Standard Methods of Input

Input device → enables you to input information and commands into the computer.

The Keyboard
One of the first peripherals to be used with a computer and is still the primary input device for text and numbers.

How a computer accepts input from the keyboard.
1. Key is pressed on the keyboard.
2. Keyboard controller sends scan code for the key to the keyboard buffer.
3. Keyboard buffer sends interrupt request to the system software.
4. System software responds to the interrupt by reading the scan code from the keyboard buffer.
5. System software passes the scan code to the CPU.

The Mouse
An input device that rolls around on a flat surface and controls the pointer. The pointer is an on-screen object (usually an arrow) that is used to select text, access menus and interact with programs, files or data that appears on the screen.

The mouse was first packaged with the Apple Mac in 1984. Instead of forcing you to type or issue commands from the keyboard the mouse and mouse based operating systems let you choose commands from a menu to use menus and dialog boxes.

Variants of the mouse
1. The trackball
   Pointing device that works like an upside-down mouse. Rest your thumb on the exposed ball and to move the pointer around the screen you move the ball with your thumb.
2. The trackpad (or touchpad)
   A stationary pointing device that some people find less tiring than a mouse or trackball. Movement of a finger across a small touch surface is translated into pointer movement on the computer.
3. Pointers in the keyboard
   Small joystick positioned near the centre of the keyboard – typically between the g and the h keys. Joystick is controlled with either forefinger.

Non standard methods of Input

Pens

Use a pen (or stylus) for data input. Hold the pen in your hand and write on a special pad or directly to the screen. Also can be used as a pointing device like a mouse. Pen based systems are not generally used to enter large amounts of text because handwriting recognition is so complex. They are frequently used for note taking and creating short messages. More commonly used for data collection where the touch of a pen may select a check box. Another common use is inputting signatures or messages that are stored or transmitted.
**Touchscreens**

Accept input by allowing the user to place a fingertip directly on the computer screen to make a selection. Most touchscreens use sensors in or near the computer screen to detect the touch of a finger. Useful in an environment where dirt or weather would render keyboards or pointing devices useless. Well suited to simple applications such as ATMs or public information kiosks. Have become popular in fast food restaurants, department stores and supermarkets.

**Game Controllers**

Can be considered an input device because a computer game is a program. It accepts input from the user, processes data and produces output in the form of graphics and sound.

**Bar code readers**

Most widely used input device after the keyboard and mouse. Most common type of barcode reader is the flatbed model commonly found in supermarkets. Devices convert a barcode – a pattern of printed bars – into a code that the computer can understand. The barcode reader emits a beam of light that is reflected by the barcode image. A light sensitive detector identifies the bar code image by recognising special bars at both ends of the image. Both these bars are different so the reader can tell if the bar code is being read the right way up. After identification the barcode is converted into numeric digits that are fed into the computer as if a number had been typed on the keyboard.

**Image scanners and optical character recognition**

Scanners convert any printed image into electronic form by shining a light onto the image and sensing the intensity of the reflection at every point. Colour scanners use filters to separate the components of colour into the primary colours at every point. If you have scanned a text document you might want to use Optical Character Recognition (OCR) software to translate the image into text that you can edit.

**Microphones and speech recognition**

Now that sound capabilities are standard in computers microphones are becoming increasingly important as input devices to record speech. For sound input you need a microphone and a sound card that translates the analogue signal (sound waves) from the microphone into digital codes that the computer can store and process. Speech (or voice) recognition, use it to dictate to the computer instead of typing. Newer generation speech recognition programs are much more reliable. Some packages accurately recognise 80% of spoken words. The user may need to “train” the software to recognise speech patterns. Speech recognition packages usually require the use of a noise-cancelling microphone.

**Video input**

PC video cameras digitise images by breaking them into individual pixels. Each pixels colour and other characteristics are stored as a digital code. This code is then
compressed so that it can be stored on disk or transmitted. Many PC video cameras attach to the top of the screen enabling the user to capture images of themselves while working at the computer. Using a video capture card the user can also connect other video devices enabling transfer of images from video equipment to the computer.

**Digital cameras**

Work similar to PC cameras except that they are handheld devices that capture still images. The digital camera digitises the image, compresses it and stores it on a special disk or memory card. The information can then be copied, printed or used in a document.

**Output Devices**

**Monitors**

The most commonly used output device.

2 basic types of monitors used with pc’s

- *CRT Cathode Ray Tube* – works in the same way as a tv screen using a large vacuum tube.
- *Flat Panel Display* – primarily used with portable computers and are becoming more popular with desktops.

How a typical CRT works

1. Electron gun shoots streams of electrons towards the screen.
2. Magnetic coil guides the stream of electrons across and down the screen.
3. Phosphor dots on the back of the screen glow when the electron beam hits them.

**Flat Panel Monitors**

2 major disadvantages associated with CRT monitors,

- Big, difficult to move. Flat panel monitors are comparatively lightweight.
- CRT’s require a lot of power. Not practical for notebook computers which have a built in battery.

Most common type of flat panel monitor is the *liquid crystal display (LCD)*. Creates an image with a special kind of liquid crystal that is normally transparent but becomes opaque when charged with electricity.

Two main categories of LCD displays,

1. Active matrix - assigns a transistor to each pixel and each pixel is turned on or off individually.
2. Passive matrix - transistors for each row and each column of pixels creating a grid that defines the location of each pixel.

**PC Projectors**

More common now to use software to create presentations directly to the screen. A pc projector plugs into one of the computer’s ports and projects the video output onto
an external surface. Most pc projectors use LCD technology to create images. Room needs to be darkened and display is blurry. Newer technology → Digital light processing (DLP) displays brighter crisper images. DLP devices use a special microchip called a digital micro mirror device that uses mirrors to control the image display.

**Sound Systems**

Speakers and their associated technology are now important output devices. Speakers attached to a pc system are similar to those on a stereo only on a smaller scale and they contain their own amplifiers. More complicated part → the sound card.

The sound card translates digital sound to electric current to be sent to the speakers

1. Electric current is sent to the speakers.
2. Electromagnet receives the signal.
3. Magnet vibrates due to the signal.
4. Wave created → Sound.

**Printers**

2 categories:

1. Impact
2. Non-impact

**Impact**

Creates an image by pressing an inked ribbon against paper using pins or hammers to shape the image e.g. typewriter. Most common type of impact printer → Dot matrix.

**Non-impact**

Use other means to create an image. Most popular types → Inkjet printers, Laser printers.

**Dot Matrix Printer** - Commonly used in workplaces where physical impact with the paper is important, such as when the user is printing to carbon copy or pressure sensitive forms. Can produce sheets of plain text very quickly. Used to print very wide sheets.

**Line Printers** - Works like a dot matrix printer but prints an entire line at a time. Not very high resolution but very quick – approx 3000 lines of text per min.

**Band Printers** - Features a rotating band that is embossed with alphanumeric characters. Very fast and robust – approx 2000 lines of text per min.

**Daisy wheel printers** - Almost obsolete. Spinning wheel with characters embossed around its edge. Creates clean text but no graphics and is very slow.
Inkjet Printers - Creates an image directly onto the paper by spraying ink through tiny nozzles. Most inkjets use separate cartridges for colour and black and white printing. This saves money by reserving coloured ink only for coloured printing.

Laser Printers - More expensive than inkjet printers but offer a higher print quality and are faster. A separate CPU and memory are built into the printer to interpret the data received from the computer and to control the laser. Technology is similar to that of a photocopier. Laser can aim at any point on a drum creating an electrical charge. Toner, which is composed of tiny particles of oppositely charged ink sticks to the drum in the places that the laser has charged. Pressure and heat transfer the toner from the drum to the paper.

Snapshot Printers - Small format printers that use special glossy paper to create medium resolution prints of 150 – 300 dpi. Best snapshot printers can create images that look nearly as good as a photo.

Thermal wax printers - Used primarily for presentation graphics and handouts. Create bold colours and have a low percentage cost. Produces vivid colours because the inks do not bleed into each other or soak the specially coated paper. Ribbon coated with panels of coloured wax that melts and adheres to plain paper as coloured dots when passed over a focused heat source.

Dye – sub printers - Dye sublimation printers have ribbons containing panels of colours which are moved across a focused heat source capable of subtle temperature variations. Heated dyes evaporate from the ribbon and diffuse on specially coated paper creating extremely sharp images but are very slow and costly.

Fiery printers - Special purpose computer – fiery print server – that transmits documents to a digital colour copier where they are printed. These printers are used in print shops as an alternative to press printing.

IRIS printers - Used by print shops to produce high resolution presentation graphics and colour proofs resembling images. Individual sheets of paper mounted onto a drum, nozzles on the printing head pass from one end of the spinning drum to the other spraying minute drops of coloured ink to form an image.

Plotters - Special kind of output device, like a printer because it produces images on paper but typically used to print large format images.

- Table plotters (or flatbed) use 2 robotic arms. Complex, large and slow.
- Roller plotters (or drum plotters) uses 1 drawing arm but moves the paper instead of holding it flat and stationary.
- Mechanical plotters have been displaced by thermal, electrostatic and inkjet plotters as well as large format dye – sub printers which are all faster and cheaper.