Output devices

Output devices translate bits and bytes into a form we can understand. These devices include monitors, printers, plotters, multimedia projectors, and voice-response system.

Monitors and graphic adapters

The output devices we are most familiar with is television like monitor which displays alphanumeric and graphic output. We describe monitors and their capabilities in term of following.

- Graphic adapters(the electronic link between the processor and the monitor)
- Size diagonal dimension of the display screen
- Resolution (details of the display)
- Display quality

The **graphic adapter** is the device controller for the monitor. Graphics adapters can be inserted into an expansion slot on the motherboard. Newer motherboards equipped with an accelerated graphics port(AGP bus slot can take advantage of AGP technology. The monitor cable is plugged into the graphic adaptor, where the digital signals are converted to analog signals compatible with the monitor's display capabilities.

Most exiting graphics adapters have their own RAM called **video RAM or VRAM** where they prepare monitor-bound images for display.

The size of the video RAM is important in that it determines the number of possible colors and resolution of the display, as well as the speed at which signals can be sent to the monitor. A minimum of two megabyte of video RAM is recommended to accommodate the complexity of modern graphics-based software. Th newer AGP graphics adapters enjoy much better performance by using the PC system's RAM directly.

Monitor size. Displays screens vary in size from 5 to 30 inches(measured diagonally). The monitor size for newly purchased desktops PCs has inched up from 9 inches to 19 inches.

Monitor resolution: Pixels and Dot pitch. Monitors vary in their quality of output, or resolution. Resolution depends on the number of pixels that can be displayed. The number of the bits used to represent each pixels, and the dot pitch of the monitor. A pixel is an addressable point on the screen, a point to which light can be directed under program control.

Each pixels, short for picture element can be assigned a color or for monochrome monitors, a shade of gray. Graye scales refer to the number of shades of a color that can be shown on a monochrome monitor's screen. Most color monitors mix red, green, and blur to achieve a spectrum of colors, and are called RGB monitors. One of the user options is the number of bits used to display each pixel. In 8-bit color mode yields 65536 colors. True color options, either 24-bit or 32-bit modes, provide photo-quality viewing with over 16 million colors. There is a trade-off between resolution and system performance.

A monitor's resolution also is affected by its **dot pitch** or the distance between the center of pixels. Any dot pitch equal to or less than 28 mm (millimeters) provides a sharp image. When you have an opportunity use a magnifying glass to examine the pixels and observe the dot pitch on your computer's monitor.

Display quality: Be Flicker Free. There are two mor characteristics that affect the quality of the display the refresh role and whether the monitor is interlaced. The phosphor coating on a monitor's CRT (cathode-ray tube) must be repainted or refreshed 50 to over 100 times each second to maintain clarity of the image. Generally, monitors with faster refresh rates have fewer flickers and are easier on the eyes. Interlacing will also affect screen flicker. Less expensive monitors are interlaced; that is, they paint every other horizontal line on the screen, then fill in the rest on a second pass (TVs are interlaced). Interlacing may result in some flicker. In contrast, noninterlaced monitors minimize flicker by painting the whole screen in one pass.

Flat-Panel monitors: **Flat-Panel monitors** use a variety of technologies, the most common being LCD (liquid crystal display). LCD monitors are active matrix or passive matrix. Active matrix monitors have higher refresh rate and better contrast, making for a more brilliant display. Millions of transistors are needed for color active matrix LCD monitors.

Color monitors need three transistors for each pixel: one each for red, green, and blue.

Touch screen monitors: *Natural monitors*. **Touch screen monitors** permit input as well as output. Pressure-sensitive overlays are placed over monitor screens that can detect pressure and the exact location of that pressure. Users simply touch the desired icon or menu item with their finger. Educators realized that we are born with and ability to point and touch, and are beginning to use touch screen technology in the classroom to teach every thing from reding to geography. Interactive touch screen systems are installed in shopping centers, zoos, airports, grocery stores, post offices, and many other public locations.

Section two: Further reading

Desktop Printers: Lots of Choices

Printers produce hard-copy output, such as college term papers, management reports, cash register receipts, labels, memos, and payroll checks. Hundreds of printers are produced by dozens of manufacturers.

Page Printers: A Page at a Time

Nonimpact page printers use laser, LED (light-emitting diode). LCS (liquid crystal shutter, and other laser-like technologies to achieve high-speed hard-copy output by printing a page at a time. Page printers are also referred to simply as laser printers. Most of the laser printers in use print shades of gray: however, color laser printers are becoming increasingly popular as their price continues to drop.

Ink-Jet Printers: Popular in SOHO

To the naked eye, there is little difference between the print quality of nonimpact ink-jet printers and page printers. Although the output quality of ink-jet printers is more in line with page printers, their mechanical operation is more like that of the dot-matrix printer because they have a print head that moves back and forth across the paper to write text and create the image. Several independently controlled injection chambers squirt ink droplets on the paper. The droplets, which dry instantly as dots, form the letters and images. Resolutions for the typical ink-jet printer are about that of page printers (600 dpi and up). Print speeds range from 4 to 12 ppm.

The color ink-jet printer is the choice for budget-minded consumers. SOHO (small office home office) buyers also are opting for color ink-jet printers.

Large-Format Ink-Jet Printers: Seeing the Big Picture

Page, ink-jet, and dot-matrix printers are capable of producing page-size graphic output, but are limited in their ability to generate large-scale, high-quality, perfectly proportioned graphic output. For example, on a blueprint, the sides of a 12-foot-square room must be exactly the same length. Architects, engineers, graphics artists, city planners, and others who routinely generate high-precision, hard-copy graphic output of widely varying sizes use another hard-copy alternative large-format ink-jet printers, also called plotters. Plotters use ink-jet technology to print on roll-feed paper up to 4 feet wide and 50 feet in length. Plotters can be used for large printing needs, such as commercial posters or blueprints, or they can be used to produce continuous output, such as plotting earthquake activity or a five-year project activity chart.

Dot-Matrix Printers: Walking Into the Sunset

The **dot-matrix printer** forms images one character at a time as the print head moves across the paper. The dot-matrix printer is an impact printer. that is, it uses from 9 to 24 tiny pins to hit an ink ribbon and the paper, much as a typewriter does. The dot-matrix printer arranges printed dots to fore characters and all kinds of images. Dot-matrix printers print up to 450 cps. (characters per second).

Most dot-matrix printers can accommodate both cut-sheet paper and fanfold paper (a continuous length of paper that is folded at perforations The tractor-feed that handles fanfold paper is standard with most dot-matrix printers. Impact printers, as opposed to nonimpact printers, touch paper and can produce carbon copies along with the original.

The Multifunction Peripheral: Print It, Fax It, Scan It, and Copy It
Traditionally, businesses have purchased separate machines to handle these paper-related tasks: computer-based printing, facsimile (fax), scanning, and copying (duplicating). The considerable overlap in the technologies used m these machines has enabled manufacturers to create all-in-one multifunction peripheral devices. These multifunction devices are becoming very popular in the small office home office environments and in other settings where the volume for any of their functions is relatively low.

Presentation Graphics: Be Persuasive

Businesspeople have found that sophisticated colorful graphics add an aura of professionalism to any report or presentation. This demand for presentation graphics has created a need for corresponding output devices Computer-generated graphic images can be re-created on paper and transparency acetates with printers. Graphic images also can be captured on 35- mm slides, displayed on a monitor, or projected onto a large screen.

The need for overhead transparencies and 35-mm slides is beginning fade as presenters discover the ease with which they can create and deliver dynamic multimedia presentations. They do this with the help of multi- media projectors. These output devices fall into two categories: LCD panels and LCD projectors. The LCD panels, which are about the size of a notebook PC, are used with overhead projectors. The LCD panels are placed directly on the overhead projector as you would a transparency acetate. The light from the overhead projector is directed through an LCD panel and whatever image is on its display is shown on a large screen for all to see. The LCD projectors use their own built-in lens and light source to project the

image on the screen.

Voice-Response Systems: Say It With Bits

Anyone who has used a telephone has heard "If you're dialing from a touch-tone phone, press 1." You may have driven a car that advised you to "fasten your seat belt." These are examples of 'talking computers' that use output

from a voice-response system. There are two types of voice-response systems: one uses a reproduction of a human voice and other sounds, and the other uses speech synthesis. Like monitors, voice-response systems provide temporary, soft-copy output.

The first type of voice-response system selects output from a digitized audio recording of words, phrases, music, alarms, or anything you might record, just as a printer would select characters. In these recorded voice- response systems, the actual analog recordings of sounds are converted into digital data, then permanently stored on disk or in a memory chip. When output occurs, a particular sound is converted back into analog before being routed to a speaker. When sounds are stored on disk, the user has the flexibility to update them to meet changing application needs.

Speech synthesis systems, which convert raw data into electronically produced speech, are popular in the PC environment. All you need to produce speech on a PC are a sound expansion card, speakers (or headset). and appropriate software. Such software often is packaged with the sound card. To produce speech, sounds resembling the phonemes are combined to make up speech.

Section three: translation activities

Computers: the enabling technology for the disable

Computer technology is having a profound effect on physically challenged people. With the aid of computers they now are better prepared to take

control of their environments.

A little over a decade ago, Nan Davis stunned the world. A paraplegic since an automobile accident on the night of her high school graduation, she

walked to the podium to receive her college diploma with the help of a rehabilitative tool that uses FES, or functional electrical stimulation.

FES uses low-level electrical stimulation to restore or supplement the minute electrical currents the nervous system generates to control different parts of the body. This electrical stimulation is controlled by a micro processor-a computer that uses feedback from the body to adjust the

electrical stimulation's length and intensity.

In Nan's case, FES took the form of electrodes to stimulate her leg muscles; a sensory feedback system; and a small, portable computer. The sensory feedback system tells the computer the position and movement of the legs so that it knows which muscles it must electronically stimulate next to produce a coordinated gait.

Although the use of FES to restore one's ability to stand, walk, and use the arms and hands is still in the experimental stage, many other FES applications are accepted medical practice. The best-known application is the cardiac pacemaker that is attached directly to a faulty heart with electrodes. FES can also be used to control chronic pain, correct spinal deformities, improve auditory defects, and pace the rise and fall of the diaphragm during breathing.

FES can also be used as a therapeutic tool to strengthen muscles idled by paralysis. Without exercise, muscles atrophy, circulation becomes sluggish, cardiovascular fitness declines, and pressure sores develop. These FES devices, which look like high-tech exercise bicycles, use a micro- processor to coordinate a system of electrodes and feedback sensors. allowing the user to push the pedals and turn a hand crank. Like anyone who engages in a regular exercise program, users of the FES devices report noticeable

improvements in muscle tone, mass, and cardiovascular fitness These devices cannot restore function, of course, but they can help the paralyzed to maintain their bodies while researchers continue to seek ways to help them walk again. In the meantime, many are thrilled just to see their bodies move again.