“Video Magnifiers”

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Fact Sheet on Video Magnifiers

Introduction

Gaining full and easy access to books, magazines, labels, pictures, and other printed material is critical for people with low vision. The need for access to printed material extends into the home, the workplace, the classroom, and many other places where reading and writing are key parts of a person's daily life. Until recently, the primary tools for meeting these needs were optical instruments like magnifying lenses. Today, consumers can also choose from a variety of electronic products called video magnifiers that combine video cameras with a viewing screen or monitor. These devices provide new options to aid people with low vision to view and read printed material. This fact sheet will discuss the types of video magnifiers currently available and their features, and list manufacturers and distributors of video magnifiers as well as more general resources for people with low vision.

This Fact Sheet mentions several specific video magnifiers to illustrate general features.

What Is A Video Magnifier?

A video magnifier is an electronic device that produces enlarged images of text and objects on a monitor or screen. Video magnifiers can be used to read printed material, look at photographs and illustrations, read prescription bottles and other product labels, write checks, complete forms, and perform close work such as sewing. An image of the material to be magnified is captured by a digital video camera, sometimes called a CCD (charge-coupled device) camera. The digital video camera is connected to a monitor or screen on which magnified images are displayed. Some video magnifiers have their own monitor or screen, while others are connected to a separate computer or television.
Video magnifiers are often called closed circuit televisions, or CCTV's, because early models used conventional television screens to display images. The camera and television screen were directly connected in a closed circuit, leading to the term "CCTV." The two terms are still more or less interchangeable, even though many video magnifiers today use computer monitors or thin-film transistor (TFT) flat screen displays.

Video magnifiers can be divided into two basic categories—desktop and portable.

**Desktop Video Magnifiers**

![Desktop Video Magnifiers](image)

Desktop video magnifiers feature a camera mounted over a tray on which the material to be magnified is placed. Some have a built-in monitor and are known as "stand-alone" magnifiers. Others are designed to connect to a television or personal computer.

Most desktop video magnifiers have a "reading tray" that holds the material to be magnified. This tray can be moved from side to side or forwards and backwards, in order to position the desired part of the material directly under the camera.

Desktop video magnifiers are usually bulky and take about as much desk space as a personal computer. Desktop models that connect to a separate computer or a television are lighter but generally require the same amount of desk space.

**Stand-Alone Desktop Models**

Video magnifiers that have their own monitor or display are called stand-alone models. Those who wish to use a video magnifier for writing tasks may prefer a model with more space between the camera and the tray.

Stand-alone desktop models typically have monitors measuring from 14 to 25 inches diagonally. Larger monitors allow more magnified material to appear on screen at a given level of magnification. Desktop
models are also available with flat screens, which are lighter in weight and easier to reposition for a more comfortable viewing angle.

**Computer-Linked and TV-Linked Desktop Models**

Desktop video magnifiers that connect to a computer or to a standard television monitor via a connector cable are also available. The magnified image is displayed on the computer monitor or TV screen. Like stand-alone models, computer-linked and TV-linked desktop models typically have X/Y trays and a frame to hold the camera above the tray, but most do not have their own monitors. (The exceptions are a few stand-alone models that have their own monitors, but allow an optional computer connection.) Computer-connected models are often helpful for people who work with computers on the job or at school. A computer-linked video magnifier does not magnify the computer screen—for this purpose, a screen magnifier or screen magnification software are required. Typically, computer-linked models have a split-screen option that shows computer output on part of the computer screen and images magnified by the video magnifier on the other part of the computer screen. Split screen viewing can make it much easier to write responses to memos at work or to copy quotations into papers for school. The advantage of a model that connects to a television is that most people already have a television. However, standard non-digital televisions have poorer resolution than most computer-type monitors, including those used in stand-alone desktop video magnifiers.

**Portable Video Magnifiers**

The first "portable" video magnifiers were handheld camera units that resembled a computer mouse, which could be connected to any television. TV-linked mouse-cameras are portable in the sense that they can be moved from one location with a television to another location with a television, but they cannot be used anywhere that lacks a television. It would be difficult to take one to a store to read labels or to a business meeting to look at the agenda. Today, though, a variety of truly portable video magnifiers are available with camera units and displays that can be moved together to any location. Below are descriptions of TV-linked camera-mouse models, along with dual systems that combine a camera-mouse with a desk-top frame; single-unit handheld models; video telescopes; and head-mounted systems.

**TV-Linked Camera-Mouse Models**

Camera-mouse models feature a camera mounted in a device that resembles a large computer mouse. The camera-mouse unit is connected to a television or other display unit via a control box and a
connector cable. To scan a document or other item, the camera unit is moved over it. A light emitting diode (LED) in the camera device illuminates the material. Rollers on the bottom of the unit aid scanning of text and other flat material. The camera unit can also be held over round surfaces such as cans and medicine bottles. Most models can be connected to a television. Depending on the model, other display options may include a computer, a TFT (thin-film transistor) flat screen display, or a goggles-style display unit. Goggles-style displays use a liquid crystal display (LCD) on the inner surface of each eyepiece to present magnified images. Some handheld mouse-camera models come with a small, lightweight TFT display that can sit on any flat surface and be moved from one location to another along with the camera unit. The camera unit itself usually weighs about six or seven ounces and the camera unit and control box together may weigh about one pound.

**Dual Systems (Desktop/Camera-Mouse Models)**
A dual system combines desktop and handheld features. These dual systems have a desktop frame with an X/Y tray and a cradle for holding a camera unit. When the camera is sitting in its cradle, the frame and camera form a desktop video magnifier, but the camera unit can also be removed from its cradle and used as a handheld camera unit.

**Single-Unit Handheld Models**
Some handheld models have a small viewing screen (a flat panel display or LCD) in the same unit as the camera, with power from a rechargeable battery. These models can be used in any location. They are recommended for "spot" use, such as looking at labels, checking addresses on envelopes, looking at bus schedules, etc. One product, the Mini-Viewer from Telesensory, has an LCD screen measuring 5.75 inches diagonally, with a choice of three magnification levels (5 times, 10 times, and 15 times). Another, the PocketViewer from Pulse Data Humanware, has a black-and-white flat panel display that measures 4 inches diagonally, with a fixed magnification level that can be increased by holding the PocketViewer closer to the material being viewed, or decreased by holding it farther away.

**Video Telescopes**
Another type of handheld model is the video telescope, which has a camera at one end and a built-in display at the other end. The display measures about one inch diagonally. To view an object, the display end is held up to one eye while the camera end is aimed at the object. Video telescopes are the only video magnifiers that can be used by pedestrians with low vision as a travel aid. For example, they can be used to read street signs or signs on buildings, and to tell whether a pedestrian signal reads "Walk" or "Don't Walk."
Head-Mounted Systems

Systems that combine display goggles with cameras mounted in front of the goggle eyepieces are called "head-mounted" video magnifiers. Several head-mounted systems are now available. Unfortunately, head-mounted systems cannot be used for walking, because the magnification provided by the goggles greatly narrows the user’s field of vision, making it unsafe to walk with the goggles on. However, head-mounted systems can be used for stationary viewing tasks, such as reading or watching television, and since the systems are lightweight and portable they can be taken to school to watch the blackboard or to a museum to look at paintings.

Common Features

There is a number of design features found in all the main video magnifier types. Understanding these features can help consumers to compare different types, brands, and models. Some of these features are listed below, with brief explanations.

- Monitor size — in general, larger monitors show a larger portion of the material under view at any level of magnification. A disadvantage of larger monitors is that they take more space. In desktop models, flat screen displays take up less space in relation to the size of the display area.

- Tray size — Many users find a larger tray easier to work with as it can accommodate a larger variety of materials, but larger trays require more desk space. Since it is necessary to move the tray from side to side and forward and back, the desk space needed is much more than the size of the tray alone would indicate.

- Magnification range — each model has its own magnification range that defines what levels of magnification are available to users of that model. Depending on model, the maximum magnification may be less than ten times or more than 100 times original size. For models that connect to a computer or television, the manufacturer may state several magnification ranges depending on the size of the computer monitor or television screen to which the video magnifier will be connected. As magnification increases, less of the magnified material can be seen on the display, and some people may find this makes it difficult to read materials at full magnification. To deal with this problem some models have an overview mode with lower magnification levels, which allows users to orient themselves on a page before increasing magnification to read.

- Display color — Some models provide only a black-and-white display, which may be sufficient for those who plan to use the magnifier solely for reading newspapers and other text. Other models have full color displays. Black-and-white models are usually a little less
expensive than color models from the same company. Most color models offer a black-and-white viewing mode, and some offer other display options, such as a full color, medium contrast photo mode suitable for viewing photographs.

- **Reverse video** — many models include a reverse video feature, in which black letters on white paper appear as white letters on a black background. This feature is helpful to individuals who are prone to experience glare when looking at a bright image.

- **Alternative color combinations** — Many models can display text in other color combinations in addition to black and white, such as green on black, light blue on black, etc., for those individuals who find other color combinations easier to view.

- **Magnification controls** — In some models, the magnification level can be changed by raising and lowering the camera above the material being viewed. Examples include desktop models in which the camera can be raised and lowered above the tray. In other models, a lever or knob controls the magnification level.

- **Manual or automatic focus** — in manual focus models, the camera must be refocused by hand each time the magnification level is changed. For those who find it difficult or tiresome to focus a lens manually by turning a knob, many models offer automatic focus capability, or a zoom feature that provides extra magnification as needed without refocusing.

- **Windowing and line markers** — Windowing allows a person to narrow the viewing window vertically or horizontally to focus on a selected part of the text that he or she wishes to read. A similar purpose is served by the line marker features, which puts lines into the display to underline or over line rows or vertically define columns without masking text outside the marker-defined area.

**Distance Viewing**

Video telescopes and head-mounted cameras with a goggle display can be used for distance viewing, such as watching television or viewing a blackboard at school. Video telescopes can also be used much like a monocular telescope to read signs or perform other mobility tasks, but, as noted above, head-mounted systems are not recommended for use while moving.

Several manufacturers have models with rotating cameras or cameras mounted on flexible arms that can be focused on distant objects. Some of these systems are designed specifically for classroom use, including systems with a single camera whose focus can be shifted from a desktop to a blackboard, and others that use two cameras, one focused on a reading tray, and the other focused on the blackboard.

**Choosing a Video Magnifier**

The only person who can decide if a video magnifier is appropriate is the person who will actually be using it. The advice of a low vision optometrist or an assistive technology specialist is often valuable, but it is the person with the disability who ultimately chooses to use the magnifier or let it gather dust. With this fact in mind, the person who will actually use the magnifier should always be the primary decision maker in the selection and purchase of a video magnifier.

Someone who is considering buying a video magnifier but who lacks experience actually using one may feel unsure which of the many video magnifier types and features would be best, or even whether a video magnifier is better than other options. What can the potential buyer do to make the right decision?
Many will find it helpful to consult a low vision optometrist or assistive technology specialist before making a decision. Both can provide information and advice regarding the full range of available options for people with low vision, which may include speech output and Braille as well as lenses and electronic magnifiers.

An important consideration is the purpose of the video magnifier. Will it be used for hobbies and crafts, reading mail, looking at photographs, school work, or on-the-job tasks? Different features may be appropriate for different tasks. Any specialist who is consulted should be told what the magnifier will be used for.

Hands-on experience should also be a part of the decision to purchase a video magnifier. Mada center has adaptive equipment demonstration centers where consumers can try products. Many manufacturers and distributors can provide in-home product demonstrations. Even when a third party payer such as a vocational rehabilitation program is purchasing the product, a demonstration can usually be arranged.

Consumers interested in finding a portable model should be aware that portability is relative, and they should examine the features of models advertised as portable to see if the models fit their particular needs. A camera mouse can be moved from one location to another, but it can only be used where there is a television or other display. Some desktop systems with flat panel displays are lightweight and are therefore called portable, but they may not be easy to set up in remote locations such as a store. Battery-powered single-unit handheld models and video telescopes can be used in a store or even outdoors, but battery life may be limited, and overnight recharging may be necessary when their rechargeable batteries run low.

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