

VISUAL SUMMARY

Input and Output

KEYBOARDS



Input is any data or instructions that are used by a computer. **Input devices** are hardware used to translate words, sounds, images, and actions that people understand into a form that the system unit can process. These include keyboards, pointing, scanning, image capturing, and audio-input devices.

Keyboards convert numbers, letters, and special characters that people understand into electrical signals. These signals are sent to, and processed by, the system unit.

Keyboards

There are four basic categories of keyboards: traditional, notebook, virtual, and thumb.

- **Traditional keyboards**, used on desktop and larger computers. Standard keyboard has 101 keys. **Toggle keys** turn features on and off. **Combination keys** perform actions when combinations of keys are held down.
- **Notebook keyboards**, used on notebook computers. Smaller than traditional keyboard with fewer keys. Typically does not have numeric keypad or standard location for function and navigation keys.
- **Virtual keyboard**, used on tablets and smartphones. Does not have a physical keyboard. Keys displayed on screen and selected by pressing a key's image.
- **Thumb keyboard**, used on smartphones and small portable devices. Very small devices primarily used for texting and connecting to the web.

POINTING DEVICES



Pointing devices provide an intuitive interface with the system unit by accepting pointing gestures and converting them into machine-readable input.

Mice

A **mouse** controls a pointer that is displayed on the monitor. The **mouse pointer** usually appears in the shape of an arrow. Some mice have a **wheel button** that rotates to scroll through information on the monitor. **Optical mouse** is the most widely used. A **cordless** or **wireless mouse** uses radio waves or infrared light waves. Three devices similar to a mouse are **trackballs**, **touch pads**, and **pointing sticks**.

Touch Screens

Touch screens allow users to select actions by touching the screen with a finger or penlike device. **Multitouch** screens accept multiple-finger commands.

Game Controllers

Game controllers provide input to computer games. Widely used controllers include **joysticks**, **dance pads**, **gamepads**, and **motion-sensing devices**.

Stylus

A **stylus** is a penlike device commonly used with tablets and PDAs. Often, a stylus interacts with the computer through **handwriting recognition software** that translates handwritten notes into a form that the system unit can process.

To be a competent end user, you need to be aware of the most commonly used input and output devices. These devices are translators for information into and out of the system unit. Input devices translate words, sounds, and actions into symbols the system unit can process. Output devices translate symbols from the system unit into words, images, and sounds that people can understand.

SCANNING DEVICES



Scanning devices move across text and images to convert them into a form that the system unit can process.

Optical Scanners

An optical scanner (scanner) converts documents into machine-readable form. The three basic types are flatbed, document, and portable.

Card Readers

Card readers interpret encoded information located on a variety of cards. The most common is the magnetic card reader that reads information from a thin magnetic strip on the back of a card.

Bar Code Readers

Bar code readers or scanners (either handheld wand readers or platform scanners) read bar codes on products. The bar code system Universal Product Code (UPC) is widely used in supermarkets.

RFID Readers

RFID readers read RFID (radio-frequency identification) tags. These tags are widely used for tracking lost pets, production, and inventory and for recording prices and product descriptions.

Character and Mark Recognition Devices

Character and mark recognition devices are scanners that are able to recognize special characters and marks. Three types are magnetic-ink character recognition (MICR), optical-character recognition (OCR), and optical-mark recognition (OMR).

IMAGE CAPTURING DEVICES



Image capturing devices create or capture original images. These devices include digital cameras and webcams.

Digital Cameras

Digital cameras are similar to traditional cameras except that images are recorded digitally on a disk or in the camera's memory. Most digital cameras record video too.

Webcams

Webcams are specialized digital video cameras that capture images and send them to a computer for broadcast over the Internet. Webcams are built into many smartphones and tablets, while others are attached to the computer monitor.

AUDIO-INPUT DEVICES

Audio-input devices convert sounds into a form that can be processed by the system unit. By far the most widely used audio-input device is the microphone.

Voice Recognition Systems

Voice recognition systems use a microphone, a sound card, and special software. These systems allow users to operate computers and other devices as well as create documents by using voice commands. Specialized portable voice recorders are widely used by doctors, lawyers, and others to record dictation. Some systems are able to translate dictation from one language to another, such as from English to Japanese.

MONITORS



Output is processed data or information. **Output devices** are any hardware used to provide or to create output.

Monitors (display screens) are the most used output device. Output is often referred to as **soft copy**. Monitors vary in size, shape, and cost. Almost all, however, have some basic distinguishing features.

Features

The most important characteristic of a monitor is its **clarity**, which relates to the quality and sharpness of images. It is a function of several monitor features, including **resolution** (matrix of pixels or picture elements), **dot pitch**, **contrast ratio**, **size**, and **aspect ratio**.

Flat Panel

Flat-panel monitors are the most widely used monitor; most are **LCD (liquid crystal display)**. Most common type is **TFT-LC (thin-film transistor liquid crystal)**. **AMOLED (active-matrix organic light-emitting diode)** is a newer flat-panel technology.

E-book Readers

E-books (electronic books) are traditional printed books in electronic format. **E-book readers (e-readers)** are mobile devices to store and display e-books and other electronic media. They use **e-ink** technology. Tablets can display e-books and have a larger display area but are heavier, more expensive, and more difficult to read in bright light.

Other Monitors

Other types of monitors include **digital (interactive) whiteboards** to project output; **high-definition television (HDTV)** to display clear detailed images; and older monitors using **cathode-ray tubes (CRTs)**.

PRINTERS



Printers translate information processed by the system unit and present the information on paper. Printer output is often called **hard copy**.

Features

Most printers have the same basic features, including **resolution** measured in **dpi (dots per inch)**, **color capability** (most common black ink selection is **grayscale**), **speed** (measured in the number of pages printed per minute), **memory**, and **duplex** (both sides of paper) **printing**.

Inkjet

Inkjet printers spray ink at high speed onto the surface of paper. Most widely used type of printer, reliable, quiet, and inexpensive. The most costly aspect of inkjet printers is replacing the ink cartridges.

Laser

Laser printers use technology similar to photocopying machine involving laser light beam to produce high-quality images. There are two categories: **personal** (less expensive, used by single user) and **shared** (supports color, more expensive, and supports group of users).

Other Printers

There are several other types of printers. These printers include cloud printers, thermal printers, and plotters.

- **Cloud printers** provide printing services to others on the Internet. **Google Cloud Print** is a service that supports cloud printing.
- **Thermal printers** use heat elements to produce images on heat-sensitive paper.
- **Plotters** are special-purpose printers for producing a wide range of specialized output including output from graphics tablets and other graphical input devices.

AUDIO AND VIDEO DEVICES



Audio-output devices translate audio information from the computer into sounds that people can understand. The most widely used are **speakers** and **headsets**.

Portable Media Players

Portable media players (digital media players) are electronic devices for storing and playing digital media. Mobile digital television (mobile DTV) technology allows direct broadcast to digital media players as well as smartphones and other computers.

COMBINATION INPUT AND OUTPUT DEVICES

Many devices combine input and output capabilities.

Multifunctional Devices

Multifunctional devices (MFD) typically combine the capabilities of a scanner, printer, fax, and copy machine.

Internet Telephones

Internet telephones send and receive voice communication over the computer networks using **voice over IP (VoIP, telephony, Internet telephony, IP telephony)**. Skype is a widely used VoIP service.

Robots

Artificial intelligence (AI) attempts to mimic human senses, thought processes, and actions. **Robotics**, an area of AI, uses **robots** (computer-controlled machines that mimic the motor activities of living things). Four types of robots: **perception system, industrial, mobile, and household**.

Virtual Reality Headgear and Gloves

Virtual reality (VR) creates 3-D simulated **immersive experiences**. Virtual reality hardware includes **headgear and gloves**. Applications include training environments, such as in aviation, surgery, spaceship repair, or nuclear disaster cleanup.

ERGONOMICS



Ergonomics is the study of human factors related to things people use. Concerned with fitting the task to the user rather than forcing the user to contort to do the task, it involves devising ways that input and output devices can be used and designed to increase ease of use and decrease health risks.

Recommendations

Some recommendations to avoid physical discomfort are

- **Eyestrain and headache.** To make the computer easier on the eyes, take a 15-minute break every hour or two; keep everything you're focusing on at about the same distance; and clean the screen periodically.
- **Back and neck pain.** To help avoid back and neck problems, use adjustable equipment; chairs should adjust for height, angle, and back support; monitors should be at eye level or slightly below. Use a footrest, if necessary, to reduce leg fatigue.
- **Repetitive strain injury.** Repetitive strain injury (RSI) is caused by fast, repetitive work and can generate neck, wrist, hand, and arm pain. One particular type of RSI, **carpal tunnel syndrome**, found among heavy computer users, consists of damage to nerves and tendons in the hands. Ergonomically correct keyboards help prevent injury. Take frequent, short rest breaks and gently massage hands.

CAREERS IN IT

Technical writers prepare instruction manuals, technical reports, and other documents. An associate or a college degree in communication, journalism, or English and a specialization in, or familiarity with, a technical field are required. Salary range is \$41,000 to \$78,000.

KEY TERMS

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To test your knowledge of these key terms with animated flash cards, visit our website at www.computing2014.com and enter the keyword [terms6](#). Or use the free *Computing Essentials 2014* app.

MULTIPLE CHOICE

Circle the correct answer.

1. Most keyboards use an arrangement of keys known as:
 - a. Alpha
 - b. Daisy
 - c. OptiKey
 - d. QWERTY
2. The device that controls a pointer displayed on the monitor.
 - a. cord
 - b. mouse
 - c. printer
 - d. scanner
3. The type of screen that can be touched with more than one finger and supports zooming in and out by pinching and stretching your fingers.
 - a. digital
 - b. dynamic
 - c. multitouch
 - d. AMOLED
4. Flatbed and document are types of:
 - a. headsets
 - b. HDTVs
 - c. monitors
 - d. scanners
5. Device used by banks to automatically read those unusual numbers on the bottom of checks and deposit slips.
 - a. MICR
 - b. FDIC
 - c. OMR
 - d. UPC
6. The most widely used audio-input device.
 - a. mouse
 - b. VR
 - c. microphone
 - d. TFT
7. The monitor feature that indicates the ability to display colors.
 - a. aspect ratio
 - b. contrast ratio
 - c. dot pitch
 - d. resolution rate
8. Mobile devices able to store and display electronic media.
 - a. e-book readers
 - b. HDTV
 - c. lasers
 - d. whiteboards
9. This technology allows television stations to broadcast their programming directly to smartphones, computers, and digital media players.
 - a. CRT
 - b. HDTV
 - c. LED
 - d. mobile DTV
10. The study of human factors related to things people use is:
 - a. ergonomics
 - b. RFID
 - c. RSI
 - d. telephony

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MATCHING

Match each numbered item with the most closely related lettered item. Write your answers in the spaces provided.

- | | |
|------------------------|--|
| a. active display area | ___ 1. Pressing this key turns a feature on or off. |
| b. digital camera | ___ 2. Input device that controls a pointer that is displayed on the monitor. |
| c. dot pitch | ___ 3. A penlike device commonly used with tablet PCs and PDAs. |
| d. MagicJack | ___ 4. Bar code readers use either handheld wand readers or platform ____. |
| e. mouse | ___ 5. Bar code system used by many electronic cash registers. |
| f. plotters | ___ 6. Records images digitally on a disk or in its memory. |
| g. scanners | ___ 7. The distance between each pixel. |
| h. stylus | ___ 8. A monitor feature that is measured by the diagonal length of the viewing area. |
| i. toggle key | ___ 9. Special-purpose printers for creating maps, images, and architectural and engineering drawings. |
| j. UPC | ___ 10. A provider of lower-cost options for VoIP. |

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OPEN-ENDED

On a separate sheet of paper, respond to each question or statement.

1. Define input and input devices.
2. Describe the different types of keyboard, pointing, scanning, image capturing, and audio-input devices.
3. Define output and output devices.
4. Describe the features and different types of monitors and printers.
5. Describe audio and video devices including portable media devices and mobile DTV.
6. Discuss combination input and output devices, including multifunctional devices, Internet telephones, robots, and virtual reality headgear and gloves.
7. Define ergonomics, and describe ways to minimize physical discomfort.