Chapter 8: Input Devices

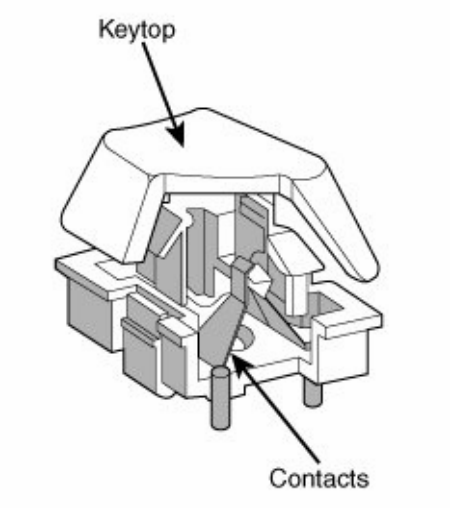
Introduction

- are the hardware parts that accept data and instructions from the user
- It enables you to input information and commands into the computers.
- convert input data and instructions into suitable binary form (such as ASCII) which can be accepted by the computer.
- The commonly used input devices are keyboard, mouse, scanner, light pen, graphic tablet, joystick, trackball, touch screen, microphone, digital tablets etc.

Keyboard

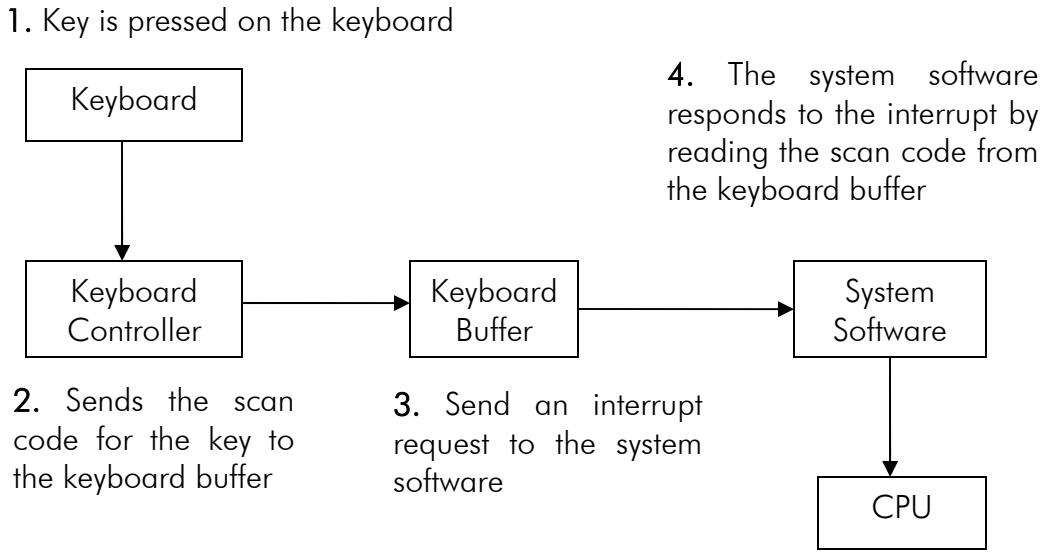
- Is the most common way to enter text and data into a computer
- Standard layout is basically like old typewriter keyboard (called a QWERTY keyboard)
- The most commonly used keyboards are
    - 101 – Key enhanced keyboard, 104 – key windows keyboard.
    - 82 – Key Apple standard keyboard and 108- key Apple extended keyboard.
    - It contains alphabets (A to Z or a to z), digits (0 to 9), special characters (!, @,#,$,%,^,&,*,<,>,? etc) and some control keys.
- There are five key groups:
    - Alphanumeric keys
        - Letters of the alphabets
        - Numbers and symbols
        - Caps lock, tab, backspace and enter key do special functions but they are part of the alphanumeric key group.
    - Modifier Key group
        - Modify what happens when you press another key
        - Shift changes letter keys to upper case
        - Shift makes the number keys produce special symbols
        - Ctrl and alt used in combination with other keys change what that key does
    - Numeric Key Pad
        - Looks like a calculator keyboard
        - Used to enter numbers and operation symbols
        - Num lock forces keypad to enter numbers which is the normal default.
    - Function Keys
        - Middle of top row
        - Labeled F1 to F12
        - Could be assigned specific commands by the current application or operating system (or software dependent)
    - Cursor Movement keys
        - Direct movement of on-screen cursor
        - Up, down, left and right arrow
        - Other keys are insert, home, page up, delete , end and page down
- Special purpose keys are in addition to the five key group are found on keyboards specifically designed for windows operating system
- Start key or windows key

When a key is pressed an electronic signal is produced which is detected by an electronic circuit called keyboard encoder or controller.



The function of an encoder is to detect which key has been pressed and to send a binary code (corresponding to the pressed key) to the computer. The binary code may be an ASCII, EBCDIC or HEX code depending upon the computer.

How the computer accepts input from the keyboard?

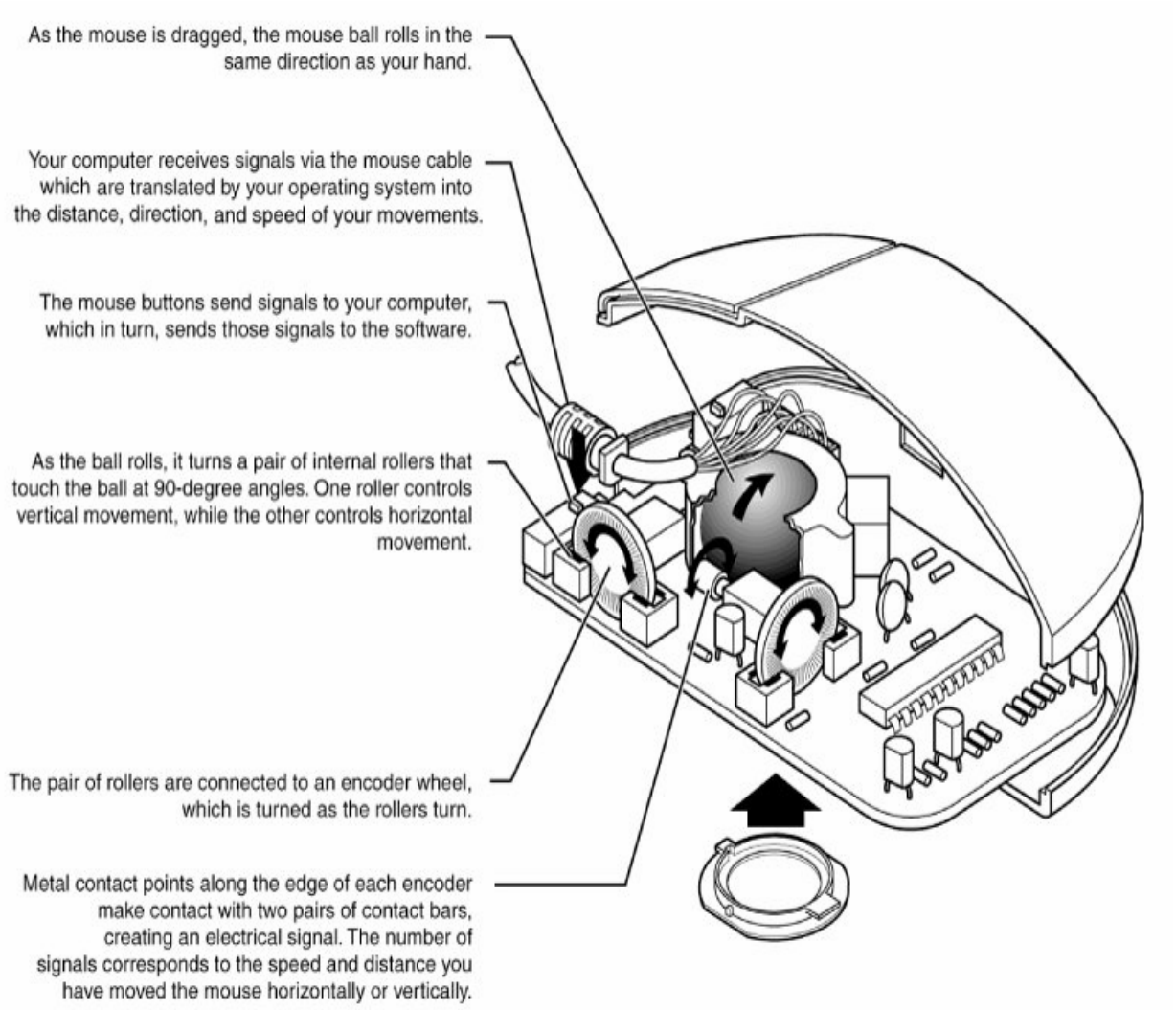


Mouse

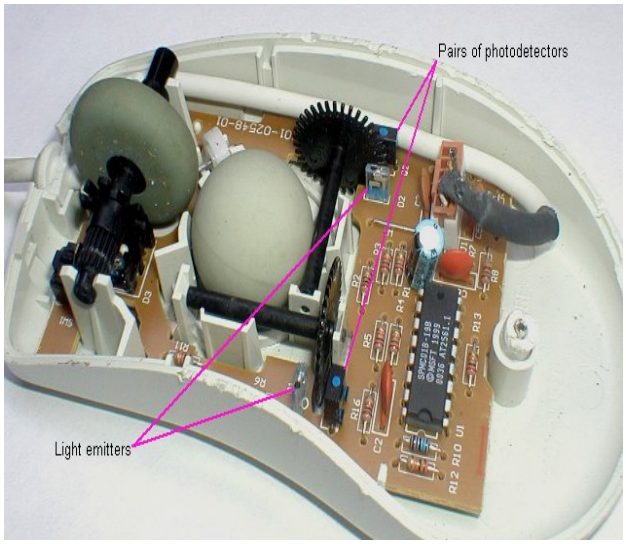
- Is a small hand held devices used to position the cursor on the screen
- Is a kind of pointing device
- Is an input device that rolls around on a flat surface and controls the pointer
- Pointer is an on-screen object, usually an arrow, that is used to select text; access menus; and interact with programs, files or data that appear on the screen.

Mouse Actions:

- Clicking – move pointer to item and click left button one time.
- Double – clicking – move pointer to item and click left button two times quickly.
- Dragging – position mouse over item, click and hold left button as you move the mouse.
- Right Click – move pointer to item and click one time with right button

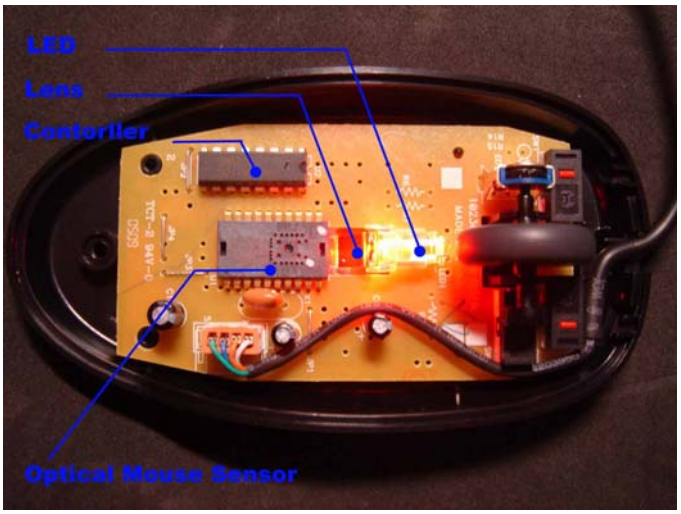


Mechanical Mouse



- a mouse that operates by mechanical means
- a rubber ball rolls as the mouse is moved across a tabletop or mouse pad, and the rubber ball turns vertical and horizontal wheels inside the mouse.
- The wheels, called encoders, have tiny metal contact points on their rims, which touch a contact bar as they turn. The contact bar sends electrical signals to the computer. The location of the mouse is established by how many times the contact points have touched the bars, the direction in which the wheels are turning, and the ratio between the number of signals from the vertical and horizontal encoders. The mechanical mouse is different from the optical mouse, which uses a beam of light to tell where it is.

Optical Mouse



- Introduced in 1999, actually uses a tiny camera to take thousands of pictures every second.
- Is able to work an almost any surface without a mouse pad
- Most optical mice use a small, red light – emitting diode (LED) that bounces light off that surface onto a complementary metal – oxide semiconductor (CMOS) sensor
- In addition to LED, a recent innovation are laser-based optical mice that detect more surface details compared to LED technology
- The results is the ability to use a laser – based optical mouse on even more surface than an LED mouse

Optical mouse has several benefits over track-ball mouse

- No moving parts means less wear and a lower chance of failure
- There's no way for dirt to get inside the mouse and interface with the tracking sensors
- Don't require a special surface such as a mouse pad.

Track Ball

- A trackball is a pointing device consisting of a ball housed in a socket containing sensors to detect rotation of the ball about two axes—like an upside-down mouse with an exposed protruding ball.
- The user rolls the ball with the thumb, fingers, or the palm of the hand to move a cursor.
- Before the advent of the touchpad, small trackballs were common on portable computers, where there may be no desk space on which to run a mouse.
- The trackball was invented by Tom Cranston and Fred Longstaff as part of the Royal Canadian Navy's DATAR system in 1952
- The advantage of track balls over a mouse it that it remains stationary and does not require more space.

Joystick

- Is also a pointing device
- Used to move the cursor position on the screen
- Has spherical ball at its lower end as well as its upper end
- The lower spherical ball moves in a socket
- The joystick can be moved right or left, forward or backward
- The electric circuitry inside the joystick detects and measure the displacement of the joystick from its central position
- Buttons mounted on the stick or elsewhere on the joystick can be pressed to execute commands.
- Mainly used to play games.

Digitizing Tablet

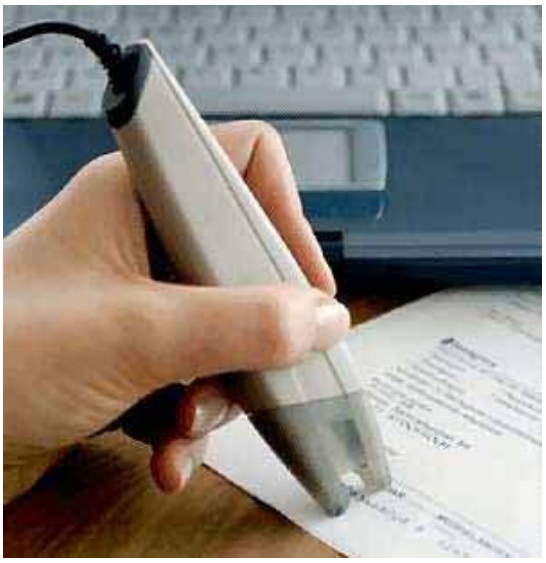
- is an input device that enables a user to enter drawings and sketches into a computer.
- consists of an electronic tablet and a cursor or pen
- A graphics tablet (or digitizing tablet, graphics pad, drawing tablet) is a computer input device that allows one to hand-draw images and graphics, similar to the way one draws images with a pencil and paper. These tablets may also be used to capture data of handwritten signatures.
- A graphics tablet (also called pen pad) consists of a flat surface upon which the user may "draw" an image using an attached stylus, a pen-like drawing apparatus.
- The image generally does not appear on the tablet itself but, rather, is displayed on the computer monitor. Some tablets however, come as a functioning secondary computer screen that you can interact with directly using the stylus.
- Some tablets are intended as a general replacement for a mouse as the primary pointing and navigation device for desktop computers.

Scanners

- is an input device that can read text or illustrations printed on paper and translate the information into a form that the computer can use.
- Using scanner drawings, graphs, photos, text can be stored for computer processing by passing an optical mechanism over the information stored.
- The core component of the scanner is the CCD array (charge couple device).

- CCD is the most common technology for image capturing in scanner. CCD is collection of tiny light sensitive diode which convert photos (light) into electrons (electrical charge)

Scanning process



- The document is placed on the glass plate
- The lamp is used to illuminate the document
- The entire mechanism (mirrors, lens , filter and CCD array) make up the scan head
- The scan head is moved slowly across the document by a belt that is attached to a stepper motor.
- The image of the document is reflected by an angled mirror to another mirror and then reflects the image onto a lens
- The lens focuses the image through a filter on the CCD array
- The lens splits the image into three smaller versions of the original (color filter R, G, B) onto a discrete section of CCD array.

Digital Camera

- is an input device used to input digital images to a computer.
- takes video or still photographs, or both, digitally by recording images via an electronic image sensor.
- can do things film cameras cannot: displaying images on a screen immediately after they are recorded, storing thousands of images on a single small memory device, recording video with sound, and deleting images to free storage space.
- are incorporated into many devices ranging from PDAs and mobile phones (called camera phones) to vehicles. The Hubble Space Telescope and other astronomical devices are essentially specialized digital cameras.

Magnetic Ink Character Reader (MICR)

- allows the computer to recognize characters printed using magnetic ink.
- a character recognition technology adopted mainly by the banking industry to facilitate the processing of cheques.
- ATM cards use a similar technology to access account information and facilitate monetary transaction.

Optical Character Recognition (OCR)

- Optical character recognition, usually abbreviated to OCR, is the mechanical or electronic translation of images of handwritten, typewritten or printed text (usually captured by a scanner) into machine-editable text.
- OCR is used for reading text from paper and translating the images into a form that the computer can manipulate (e.g. into ASCII code)
- Scans the documents and using the photo electric device converts the shape into electric signals.
- These patterns are then compared with the stored patterns of the characters which the reader can recognize
- If a match is found, the character scanned is identified otherwise the document may be rejected by the reader.

OMR (Optical Mark Reader)

- Can sense the presence of a pen or pencil mark
- It is widely used in scoring answers to multiple choice questions.

BCR (Bar Code Reader)

- is an electronic device for reading printed barcodes.
- consists of a light source, a lens and a photo conductor translating optical impulses into electrical ones.
- Is used to extract the information of any product, its description, date of manufacture and expiry and price.

Touch Screen

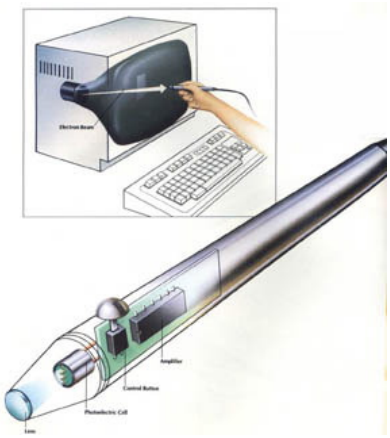
- is a display which can detect the presence and location of a touch within the display area.
- The term generally refers to touch or contact to the display of the device by a finger or hand.
- Touch screens can also sense other passive objects, such as a stylus.
- Until the early 1980s, most consumer touch screens could only sense one point of contact at a time, and few have had the capability to sense how hard one is touching. This is starting to change with the commercialization of multi-touch technology.
- The touch screen has two main attributes.
    - First, it enables one to interact with what is displayed directly on the screen, where it is displayed, rather than indirectly with a mouse or touchpad.

- Secondly, it lets one do so without requiring any intermediate device, again, such as a stylus that needs to be held in the hand. They also play a prominent role in the design of digital appliances such as the personal digital assistant (PDA), satellite navigation devices and mobile phones.

Touch Pad (Track Pad)

- is a pointing device consisting of specialized surface that can translate the motion and position of a user's fingers to a relative position on screen.
- They are a common feature of laptop computers and also used as a substitute for a computer mouse where desk space is scarce.
- Touch pads vary in size but are rarely made larger than 40 square centimeters (about 6 square inches). They can also be found on personal digital assistants (PDAs) and some portable media players.

Light Pen



- A light pen is a computer input device in the form of a light-sensitive wand used in conjunction with the computer's monitor.
- It allows the user to point to displayed objects, or draw on the screen, in a similar way to a touch screen but with greater positional accuracy.
- A light pen can work with any CRT-based display, but not with LCD screens (though Toshiba and Hitachi displayed a similar idea at the "Display 2006" show in Japan), projectors and other display devices.