

Introduction to Assistive Computer Technology

A Lighthouse Center for Education Resource



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Advances in technology have opened new opportunities for people who are blind and partially sighted to be fully independent at work, in school, and at home. On the market today are optical scanners that "read" print, closed circuit television systems that magnify print or pictures, and an array of devices and software that work with standard personal computers ("PCs") to create large print, synthetic voice or Braille output.

When you consider purchasing an assistive device, especially one that is specialized, expensive, or may require training to use, there are some general points to keep in mind:

- There is no device that is universal. What works for others may not work for you.
- Determine your needs. What do you want to be able to do with the equipment?
- If you are partially sighted, consult with your eye care specialist before purchasing any equipment. Your vision condition may make it easier or harder to use some devices, and it is best to determine that as early as possible.
- Get as much information as possible about the device and the different companies who make it.

- Make sure that any necessary software will work for you. Windows, and other software that relies on graphic features such as icons, have in the past been difficult for people with impaired vision to use. Recent developments in screen reading software have made this type of software more accessible for users of voice output, refreshable Braille, and screen magnification programs. However, it is still a good idea to consult a technology specialist to help you select software that works best for you.
- Arrange to test equipment before purchase. Tryouts can usually be arranged at a local vision rehabilitation agency or technology center. Call the Lighthouse Information & Resource Service at (800) 829-0500 to find an agency near you.
- If training is needed to use the equipment, find out how it will be provided. Will the manufacturer provide training? If not, where can you get training? Is there a fee?
- Determine your budget. There may be a variety of devices and/or software that you can use, so get the one that fits within your spending limit. Many of the devices described here are costly. Check with your state or private rehabilitation agency, state or local advocacy group, independent living center, or membership organization (such as the National Federation of the Blind or the American Council of the Blind) for advice on financial assistance.

Also, call the Lighthouse Information and Resource Service at (800) 829-0500 to request a free copy of “Grants-in-Aid,” a

resource guide that lists the names of foundations and other organizations to which you can apply for financial assistance.

OVERVIEW OF ASSISTIVE DEVICES

This is an overview of assistive devices and software that make information accessible. For people who are visually impaired, assistive technology makes information accessible by converting print to synthetic voice, large print, or Braille.

- Synthetic speech can be produced either by a specialized device or by the use of a computer's built-in sound system with the addition of specialized software (often known as screen reader software). Synthetic speech devices can "read" material aloud. With synthetic speech, people who have little or no vision can access many mainstream computer applications, read books and other printed material without the assistance of a sighted reader.
- Large print devices and/or software electronically magnify material. With this technology, people with limited vision can read computer screens, printed matter, or view pictures.
- Braille devices offer access to computers to people who use Braille. They permit Braille input of information; display computer output in Braille; or display books and other material in Braille.

ASSISTIVE DEVICES FOR COMPUTERS

There is an array of assistive hardware/software designed specifically for use with standard personal computers (PCs) found in homes, schools, and offices. With the addition of appropriate assistive technology, people with impaired vision can do word processing, use spreadsheets and databases, send and receive e-mail, surf the Web and perform most computer tasks via Braille, voice or large print access.

The great majority of up-to-date computers can be used with assistive technology. The PC, however, must have certain features, such as additional memory, in order to work well with most assistive hardware/software. Before making a purchasing decision, be sure to check that the PC you select can be used with the assistive technology you plan to use.

The following survey of assistive technology available to people who are blind or partially sighted briefly describes each type's capabilities, training requirements, approximate price range, and current manufacturer(s). Contact information for the manufacturers themselves is provided at the end of this resource guide. These companies can send you detailed product literature, and many are able to send it in audiocassette, large print or Braille format. Please note that Lighthouse International does not endorse the products, services, or any company listed in this guide.

CLOSED CIRCUIT TELEVISION MAGNIFIERS FOR PEOPLE WITH LOW VISION

For people who have low vision, a closed circuit television magnifier (CCTV) is a vital and basic optical device. With a CCTV, people with low vision can comfortably read books and newspapers, manage their checkbooks, read prescription bottles, or view photos. Most CCTVs are stationary "desk" models, but there are a growing number of portable CCTVs.

Standard CCTVs consist of a camera and monitor screen (usually 12 or 19 inches). Material placed under the camera is magnified and displayed on the CCTV monitor. Print size, brightness and contrast can be adjusted to meet individual reading needs. The image can be viewed either with black letters on a white screen or white letters on a black screen. Standard CCTVs have a black and white screen. Color CCTVs are also available.

Portable CCTVs are now increasingly available. There are a variety of portable CCTVs: some use a small "handheld" camera that is passed over the text to be enlarged, while others use a compact version of the desktop monitor. Text is displayed in magnified form on either a standard CCTV monitor, a small portable monitor, or on the screen of an ordinary television set or computer, depending on the model selected. Portable CCTVs offer levels of magnification that far exceed that of standard optical devices.

One version of the CCTV combines elements of a scanning system with elements of a CCTV. Pages are scanned in (at the rate of about 10 seconds per page) and then the text is displayed in magnified form on a monitor. Text can be scrolled continuously

across the screen, making this a good choice for people who read a lot.

Connecting a CCTV to a Computer

Certain CCTVs can be used with computers: only one monitor is needed, because the computer and the CCTV "share" the screen. The screen is "split," and it shows both PC and CCTV material, making it possible to read print and computer files simultaneously.

Training

CCTVs are easy to use. Before making a purchasing decision, test out the CCTV with documents you are likely to read - newspapers, business correspondence, faxes, photos, etc. - to assure that its performance meets your expectations.

Price

The standard basic black and white unit starts at approximately \$1,800. Portable CCTVs vary in price depending on size and display capability but they start at about \$900. The CCTV that scans materials in and then scrolls text across the screen costs about \$2,900 (not including the monitor).

Recently, some people who purchased a CCTV on the advice of a low vision specialist were able to receive some funding from Medicare towards the cost of the CCTV. Although the filing and appeals process was lengthy, a judge ruled that CCTVs fall under the heading of "durable medical equipment" and "prosthetic device." If your doctor has suggested using a CCTV, you may want to file a Medicare part B form and see if coverage is available.

Note: Closed circuit television devices as well as any optical devices such as telescopes, hand or stand magnifiers, or high powered spectacles, should be purchased with the advice of a low vision specialist, eye care professional, or vision rehabilitation therapist.

Closed circuit televisions for persons with low vision are available from:

PulseData/HumanWare, Inc. (SmartView)
Innoventions, Inc. (Portable CCTVs such as Magni-Cam)
Optelec, Inc. (ClearView series)
TeleSensory, Inc. (Aladdin series, Genie Pro, Atlas series, MiniViewer)

OPTICAL CHARACTER RECOGNITION SYSTEMS ("PERSONAL READING MACHINES") FOR PEOPLE WHO ARE BLIND OR PARTIALLY SIGHTED

Optical character recognition (OCR) systems, also known as "personal reading machines," enable people who are totally blind or who have partial sight to "read" print.

OCRs can either be a self-contained unit (stand-alone) or part of a PC-based system. A stand-alone OCR or the scanner of a computer-based OCR system looks something like a small photocopier. It has a glass screen on which print to be "read" is placed. The scanner camera scans the material and, in a few seconds, the page is read out loud using synthetic voice. OCRs can read almost any book, newspaper or other typewritten materials.

Note: Handwritten material cannot be read.

When linked to a PC, printed material that has been scanned in can be converted to Braille, large print, voice, computer accessible files, or other media.

If you are considering purchasing an OCR, test it out with documents you are likely to read - newspapers, business correspondence, faxes, etc. - to ensure its performance meets your expectations.

Training

Even people who have never used a computer can learn to use a stand-alone OCR system within only a few hours of training. People who already know how to use a standard PC computer require modest amounts of training to learn to use a computer-based OCR system.

Price

An OCR self-contained unit starts at about \$4,000. OCR systems, which include a scanner and software that PCs need to operate, begin at about \$1,100 (not including the cost of the PC).

Personal readers and OCR (optical character recognition) systems are available from:

Freedom Scientific (OpenBook)
Kurzweil Educational Systems (Kurzweil 1000)
PulseData/HumanWare, Inc. (ScannaR)
Robotron (Galileo Reading System, Pronto Reading Machine,
Rainbow Reading Machine)

PORTABLE NOTE TAKING DEVICES

Portable note taking devices can be used by people who know Braille as well as people who do not.

Note taking devices are small, lightweight devices equipped with a Braille or typewriter-style keyboard for input and synthetic voice. Some also contain a Braille display (between 18 and 40 characters) for output.

Note takers are excellent tools for recording notes in school, at home or at work. They often have additional features such as a calculator and a calendar function. Newer models have a built-in modem which allows the user to access e-mail as well as surf the Web. Most people take their note takers everywhere. They can be used as a stand-alone device, but when connected to a PC the versatility is greatly enhanced. For example, files can be exchanged between a note taker and a PC, or information can be sent from the note taker to a Braille embosser or to an ink print printer.

When linked to a PC using a screen reader, note takers equipped with a Braille display can act as a Braille output device.

Training

Experienced Brailleists or typists can learn the basic functions of a portable note taker with about 12 hours of training.

Price

Note takers with speech only range in price from \$1,300-\$2,200. Those equipped with Braille display range from \$3,500-\$5,900 depending on the length of the Braille display.

Note takers are available from:

Artic Technologies (Trans Type, Braille Desk)

Freedom Scientific (Braille Lite series, Braille 'n Speak, Type 'n Speak, Type Lite)

PulseData/HumanWare, Inc. (BrailleNote*)

Robotron (Aria)

Sighted Electronics (ELba)

* Note: The BrailleNote note taker can also be connected to a GPS receiver.

LARGE PRINT/ SCREEN MAGNIFICATION HARDWARE/SOFTWARE FOR PEOPLE WITH LOW VISION

People with low vision (also called partial vision) can use assistive hardware/software to enlarge material - either print or graphics - that is displayed on a computer screen.

Large print assistive technology consists of either hardware or software. In both cases, these systems enable people with low vision to use PCs for word processing, spreadsheets, or virtually any computer application. Some screen magnification software packages include a synthetic speech component that works with the sound system of a PC. This is useful for people who need

some speech feedback as they type and use navigation keystrokes.

With the assistance of screen magnification software, most users of large print should be able to use Windows or other graphically-based software. To be sure, check with a technology specialist or the manufacturer before you purchase the equipment.

Training

People who already know how to use a standard PC computer require modest amounts of training to learn to use large print technology.

Price

Prices for screen magnification software range from \$395-\$600. The cost of large print hardware is about \$2,500. (This price does not include the cost of the PC.)

Software to enlarge text on the computer screen is available from:

AI Squared (ZoomText)
ALVA Access Group Inc. (inLARGE for Macintosh)
Dolphin Computer Access (Supernova, Lunar, LunarPlus)
Freedom Scientific (MAGic)

SYNTHETIC SPEECH "TALKING" COMPUTERS FOR PEOPLE WHO ARE BLIND OR HAVE ADVANCED LOW VISION

Most standard PC computers can "talk" with the addition of a speech synthesizer and screen reading software. The synthetic speech can be produced either via a synthetic voice device or software which makes use of the computer's sound system. Computers equipped with synthetic speech and screen reading software allow people who are blind or who have very low vision to perform word processing, use spreadsheets, work with databases, surf the Web, and perform most computer operations.

In the DOS environment, the synthetic voice must be produced by a hardware synthesizer especially designed for that purpose. In the Windows environment, one is also able to use software synthesizer programs, which make use of the sound systems that are included with current PCs. These are less expensive than hardware synthesizers. However, in all environments, screen reading software is needed to direct the hardware/software speech synthesizer. When making purchasing decisions, be sure that the synthesizer and screen reading software are compatible.

The hardware or software synthesizer in combination with a screen reader "reads" the screen. As one navigates the screen with the use of keystrokes, the character, word, or line at the cursor location, highlighted items, and other necessary information are announced.

Training

Training is required to use these programs successfully. Users will need training in the keystrokes needed to navigate Windows and

the keystroke commands of the chosen screen reader. Users will also need training to learn the specific word processing, database, spreadsheet, or Internet browser program they plan to use. To aid with training, companies have produced tutorials in Braille, large print, audiocassette, and CD-ROM formats. The subjects of these tutorials include: various versions of the Windows operating system, MS Word (97 and 2000), Outlook 2000, Excel, WordPerfect for Windows, Netscape, and Internet Explorer version 5.

Price

The price of synthetic voice usually depends on the quality of the speech generated and whether it is a hardware device or a software application. Prices for screen reading software vary. Screen readers for Windows-based systems cost between \$600-\$1,400; screen reading software for DOS systems range in price from no charge to \$600. Hardware synthesizers cost between \$300-\$1200. Some software synthesizer applications are provided with many screen readers at no additional cost. Other software synthesizers are priced at approximately \$200. (These prices do not include the cost of the PC.) Prices for tutorials range from \$60 to \$85.

Synthetic speech hardware and software for personal computers are available from:

ALVA Access Group, Inc. (outSPOKEN for Windows or Macintosh)

Artic Technologies (WinVision)

Dolphin Computer Access (Hal, Supernova)

Freedom Scientific (JAWS)

GW Micro (Window-Eyes)

TALKING INTERNET BROWSERS

Although the majority of screen readers work well with mainstream Internet browsers, there are software packages currently on the market that are designed to provide speech access only to the Internet. The packages include a software speech synthesizer, an Internet browser, and an easy to use set of navigation and reading keystrokes. This software is primarily designed for people who do not wish to learn Windows navigation, nor other applications, but who want to surf the Web.

Training

Some training is required in order to use these packages.

Price

These software packages range in price from \$150-\$250.

Talking Internet browser software is available from:

IBM (Home Page Reader)
Serotek Corporation (FreedomBox)

"REFRESHABLE" BRAILLE DISPLAYS FOR PEOPLE WHO READ AND WRITE BRAILLE

Refreshable Braille displays (sometimes called paperless Braille) provide access to PC computers via electronic Braille. The Braille display, which changes as the cursor moves from line to line on the computer screen, consists of plastic pins that are electronically

raised and lowered to form Braille characters. As many as 80 Braille characters can be displayed at one time.

Devices of this type are very useful for accurate proofreading or reviewing computer screen layouts. Depending upon how the computer will be used, Braille output can be an important addition, or alternative, to speech output.

Training

These devices require many hours of training to use and should only be used by experienced Braille readers.

Price

Prices of refreshable Braille devices start at about \$5,500 for a 40-character display, \$8,000 for a 65-character display (corresponding to one full line of print on the computer screen), and go as high as \$12,000 for an 80-character display.

Refreshable Braille displays are available from:

- Advanced Access Devices (SuperBraille)
- ALVA Access Group, Inc. (ALVA Satellite series, ALVA Delphi MultiMedia series, ALVA ABT3 series)
- Freedom Scientific (PowerBraille, Focus)
- PulseData/HumanWare, Inc. (Braille Star)
- Sighted Electronics (BRAILLEX series)

BRaille TRANSLATION SOFTWARE

Braille translation software allows a person to translate print to Braille and Braille to print using a standard PC computer. The advantage is that one need not understand either system of communication to be able to effectively write in it. The software is compatible with Windows, MS-DOS, Microsoft Word, and WordPerfect.

Training and Price

Training requirements and price ranges are described in the next section on Braille embossers.

Braille translation software to convert electronic text files to Braille, or Braille to electronic text files, is available from:

Duxbury Systems, Inc. (Duxbury Braille Translator)

BRaille EMBOSSERS FOR PRODUCING HARDCOPY DOCUMENTS IN BRaille

Braille embossers connect to standard PCs in the same way as ink printers do. Braille embossers work like any other printer, but emboss in Braille rather than print in ink. Virtually any PC can be connected to a Braille embosser and, with the addition of "translation software," can print information in grade 2 Braille.

Braille embossers can be noisy. Covers, sometimes called "quietizers," are available to reduce noise.

Training

Anyone, including people who do not have Braille skills, can learn to use a Braille embosser and associated translation software within a few hours.

Price

There are many Braille embossers on the market and the price generally depends on printing speed. Prices start at about \$1,800. Translation software starts at about \$500.

Braille embossers are available from:

BRL Inc. (Tiger Advantage)

Enabling Technologies (Romeo series, Juliet series, Thomas, ET, BookMaker, Marathon, BraillePlace, PrestoBraille signmaker, KGS BrailleLabeler)

Freedom Scientific (VersaPoint Duo, Braille Blazer)

PulseData/HumanWare, Inc. (Mountbatten Pro)

Sighted Electronics (Index series, Everest, Impacto, Porta-Thiel)

TUTORIALS

Screen reader and magnification software manufacturers have training materials included with their products. Tutorials for popular computer applications such as Microsoft Word, Outlook, Excel and Internet Explorer, as well as various versions of the Microsoft Windows operating system, are available in Braille, large print, cassette and CD-ROM.

Price

Prices for tutorials range from \$60 to \$85.

Tutorials are available from:

BRL Inc.

CrissCross Technologies

Freedom Scientific

Project ASSIST with Windows, Iowa Department for the Blind

ADDITIONAL RESOURCES

Additional information about assistive technology may be obtained from the following resources:

ABLEDATA

Sponsored by the National Institute on Disability and Rehabilitation Research, US Department of Education, ABLEDATA is a federally funded project whose primary mission is to provide information on assistive technology and rehabilitation equipment available from domestic and international sources and targeted to consumers, organizations, professionals, and caregivers within the United States.

The ABLEDATA database contains information on more than 27,000 assistive technology products (over 18,000 of which are currently available), from white canes to voice output programs. The database also contains detailed descriptions of each product, including price and company information, as well as information on noncommercial prototypes, customized and one-of-a-kind products, and do-it-yourself designs.

ABLEDATA

8630 Fenton Street, Suite 930

Silver Spring, MD 20910

(301) 608-8998

(800) 227-0216

Fax (301) 608-8958

TTY (301) 608-8912

Web site: www.abledata.com

ACCESS WORLD

Access World is a journal published by AFB Press of the American Foundation for the Blind. It is a comprehensive resource for obtaining the latest on available assistive technology products, including product evaluations. It is available online, in print, on audiotape, or in Braille. To subscribe, contact:

AFB Press

American Foundation for the Blind

1011 Plaza, Suite 300

New York, NY 10001

(212) 502-7651

Fax (212) 502-7774

E-mail: afbpress@afb.net

Web site: www.afb.org

ASSISTIVE TECHNOLOGY CENTERS

The Technical Assistance Project, sponsored by the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA), provides technical assistance to 56 federally funded state and territory programs that provide training, information, equipment loan arrangements, and other services related to assistive technology. For general information about this project, contact:

Technical Assistance Project

1700 North Moore Street, Suite 1540

Arlington, VA 22209-1903

(703) 524-6686

Fax (703) 524-6630

TTY (703) 524-6639

E-mail: resnaTA@resna.org
Web site: www.resna.org

To locate RESNA assistive technology centers in your state, call Lighthouse International's Information and Resource Service at (800) 829-0500.

MANUFACTURER INFORMATION

Advanced Access Devices

2066-C Walsh Avenue
Santa Clara, CA 95050
(408) 970-9760
Fax: (408) 727-9351
Email: inquiry@aadbrl.com
Web site: www.aadbrl.com
Manufacturer of SuperBraille

Ai Squared

PO Box 669
Manchester Center, VT 05255
(802) 362-3612
Fax (802) 362-1670
Email: sales@aisquared.com
Web site: www.aisquared.com
Screen magnification software

ALVA Access Group, Inc.

436 14th Street, Suite 700
Oakland, CA 94612
(888) 318-2582
Fax (510) 451-0878
Email: info@aagi.com
Web site: www.aagi.com
Braille displays, screen reading software

Artic Technologies

Contact Dale McDaniel
1000 John R. Road, Suite 108
Troy, MI 48083

(248) 588-7370
Fax (248) 588-2650
Email: info@artictech.com
Web site: www.artictech.com
Screen readers

BRL Inc.

Contact Peter Duran
110 Commerce Drive, Suite 210
Fayetteville, GA 30214
(770) 716-9222
Fax: (770) 716-9599
Email: brlinc@wyfiwyg.com
Web site: www.wyfiwyg.com
Braille embossers, computers for the blind, OCR scanners, tutorials

CrissCross Technologies

110-64 Queens Boulevard, #406
Forest Hills, NY 11375
(718) 268-6988
Email: info@crisscrosstech.com
Web site: www.crisscrosstech.com
Tutorials

Dolphin Computer Access, LLC

60 East Third Avenue, Suite 130
San Mateo, CA 94401
(866) 797-5921
Fax (650) 348-7403
Email: info@dolphinusa.com
Web site: www.dolphinusa.com

Screen reading software, magnification software, and speech synthesizers

Duxbury Systems, Inc.

270 Littleton Road, Unit 6
Westford, MA 01886-3523
(978) 692-3000
Fax (978) 692-7912
Email: orders@duxsys.com
Web site: www.duxburysystems.com
Braille translation software

Enabling Technologies

1601 Northeast Braille Place
Jensen Beach, FL 34957
(772) 225-DOTS (3687)
Phone toll free in continental USA: (800) 777-DOTS (3687)
Fax (772) 225-3299
Fax toll free in continental USA: (800) 950-DOTS (3687)
Email: enabling@brailier.com
Web site: www.brailier.com
Braille embossers

Freedom Scientific

11800 31st Court North
St. Petersburg, FL 33716-1805
(800) 444-4443
(727) 803-8000
Fax (727) 803-8001
Email: info@freedomscientific.com
Web site: www.freedomscientific.com
Screen reading software, screen magnification software, OCR software, Braille displays, Braille embossers, note takers

GW Micro

725 Airport North Office Park

Fort Wayne, IN 46825

(260) 489-3671

Fax (260) 489-2608

Email: webmaster@gwmicro.com

Web site: www.gwmicro.com

Screen reading software

IBM Accessibility Center

11400 Burnet Road

Austin, TX 78758

(800) 426-4832

Web site: www.ibm.com/able/

Talking Internet browser (Home Page Reader)

Innoventions, Inc.

5921 S. Middlefield Rd, #102

Littleton, CO 80123-2877

(800) 854-6554

Fax (303) 727-4940

Email: magnicam@magnicam.com

Web site: www.magnicam.com

CCTVs

Kurzweil Educational Systems, Inc.

14 Crosby Drive

Bedford, MA 01730-1402

(781) 276-0600

Email: info@kurzweiledu.com

Web site: www.kurzweiledu.com

OCR software

Optelec, Inc.

6 Lyberty Way
Westford, MA 01886
(800) 828-1056
Fax (978) 692-6073
Email: info@optelec.com
Web site: www.optelec.com
CCTVs

Project ASSIST with Windows

Iowa Department for the Blind
524 Fourth Street
Des Moines, IA 50309-2364
Phone: (515) 281-1357
E-mail: ASSIST@blind.state.ia.us
Web site: <http://www.blind.state.ia.us/assist/Tutorials>

PulseData/HumanWare, Inc.

175 Mason Circle
Concord, CA 94520
(800) 722-3393
Fax (925) 681-4630
Web site: www.humanware.com
Braille displays, note takers, CCTVs

Robotron Group

15 Stamford Road
Oakleigh 3166
Australia
(+61) 3 9568 2568

Fax: (+61) 3 9568 1377

Email: info@robogroup.com

Web site: www.sensorytools.com

Robotron U.S. Distributor:

Technologies for the Visually Impaired

Contact John Panarese

9 Nolan Court

Hauppauge, NY 11788

(631) 724-4479

Fax (631) 724-4479

Email: contact@tvi-web.com

Web site: <http://www.tvi-web.com>

Note takers, OCR stand-alone systems, talking compass

Serotek Corporation

1128 Harmon Place, Suite 310

Minneapolis, MN 55403

(612) 341-3030

Fax (612) 659-0760

Email: sales@freedombox.info

Web site: www.freedombox.info

Talking Internet browser (FreedomBox)

Sighted Electronics

Contact Dave Pilitcher

69 Woodland Avenue

Westwood, NJ 07675

(201) 666-2221

(800) 666-4883

Email: sales@sighted.com

Web site: www.sighted.com

Braille displays, Braille embossers

TeleSensory Corporation

520 Almanor Ave.

Sunnyvale, CA 94086-3533

(800) 804-8004

(408) 616-8700

Fax (408) 616-8720

Email: info@telesensory.com

Web site: www.telesensory.com

Products for people with low vision

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