323-7938

National Organization for Albinism and Hypopigmentation
(800) 473-2310 (V)

National Organization on Fetal Alcohol Sydrome
(800) 666-6327

National Reye's Syndrome Foundation
(800) 233-7393 (V)

National Scoliosis Foundation
(800) 673-6922

National Stuttering Association
(800) 221-2483

National Tay-Sachs & Allied Diseases Association, Inc.
(800) 906-8723

National Tuberous Sclerosis Association
(800) 225-6872 (V)

Neurofibromatosis, Inc.
(800) 942-6825

Osteogenesis Imperfecta Foundation
(800) 981-2663

Prader-Willi Syndrome Association
(800) 926-4797 (V)

Spina Bifida Associations of America
(800) 621-3141 (V)

Stuttering Foundation of America
(800) 992-9392 (V)

Sudden Infant Death Syndrome Alliance
(800) 221-7437 (V)

Support Organization for Trisomy 17, 13, and Related Disorders
(800) 716-7638

Tourette Syndrome Association
(800) 237-0717 (V)

Treacher Collins Foundation
(800) 823-2055

United Cerebral Palsy Associations
(800) 872-5827 (V/TTY)

United Leukodystrophy Foundation
(800) 728-5483 (V)

United Scleroderma Foundation
(800) 722-4673 (V)

SUPPLEMENTAL SECURITY INCOME (SSI)

Social Security Administration
(800) 772-1213 (V)
(800) 325-0778 (TTY)
(800) 392-0812 (TTY; in MO)

TRAUMA

American Trauma Society
(800) 556-7890 (V)
(800) 735-2258 (TTY)

Brain Injury Association
(800) 444-6443 (V)

National Spinal Cord Injury Association
(800) 962-9629 (V)

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APPENDIX J

Key Provisions on Assistive Technology IDEA 1997

This fact sheet was prepared by the Massachusetts Assistive Technology Partnership, an organization that assists consumers in obtaining assistive technology and rehabilitation services. Developed under a grant from the National Institute on Disabilities and Rehabilitation Research, U.S. Department of Education, it is an overview of the key provisions of the federal regulations that implement the Individuals with Disabilities Education Act (IDEA) and present several provisions and definitions that relate to assistive technology.

KEY PROVISION IN IDEA REGULATIONS 1997

Key Definitions

- *300.5 Assistive Technology Device.*

  As used in this part, Assistive technology device means any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability. (Authority: 20 U.S.C. 1401(1))

- *300.6 Assistive Technology Service.*

  As used in this part, Assistive technology service means any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device. The term includes:

  a. The evaluation of the needs of a child with a disability, including a functional evaluation of the child in the child's customary environment;

  b. Purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices by children with disabilities;

  c. Selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing assistive technology devices;

  d. Coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs;

  e. Training or technical assistance for a child with a disability or, if appropriate, that child's family; and

  f. Training or technical assistance for professionals (including individuals providing education or rehabilitation services), employers, or other individuals who provide services to, employ, or are otherwise substantially involved in the major life functions of that child. (Authority: 20 U.S.C. 1401(2))

Access to State/District-Wide Assessments

- *300.138 Participation in Assessments.*

  The State must have on file with the Secretary information to demonstrate that:

a. Children with disabilities are included in general State and district-wide assessment programs, with appropriate accommodations and modifications in administration, if necessary;

b. As appropriate, the State or LEA

1. Develops guidelines for the participation of children with disabilities in alternate assessments for those children who cannot participate in State and district-wide assessment programs;

2. Develops alternate assessments in accordance with paragraph (b)(1) of this section; and

3. Beginning not later than July 1, 2000, conducts the alternate assessments described in paragraph (b)(2) of this section. (Authority: 20 U.S.C. 1412(a)(17)(A))

Timeliness of Service(s)

- *300.142 Methods of Ensuring Services.*

1. A noneducational public agency described in paragraph (b)(1)(i) of this section may not disqualify an eligible service for Medicaid reimbursement because that service is provided in a school context.

2. Reimbursement for services by noneducational public agency. If a public agency other than an educational agency fails to provide or pay for the special education and related services described in paragraph (b)(1) of this section, the LEA (or State agency responsible for developing the child's IEP) shall provide or pay for these services to the child in a timely manner.

The LEA or State agency may then claim reimbursement for the services from the noneducational public agency that failed to provide or pay for these services and that agency shall reimburse the LEA or State agency in accordance with the terms of the interagency agreement or other mechanism described in paragraph (a)(1) of this section, and the agreement described in paragraph (a)(2) of this section. (Authority: 20 U.S.C. 1412(a)(12)(A), (B), and (C); 1401(8))

Key Provision for AT/and AT at Home

- *300.308 Assistive Technology.*

a. Each public agency shall ensure that assistive technology devices or assistive technology services, or both, as those terms are defined in sections 300.5–300.6, are made available to a child with a disability if required as a part of the child's:

1. Special education under section 300.26;

2. Related services under section 300.24; or

3. Supplementary aids and services under sections 300.28 and 300.550(b)(2).

b. On a case-by-case basis, the use of school-purchased assistive technology devices in a child's home or in other settings is required if the child's IEP team determines that the child needs access to those devices in order to receive FAPE. (Authority: 20 U.S.C. 1412(a)(12)(B)(i))

Required IEP Considerations

- *300.346 Development, Review, and Revision of IEP.*

2. Consideration of special factors. The IEP team also shall:

i. In the case of a child whose behavior impedes his or her learning or that of others, consider, if appropriate, strategies, including positive behavioral interventions, strategies, and supports to address that behavior;

ii. In the case of a child with limited English proficiency, consider the language needs of the child as those needs relate to the child's IEP;

iii. In the case of a child who is blind or visually impaired, provide for instruction in Braille and the use of Braille unless the IEP team determines, after an evaluation of the child's reading and writing skills, needs, and appropriate reading and writing media (including an evaluation of the child's future needs for instruction in Braille or the use of Braille), that instruction in Braille or the use of Braille is not appropriate for the child;

iv. Consider the communication needs of the child, and in the case of a child who is deaf or hard of hearing, consider the child's language and communication needs, opportunities for direct communications with peers and professional personnel in the child's language and communication mode, academic level, and full range of needs, including opportunities for direct instruction in the child's language and communication mode; and

v. Consider whether the child requires assistive technology devices and services. (Authority: 20 U.S.C. 1414(d)(3) and (4)(B) and (e))

Key Evaluation Provision

- *300.532 Evaluation Procedures.*

  Each public agency shall ensure, at a minimum:

  (e) Tests are selected and administered so as best to ensure that if a test is administered to a child with impaired sensory, manual, or speaking skills, the test results accurately reflect the child's aptitude or achievement level or whatever other factors the test purports to measure, rather than reflecting the child's impaired sensory, manual, or speaking skills (unless those skills are the factors that the test purports to measure). (Authority: 20 U.S.C. 1412(a)(6)(B), 1414 (b)(2) and (3))

APPENDIX K

A Guide to Disability Rights Laws

This appendix is a listing of current laws and regulations that apply to persons with disabilities. This guide, prepared by the National Council on Disability and the National Urban League, provides a summary of federal civil rights laws that ensure equal opportunity for people with disabilities. The original source for this information is the U.S. Department of Justice (DOJ). To find out more about how these laws may apply to you or your family and friends, please contact the agencies and organizations listed in this summary. For more information, point your Web browser to the National Council on Disabilities Web site at
http://www.ncd.gov/newsroom/publications/disabilityrights.html.

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AMERICANS WITH DISABILITIES ACT

The Americans with Disabilities Act (ADA) prohibits discrimination on the basis of disability in *employment, state and local government, public accommodations, commercial facilities, transportation, and telecommunications.* The act also applies to the United States Congress.

To be protected by ADA, one must have a disability or have a relationship or association with an individual with a disability. An individual with a disability is defined by ADA as a person who has a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such an impairment, or a person who is perceived by others as having such an impairment. ADA does not specifically name all the impairments that are covered.

ADA Title I: Employment

Title I requires employers with 15 or more employees to provide qualified individuals with disabilities with an *equal opportunity* to benefit from the full range of employment-related opportunities available to others. For example, it prohibits discrimination in recruitment, hiring, promotions, training, pay, social activities, and other privileges of employment. It restricts questions that can be asked about an applicant's disability before a job offer is made, and it requires that

employers make reasonable accommodation to the known physical or mental limitations of otherwise qualified individuals with disabilities, unless the accommodation results in undue hardship for the employer. Religious entities with 15 or more employees are covered under title I.

Title I complaints must be filed with the U.S. Equal Employment Opportunity Commission (EEOC) within 180 days of the date of discrimination, or within 300 days if the charge is filed with a designated state or local fair employment practice agency. Individuals may file a lawsuit in federal court only after they receive a right-to-sue letter from EEOC.

Charges of employment discrimination on the basis of disability may be filed at any EEOC field office. Field offices are located in 50 cities throughout the United States and are listed in most telephone directories under "U.S. Government." For the appropriate EEOC field office in your geographic area, call

(800) 669-4000 (voice)
(800) 669-6820 (text telephone)
http://www.eeoc.gov

You can obtain publications and information on EEOC-enforced laws by calling

(800) 669-3362 (voice)
(800) 800-3302 (text telephone)

For information on how to accommodate a specific individual with a disability, contact the Job Accommodation Network at

(800) 526-7234 (voice/relay)
http://janweb.icdi.wvu.edu/english

ADA Title II: State and Local Government Activities

Title II covers all activities of state and local governments, regardless of the government entity's size or whether it receives federal funding. Title II requires that state and local governments give people with disabilities an equal opportunity to benefit from all of their programs, services, and activities, such as *public education, employment, transportation, recreation, health care, social services, courts, voting, and town meetings.*

State and local governments are required to follow specific architectural standards in the new construction and alteration of their buildings. They also must relocate programs or otherwise provide access in inaccessible older buildings, and they must communicate effectively with people who have hearing, vision, or speech disabilities. Public entities are not required to take actions that would result in undue financial and administrative burdens. They are required to make reasonable modifications to policies, practices, and procedures where necessary to avoid discrimination, unless they can demonstrate that doing so would fundamentally alter the nature of the service, program, or activity being provided.

Complaints of title II violations may be filed with DOJ within 180 days of the date of discrimination. In certain situations, cases may be referred to a mediation program sponsored by DOJ. DOJ may bring a lawsuit where it has investigated a matter and has been unable to resolve violations. For more information, contact:

Disability Rights Section
Civil Rights Division
U.S. Department of Justice
P.O. Box 66738
Washington, DC 20035-6738
(800) 514-0301 (voice)
(800) 514-0383 (text telephone)
http://www.usdoj.gov/crt/ada/adahom1.htm

Title II may also be enforced through private lawsuits in federal court. It is not necessary to file a complaint with DOJ or any other federal agency, or to receive a right-to-sue letter, before going to court.

ADA Title II: Public Transportation

The transportation provisions of title II cover *public transportation services, such as city buses, and public rail transit, such as subways, commuter rails, and Amtrak.* Public transportation authorities may not discriminate against people with disabilities in the provision of their services. They must comply with requirements for accessibility in newly purchased vehicles, make good-faith efforts to purchase or lease accessible used buses, remanufacture buses in an accessible manner, and, unless it would result in an undue burden, provide paratransit where they operate fixed-route bus or rail systems. Paratransit is a service through which persons who are unable to use the regular transit system independently (because of a physical or mental impairment) are picked up and dropped off at their destinations. Questions and complaints about public transportation should be directed to:

Federal Transit Administration
U.S. Department of Transportation
400 Seventh Street, SW
Washington, DC 20590
(888) 446-4511 (voice/relay)
(202) 366-2285 (voice)
http://www.fta.dot.gov/office/civ.htm

ADA Title III: Public Accommodations

Title III covers businesses and nonprofit service providers that are *public accommodations, privately operated entities offering certain types of courses and examinations, privately operated transportation, and commercial facilities.* Public accommodations are private entities that own, lease, lease to, or operate facilities such as restaurants, retail stores, hotels, movie theaters, private schools, convention centers, doctors' offices, homeless shelters, transportation depots, zoos, funeral homes, day care centers, and recreation facilities, including sports stadiums and fitness clubs. Transportation services provided by private entities, such as taxicabs, are also covered by title III.

Public accommodations must comply with basic nondiscrimination requirements that prohibit exclusion, segregation, and unequal treatment. They also must comply with specific requirements related to architectural standards for new and altered buildings; reasonable modifications to policies, practices, and procedures; effective communication with people with hearing, vision, or speech disabilities; and other access requirements. Additionally, public accommodations must remove barriers in existing buildings where this can be done without much difficulty or expense, given the public accommodation's resources.

Courses and examinations related to professional, educational, or trade-related applications, licensing, certifications, or credentialing must be provided in a place and manner accessible to people with disabilities, or alternative accessible arrangements must be offered.

Commercial facilities, such as factories and warehouses, must comply with ADA's architectural standards for new construction and alterations.

Complaints of title III violations may be filed with DOJ. In certain situations, cases may be referred to a mediation program sponsored by DOJ. DOJ is authorized to bring a lawsuit where there is a pattern or practice of discrimination in violation of title III or where an act of discrimination raises an issue of general public importance. Title III may also be enforced through private lawsuits. It is not necessary to file a complaint with DOJ or any federal agency, or to receive a right-to-sue letter, before going to court. For more information, contact:

Disability Rights Section
Civil Rights Division
U.S. Department of Justice
P.O. Box 66738
Washington, DC 20035-6738

(800) 514-0301 (voice)
(800) 514-0383 (text telephone)
http://www.usdoj.gov/crt/ada/adahom1.htm

ADA Title IV: Telecommunications Relay Services

Title IV addresses telephone and television access for people with hearing and speech disabilities. It requires common carriers (telephone companies) to establish interstate and intrastate telecommunications relay services (TRS) 24 hours a day, 7 days a week. TRS enables callers with hearing and speech disabilities who use text telephones (TTYs) and callers who use voice telephones to communicate with each other through a third-party communications assistant. The Federal Communications Commission (FCC) has set minimum standards for TRS. Title IV also requires closed captioning of federally funded public service announcements. For more information about TRS, contact the FCC at:

Federal Communications Commission
445 12th Street, SW
Washington, DC 20554
(888) 225-5322 (voice/relay)
http://www.fcc.gov/cib/dro

TELECOMMUNICATIONS ACT

Section 255 and section 251(a)(2) of the Communications Act of 1934, as amended by the Telecommunications Act of 1996, require manufacturers of telecommunications equipment and providers of telecommunications services to ensure that such equipment and services are accessible to and usable by persons with disabilities, if this goal is readily achievable. These amendments ensure that people with disabilities will have access to a broad range of products and services—such as telephones, cell phones, pagers, call waiting, and operator services—that, in the past, were inaccessible to many users with disabilities. For more information, contact:

Federal Communications Commission
445 12th Street, SW
Washington, DC 20554
(888) 225-5322 (voice/relay)
http://www.fcc.gov/cib/dro

FAIR HOUSING ACT

The Fair Housing Act, as amended in 1988, prohibits housing discrimination on the basis of race, color, religion, sex, disability, familial status, and national origin. Its coverage includes private housing, housing that receives federal financial assistance, and state and local government housing. It is unlawful to discriminate in any aspect of selling or renting housing or to deny a dwelling to a buyer or renter because of the disability of that individual, an individual associated with the buyer or renter, or an individual who intends to live in the residence. Other covered activities include, for example, financing, zoning practices, new construction design, and advertising.

The Fair Housing Act requires owners of housing facilities to make reasonable exceptions in their policies and operations to afford people with disabilities equal housing opportunities. For example, a landlord with a "no pets" policy may be required to grant an exception to this rule and allow an individual who is blind to keep a guide dog in the residence. The Fair Housing Act also requires landlords to allow tenants with disabilities to make reasonable access-related modifications to their private living space, as well as to common use spaces. (The landlord is not required to pay for the changes.) The Act further requires that new multifamily housing with four or more units be designed and built to allow access for persons with disabilities. This includes accessible common use areas,

doors that are wide enough for wheelchairs, kitchens and bathrooms that allow a person using a wheelchair to maneuver, and other adaptable features within the units.

Complaints of Fair Housing Act violations may be filed with the U.S. Department of Housing and Urban Development. For more information or to file a complaint, contact:

Office of Program Compliance and Disability Rights
Office of Fair Housing and Equal Opportunity
U.S. Department of Housing and Urban Development
451 Seventh Street, SW, Room 5242
Washington, DC 20140
(800) 669-9777 (voice)
(800) 927-9275 (text telephone)
http://www.hud.gov/fhe/fheo.html

For questions about the Fair Housing Act, call the Office of Fair Housing and Equal Opportunity at

(202) 708-2333 (voice)
(202) 401-1247 (text telephone)

For publications, call the Housing and Urban Development Customer Service Center at

(800) 767-7468 (voice/relay)

Additionally, DOJ can file a lawsuit in cases involving a pattern or practice of discrimination. The Fair Housing Act also may be enforced through private lawsuits.

AIR CARRIER ACCESS ACT

The Air Carrier Access Act prohibits discrimination in air transportation by domestic and foreign air carriers against qualified individuals with physical or mental impairments. The act applies only to air carriers that provide regularly scheduled services for hire to the public. Requirements address a wide range of issues, including boarding assistance and certain accessibility features in newly built aircraft and new or altered airport facilities. People may enforce rights under the Air Carrier Access Act by filing a complaint with the U.S. Department of Transportation, or by bringing a lawsuit in federal court. For more information or to file a complaint, contact:

Aviation Consumer Protection Division
U.S. Department of Transportation
400 Seventh Street, SW
Room 4107, C-75
Washington, DC 20590
(202) 366-2220 (voice)
(202) 755-7687 (text telephone)
http://www.dot.gov/airconsumer

VOTING ACCESSIBILITY FOR THE ELDERLY AND HANDICAPPED ACT

The Voting Accessibility for the Elderly and Handicapped Act of 1984 generally requires polling places across the United States to be physically accessible to people with disabilities for federal elections. Where no accessible location is available to serve as a polling place, a political subdivision must provide an alternate means of casting a ballot on the day of the election. This law also requires states to make registration and voting aids available for disabled and elderly voters, including information by text telephones. For more information, contact

Voting Section
Civil Rights Division
U.S. Department of Justice
P.O. Box 66128
Washington, DC
20035-6128
(800) 253-3931 (voice/relay)
http://www.usdoj.gov/crt/voting

NATIONAL VOTER REGISTRATION ACT

The National Voter Registration Act of 1993, also known as the "Motor Voter Act," makes it easier for all Americans to exercise their fundamental right to vote. One of the basic purposes of the act is to increase the historically low registration rates of minorities and persons with disabilities that have resulted from discrimination. The act requires all offices of state-funded programs that are primarily engaged in providing services to persons with disabilities to provide all program applicants with voter registration forms, to assist them in completing the forms, and to transmit completed forms to the appropriate state official. For more information, contact

Voting Section
Civil Rights Division
U.S. Department of Justice
P.O. Box 66128
Washington, DC
20035-6128
(800) 253-3931 (voice/relay)
http://www.usdoj.gov/crt/voting

CIVIL RIGHTS OF INSTITUTIONALIZED PERSONS ACT

The Civil Rights of Institutionalized Persons Act (CRIPA) authorizes the U.S. Attorney General to investigate conditions of confinement at state and local government institutions such as prisons, jails, pretrial detention centers, juvenile correctional facilities, publicly operated nursing homes, and institutions for people with psychiatric or developmental disabilities. Its purpose is to allow the Attorney General to uncover and correct widespread deficiencies that seriously jeopardize the health and safety of residents of institutions. The Attorney General does not have authority under CRIPA to investigate isolated incidents or to represent individual institutionalized persons.

The Attorney General may initiate civil lawsuits where there is reasonable cause to believe that conditions are "egregious or flagrant," that they are subjecting residents to "grievous harm," and that they are part of a "pattern or practice" of resistance to residents' full enjoyment of constitutional or federal rights, including title II of ADA and section 504 of the Rehabilitation Act. For more information or to bring a matter to DOJ's attention, contact

Special Litigation Section
Civil Rights Division
U.S. Department of Justice
P.O. Box 66400
Washington, DC 20035-6400
(202) 514-6255 (voice/relay)
http://www.usdoj.gov/crt/split/index.html

INDIVIDUALS WITH DISABILITIES EDUCATION ACT

The Individuals with Disabilities Education Act (IDEA) (formerly called P.L. 94-142 or the Education for all Handicapped Children Act of 1975) requires public schools to make available to all eligible children with disabilities a free, appropriate public education in the least restrictive environment appropriate to their individual needs.

IDEA requires public school systems to develop appropriate Individualized Education Programs (IEPs) for each child. The specific special education and related services outlined in each IEP reflect the individual needs of each student.

IDEA also mandates that particular procedures be followed in the development of the IEP. Each student's IEP must be developed by a team of knowledgeable persons and must be reviewed at least annually. The team includes the child's teacher; the parents, subject to certain limited exceptions; the child, if appropriate; an agency representative who is

qualified to provide or supervise the provision of special education; and other individuals at the parents' or agency's discretion.

If parents disagree with the proposed IEP, they can request a due process hearing and a review from the state educational agency, if applicable in that state. They also can appeal the state agency's decision to state or federal court. For more information, contact

Office of Special Education Programs
U.S. Department of Education
330 C Street, SW, Room 3086
Washington, DC 20202
(202) 205-8824 (voice/relay)
http://www.ed.gov/offices/OSERS/OSEP/index.html

REHABILITATION ACT

The Rehabilitation Act prohibits discrimination on the basis of disability in programs conducted by federal agencies, in programs receiving federal financial assistance, in federal employment, and in the employment practices of federal contractors. The standards for determining employment discrimination under the Rehabilitation Act are the same as those used in title I of ADA.

Section 501

Section 501 requires affirmative action and nondiscrimination in employment by federal agencies of the executive branch. To obtain more information or to file a complaint, employees should contact their agency's Equal Employment Opportunity Office.

Section 503

Section 503 requires affirmative action and prohibits employment discrimination by federal government contractors and subcontractors with contracts of more than $10,000. For more information on section 503, contact

Office of Federal Contract Compliance Programs
U.S.Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210
(202) 693-0106 (voice/relay)
http://www.dol.gov/dol/esa/public/ofcp_org.htm

Section 504

Section 504 states that "no qualified individual with a disability in the United States shall be excluded from, denied the benefits of, or be subjected to discrimination under" any program or activity that either receives federal financial assistance or is conducted by any agency of the executive branch or the U.S. Postal Service.

Each federal agency has its own set of section 504 regulations that apply to its own programs. Agencies that provide federal financial assistance also have section 504 regulations covering entities that receive federal aid. Requirements common to these regulations include reasonable accommodation for employees with disabilities, program accessibility, effective communication with people who have hearing or vision disabilities, and accessible new construction and alterations. Each agency is responsible for enforcing its own regulations. Section 504 may also be enforced through private lawsuits. It is not necessary to file a complaint with a federal agency or to receive a right-to-sue letter before going to court.

For information on how to file section 504 complaints with the appropriate agency, contact

Disability Rights Section
Civil Rights Division
U.S. Department of Justice
P.O. Box 66738
Washington, DC 20035-6738

(800) 514-0301 (voice)
(800) 514-0383 (text telephone)
http://www.usdoj.gov/crt/ada/adahom1.html

Section 508

Section 508 establishes requirements for electronic and information technology developed, maintained, procured, or used by the federal government. Section 508 requires federal electronic and information technology to be accessible to people with disabilities, including employees and members of the public.

An accessible information technology system is one that can be operated in a variety of ways and does not rely on a single sense or ability of the user. For example, a system that provides output only in visual format may not be accessible to people with visual impairments, and a system that provides output only in audio format may not be accessible to people who are deaf or hard of hearing. Some individuals with disabilities may need accessibility-related software or peripheral devices to use systems that comply with section 508. For more information on section 508, contact

GSA Office of Governmentwide Policy
Center for IT Accommodation (CITA)
1800 F Street, NW
Room 1234, MC:MKC
Washington, DC 20405-0001
(202) 501-4906 (voice)
(202) 501-2010 (text telephone)
http://www.itpolicy.gsa.gov/cita

U.S. Architectural and Transportation Barriers Compliance Board
1331 F Street, NW, Suite 1000
Washington, DC 20004-1111
(800) 872-2253 (voice)
(800) 993-2822 (text telephone)
http://www.access-board.gov

ARCHITECTURAL BARRIERS ACT

The Architectural Barriers Act (ABA) requires that buildings and facilities that are designed, constructed, or altered with federal funds, or leased by a federal agency, comply with federal standards for physical accessibility. ABA requirements are limited to architectural standards in new and altered buildings and in newly leased facilities. They do not address the activities conducted in those buildings and facilities. Facilities of the U.S. Postal Service are covered by ABA. For more information or to file a complaint, contact

U.S. Architectural and Transportation Barriers Compliance Board
1331 F Street, NW, Suite 1000
Washington, DC 20004-1111
(800) 872-2253 (voice)
(800) 993-2822 (text telephone)
http://www.access-board.gov

GENERAL SOURCES OF DISABILITY RIGHTS INFORMATION

ADA Information Line
(800) 514-0301 (voice)
(800) 514-0383 (text telephone)
http://www.usdoj.gov/crt/ada/adahom1.htm

Regional Disability and Business Technical Assistance Centers
(800) 949-4232 (voice/text telephone)
www.adata.org

National Council on Disability
1331 F Street, NW, Suite 1050
Washington, DC 20004
(202) 272-2004
(202) 272-2074 (text telephone)
(202) 272-2022 (fax)
http://www.ncd.gov

Last Updated: June 27, 2000

APPENDIX L

RESNA Technology Assistance Project State Contact List

This list provides state contact information for various technical assistance projects around the United States and its territories. The centers are useful contact points for learning about assistive technologies in general and can also help you obtain assistive technology from a variety of state, federal, and private sources. The list includes the name of each project, address and phone contacts, as well as the center's directors and information specialists. This list was compiled by RESNA. The list is in alphabetical order by state. For more information about the technical assistance projects or about RESNA, you can point your Web browser to http:// www.resna.org or contact

RESNA Technical Assistance Project
1700 North Moore Street, Suite 1540
Arlington, VA 22209-1903
Phone: (703) 524-6686
Fax: (703) 524-6630
TTY: (703) 524-6639
E-mail: resnata@resna.org

Alabama Statewide Technology Access and Response Project (STAR) System for Alabamians with Disabilities (1993)
2125 East South Boulevard
P.O. Box 20752
Montgomery, AL 36120-0752
Project Director: Ted Bridges
Phone: (334) 613-3480
Phone: (800) STAR656 (In-State)
TDD: (334) 613-3519
Fax: (334) 613-3485
E-mail: tbridges@rehab.state.al.us
Homepage: http://www.rehab.state.al.us/star

Assistive Technologies of Alaska (1990)
1016 West 6th
Suite 205
Anchorage, AK 99501
Phone: (907) 563-0138 (V/TDD)
Project Director: Jim Beck
Phone: (907) 269-3569 (V/TDD)
Fax: (907) 269-3632
E-mail: jim_beck@labor.state.ak.us
Homepage: http://www.labor.state.ak.us/at/index.htm

American Samoa Assistive Technology Service Project (ASATS) (1993)
Division of Vocational Rehabilitation

The date in parentheses is the date in which the project was funded through a grant by the U.S. Department of Education, National Institute on Disability and Rehabilitation Research under the Technology-Related Assistance for Individuals with Disabilities Act of 1998, as Amended (P.L. 105-394).

Department of Human Resources
Pago Pago, American Samoa 96799
Project Director: Edmund Pereira
Phone: (684) 699-1529
TDD: (684) 233-7874
Fax: (684) 699-1376
E-mail: edperei@yahoo.com

Arizona Technology Access Program (AZTAP) (1994)
Northern Arizona University
2715 North Third Street, Suite 104
Phoenix, AZ 85004
Project Director: Jill Oberstein
Phone: (602) 728-9532
Phone: (800) 477-9921
TDD: (602) 728-9536
Fax: (602) 728-9535
E-mail: jill.oberstein@nau.edu
Homepage: http://www.nau.edu/ihd/aztap

Arkansas Increasing Capabilities Access Network (ICAN) (1989)
Arkansas Department of Workforce Education
Arkansas Rehabilitation Services
2201 Brookwood Drive, Suite 117
Little Rock, AR 72202
Project Director: Sue Gaskin
Phone: (501) 666-8868 (V/TDD)
Phone: (800) 828-2799 (V/TDD, In-State)
Fax: (501) 666-5319
E-mail: sogaskin@ars.state.ar.us
Homepage: http://www.arkansas-ican.org

California Assistive Technology System (CATS) (1993)
California Department of Rehabilitation
2000 Evergreen
Sacramento, CA 95815
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Colorado Assistive Technology Partners (1989)
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Connecticut Assistive Technology Project (1992)
Department of Social Services, BRS
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Hartford, CT 06106
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Phone: (800) 537-2549 (In-State)
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Delaware Assistive Technology Initiative (DATI) (1991)
Center for Applied Science & Engineering
University of Delaware/duPont Hospital for Children
1600 Rockland Road
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TDD: (302) 651-6794
Fax: (302) 651-6793
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Homepage: http://www.asel.udel.edu/dati

University Legal Services AT Program for the District of Columbia (1993)
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Washington, DC 20002
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Florida Alliance for Assistive Service and Technology (FAAST, Inc.) (1992)
1020 E. Lafayette Street, Suite 110
Tallahassee, FL 32301-4546
Project Director: Terry Ward
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TDD: (850) 922-5951
Fax/TDD: (850) 487-2805
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Georgia Tools for Life (1991)
Division of Rehabilitation Services
2 Peachtree Street, N.W., Suite 35-415
Atlanta, GA 30303-3142
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Phone: (800) 479-8665 (In-State)
TDD: (404) 657-3085
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E-mail: toolsforlife@mindspring.com
Homepage: http://www.gatfl.org

Guam System for Assistive Technology (GSAT) (1994)
University Affiliated Program—Developmental Disabilities
University of Guam
UOG Station
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Principal Investigator: Heidi E. Farra-San Nicolas, Ph.D.
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Assistive Technology Resource Centers of Hawaii (ATRC) (1991)
414 Kuwili Street, Suite 104
Honolulu, HI 96817
Information and Outreach Coordinator: Judith Clark
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Homepage: http://www.atrc.org

Idaho Assistive Technology Project (1992)
129 W. Third Street
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Illinois Assistive Technology Project (1989)
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Assistive Technology through Awareness in Indiana Attain Project (1990)
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TDD: (800) 486-8809 (National)
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Homepage:http://www.attaininc.org

Iowa Program for Assistive Technology (IPAT) (1990)
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University Hospital School
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Assistive Technology for Kansas Project (1993)
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Kentucky Assistive Technology Service (KATS) Network (1989)
Charles McDowell Rehabilitation Center
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Information and Referral: Ronji Dearborn
Project Director: J. Chase Forrester
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Phone: (800) 327-5287 (V/TDD, In-State)
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Homepage: http://www.katsnet.org

Louisiana Assistive Technology Access Network (LATAN) (1991)
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Baton Rouge, LA 70898-4115
Executive Director: Julie Nesbit
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Phone: (800) 270-6185 (V/TDD)
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Homepage: http://www.latan.org

Maine Consumer Information and Technology Training Exchange (CITE) (1989)
Maine CITE Coordinating Center
University of Maine System Network
46 University Drive
Augusta, ME 04330
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Maryland Technology Assistance Program (TAP) (1989)
Governor's Office for Individuals with Disabilities
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Baltimore, MD 21218
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Homepage: http://www.mdtap.org

Massachusetts Assistive Technology Partnership (MATP) (1990)
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Michigan Tech 2000 (1992)
Michigan Assistive Technology Project
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Minnesota Star Program (1989)
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TDD: (651) 296-8478
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E-mail: star.program@state.mn.us
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Homepage: http://www.state.mn.us/ebranch/admin/assistivetechnology/index.html

Mississippi Project Start (1990)
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Jackson, MS 39215-1000
Phone: (601) 987-4872
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Missouri Assistive Technology Project (1991)
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Independence, MO 64055-6975
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TDD: (816) 373-9315
Fax: (816) 373-9314
E-mail: dcgolden@swbell.net
Homepage: http://www.dolir.state.mo.us/matp

MonTECH (1991)
Rural Institute on Disabilities
The University of Montana
634 Eddy Avenue
Missoula, MT 59812
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Phone: (406) 243-5676
Fax: (406) 243-4730
E-mail: montech@selway.umt.edu
Homepage: http://rudi.montech.umt.edu

Nebraska Assistive Technology Partnership (1989)
5143 South 48th Street, Suite C
Lincoln, NE 68516-2204
Information and Referral: Kathryn Kruse
Project Director: Mark Schultz
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Fax: (402) 471-6052
E-mail: mschultz@atp.state.ne.us
Homepage: http://www.nde.state.ne.us/ATP/TECHome.html

Nevada Assistive Technology Collaborative (1990)
Rehabilitation Division
Community Based Services
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Carson City, NV 89710
Project Administrator: Donny Loux
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TDD: (775) 687-3388
Fax: (775) 687-3292
E-mail: pgowins@govmail.state.nv.us
Homepage: http://detr.state.nv.us/rehab/reh_pgbs.htm#State%20Assistive%20Technology%20Act%20Program

New Hampshire Technology Partnership Project (1991)
Institute on Disability/UAP
The Concord Center
Ten Ferry Street #14
Concord, NH 03301
Project Director: Jan Nisbet
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E-mail: twillkomm@nhaat.mv.com
Homepage: http://iod.unh.edu/projects/assist.htm#nhatpp

New Jersey Technology Assistive Resource Program (TARP) (1992)
New Jersey Protection and Advocacy, Inc.
210 South Broad Street, 3rd Floor
Trenton, NJ 08608
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Phone: (800) 342-5832 (In-State)
TDD: (609) 633-7106
Fax: (609) 341-3327
E-mail: gblue@njpanda.org
Homepage: http://www.njpanda.org

New Mexico Technology Assistance Program (1990)
435 St. Michael's Drive, Building D
Santa Fe, NM 87505
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Homepage: http://www.nmtap.com

New York State Traid Project (1990)
Office of Advocate for Persons with Disabilities
One Empire State Plaza, Suite 1001
Albany, NY 12223-1150
Acting-Project Manager: Lisa Rosano-Kaczkowski
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Phone: (800) 522-4369 (V/TDD; In-State)
TDD: (518) 473-4231
Fax: (518) 473-6005
E-mail: traid@emi.com
Homepage: http://www.advoc4disabled.state.ny.us/TRAID_Project/technlog.htm

North Carolina Assistive Technology Project (1990)
Department of Health and Human Services
Division of Vocational Rehabilitation Services
1110 Navaho Drive, Suite 101
Raleigh, NC 27609-7322
Project Director: Ricki Cook
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North Dakota Interagency Program for Assistive Technology (IPAT) (1993)
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E-mail: jlee@polarcomm.com
Homepage: http://www.ndipat.org

Commonwealth of the Northern Mariana Islands Assistive Technology Project (1994)
Governor's Developmental Disabilities Council
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P.O. Box 2565 CK
Saipan, MP 96950-2565
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Assistive Technology of Ohio (1992)
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Oklahoma Able Tech (1992)
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E-mail: mljwell@okstate.edu
Homepage: http://okabletech. okstate.edu

Oregon Technology Access for Life Needs Project (TALN) (1990)
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3070 Lancaster Drive NE
Salem, OR 97305-1396
Project Director: Byron McNaught
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Homepage: http://www.taln.org

Pennsylvania's Initiative on Assistive Technology (PIAT) (1992)
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Puerto Rico Assistive Technology Project (1993)
University of Puerto Rico
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College of Related Health Professions
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E-mail: pratp@coqui.net
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Rhode Island Assistive Technology Access Partnership (ATAP) (1993)
Office of Rehabilitation Services
40 Fountain Street
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Homepage: http://www.atap.state.ri.us

South Carolina Assistive Technology Program (1991)
USC School of Medicine
Center for Disability Resources
Columbia, SC 29208
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South Dakota Assistive Technology Project (DAKOTALINK) (1992)
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Tennessee Technology Access Project (TTAP) (1990)
Citizens Plaza State Office Building, 11th Floor
400 Deaderick Street
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Phone: (800) 732-5059
Phone: (615) 741-4566 (TDD)
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E-mail: kwright@mail.state.tn.us
Homepage: http://www.state.tn.us/mental/ttap.html

Texas Technology Access Project (1992)
Texas Center for Disability Studies
University of Texas at Austin
SZB252-D5100
Austin, TX 78712-1290
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Phone: (800) 828-7839
Project Director: Susanne Elrod
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U.S. Virgin Island Technology-Related Assistance for Individuals with Disabilities (TRAID) (1995)
University of the Virgin Islands/UAP
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Utah Assistive Technology Program (1989)
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Virginia Assistive Technology System (1990)
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Homepage: http://www.vats.org

Washington Assistive Technology Alliance (1993)
University of Washington
Center for Technology and Disability Studies
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Seattle, WA 98195-7920
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Homepage: http://wata.org

West Virginia Assistive Technology System (WVATS) (1992)
University Affiliated Center for Developmental Disabilities
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WisTech (1990)
Wisconsin Assistive Technology Program
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Homepage: http://www.wistech.org

Wyoming's New Options in Technology (WYNOT) (1993)
University of Wyoming
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Homepage: http://wind.uwyo.edu/wynot/wynot.htm

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