# UNIT 3

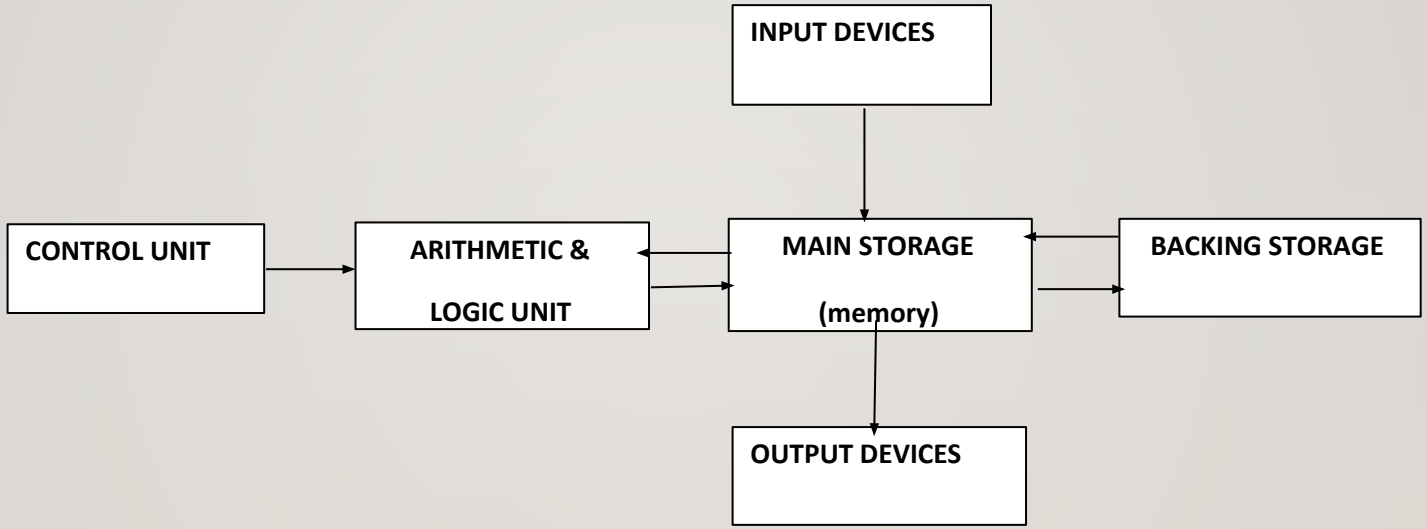
## HARDWARE SUPPORTS IN DATA PROCESSING CONTENTS

# 2 INPUT, PROCESSING AND OUTPUT COMPONENTS OF DATA PROCESSING

- Whenever a computer is used it must work its way through three basic stages before any task can be completed. These are input, processing and output. A Computer works through these stages by running a program. A program is a set of step-by-step instructions which tells the computer exactly what to do with the input in order to produce the required output.
- **Input:** The input stage of computing is concerned with getting the data needed by the program into the computer. Input devices are used to do this. The most commonly used input devices are the mouse and the keyboard.
- **Processing:** The program contains instructions about what to do with the input. During the processing stage the compute follows these instructions using the data which has just been input. What the computer produces at the end of this stage, the output, will only be as good as the instructions given in the program. In other words if garbage has been put in to the program, garbage is what will come out of the computer. This is known as GIGO, or Garbage In Garbage Out.
- **Output:** The output stage of computing is concerned with giving out processed data as information in a form that is useful to the user. Output devices are used to do this. The most commonly used output devices are the screen, which is also called a monitor or VDU and the printer.

# 3 ARCHITECTURE OF COMPUTER SYSTEM

- This is the 'brain' of the computer. It is where all the searching, sorting, calculating and decision making takes place. The CPU collects all of the raw data from various input devices (such a keyboard or mouse) and converts it into useful information by carrying out software instructions. The result of all that work is then sent to output devices such as monitors and printers. The CPU is a microprocessor - a silicon chip - composed of tiny electrical switches called 'transistors'. The speed at which the processor carries out its operations is measured in megahertz (MHz) or Gigahertz (GHz). The higher the number of MHz the faster the computer can process information. A common CPU today runs at around 3 GHz or more. The Intel Pentium processor and the Athlon are examples of a CPU.




- Figure 1: Block diagram of CPU

# 5 THE CONTROL UNIT (CU)

- The Control Unit (CU) co-ordinates the work of the whole computer system. It has three main jobs:

1. It controls the hardware attached to the system. The Control Unit monitors the hardware to make sure that the commands given to it by the current program are activated.
2. It controls the input and output of data, so all the signals go to the right place at the right time.
3. It controls the flow of data within the CPU.

# 6 THE IMMEDIATE ACCESS STORE (IAS)

- The Immediate Access Store (IAS) holds the data and programs needed at that instant by the Control Unit. The CPU reads data and programs kept on the backing storage and store them temporarily in the IAS's memory. The CPU needs to do this because Backing Store is much too slow to be able to run data and programs from directly. For example, lets pretend that a modern CPU was slowed down to carry out one instruction in 1 second, then the hard disk (i.e. Backing Store) would take 3 months to supply the data it needs! So the trick is to call in enough of the data and programs into fast Immediate Access Store memory so as to keep the CPU busy.

# 7 ARITHMETIC AND LOGIC UNIT (ALU)

- It is where the computer processes data by either manipulating it or acting upon it. It has two parts:

1. Arithmetic part - does exactly what you think it should - it does the calculations on data such as 3 + 2.

2. Logic part - This section deals with carrying out logic and comparison operations on data. For example working out if one data value is bigger than another data value.

# 8 INPUT DEVICES

- Due to a constant research in the computer hardware we have a large number of input devices. Recall that before data can be processed by the computer they must be translated into machine readable form and entered into the computer by an input device. A variety of input devices includes keyboards, mouse, track balls, Joystick, digital camera, touch screen, scanner, graphic tablets etc.

# KEYBOARD

9

- The keyboard is the most widely used input device and is used to enter data or commands to the computer. It has a set of alphabet keys, a set of digit keys, and various function keys and is divided into four main areas:
  - Function keys across the top
  - Letter keys in the main section
  - A numeric keypad on the right
  - Cursor movement and editing keys between the main section and the numeric keypad.

The layout of the letters on a keyboard is standard across many countries and is called a QWERTY keyboard. The name comes from the first six keys on the top row of the alphabetic characters. Some keyboards come with added keys for using the Internet and others have an integrated wrist support. Ergonomic keyboards have been developed to reduce the risk of repetitive strain injury to workers who use keyboards for long periods of time

# 10

- The computer's processor scans the keyboard hundreds of times per second to see if a key has been pressed. When a key is pressed, a digital code is sent to the Central Processing Unit (CPU). This digital code is translated into ASCII code (American Standard Code of Information Interchange). For example, pressing the 'A' key produces the binary code 01100001 representing the lower case letter 'a'. Holding down the shift key at the same time produces the binary code 01000001 representing the upper case letter 'A'.

# 11 ADVANTAGES AND DISADVANTAGES

## ADVANTAGES

- Most computers have this device attached to it
- It is a reliable method for data input of text and numbers
- A skilled typist can enter data very quickly.
- Specialist keyboards are available

## DISADVANTAGES

- It is very easy to make mistakes when typing data in
- It can be very time consuming to enter data using a keyboard, especially if you are not a skilled typist.
- It is very difficult to enter some data, for example, details of diagrams and pictures.
- It is very slow to access menus and not flexible when you want to move objects around the screen
- Difficult for people unable to use keyboards through paralysis or muscular disorder.

# 12 OUTPUT DEVICES

- Once data has been input into a computer and processed, it is of little use unless it can be retrieved quickly and easily from the system. To allow this, the computer must be connected to an output device. The most common output devices are computer monitors and printers. However, output can also be to a modem, a plotter, speakers, a computer disk, another computer or even a robot.

- Output devices includes: monitor, printers, plotters etc.

# 13 MONITOR

- A Monitor (or "screen") is the most common form of output from a computer. It displays information in a similar way to that shown on a television screen. On a typical computer the monitor may measure 17 inches (43 cm) across its display area.
- Larger monitors make working at a computer easier on the eyes. Of course the larger the screen, the higher its cost! Typical larger sizes are 19 inch, 20 inch and 21 inches.
- Part of the quality of the output on a monitor depends on what resolution it is capable of displaying. Other factors include *how much contrast it has*, *its viewing angle* and *how fast does it refresh the screen*. For example a good computer game needs a fast screen refresh so you can see all the action. The picture on a monitor is made up of thousands of tiny colored dots called pixels. The quality and detail of the picture on a monitor depends on the number of pixels that it can display. The more dense the pixels the greater the clarity of the screen image. A PC monitor contains a matrix of dots of Red, Green and Blue known as RGB. These can be blended to display millions of colors.

- This is one RGB pixel of light

  14

  R + B = M (magenta)

  B + G = C (cyan)

  G + R = Y (yellow)

  R + G + B = W (white)

- The two most common types of monitor are a cathode-ray tube (CRT) monitor and a liquid crystal display (LCD).

# 15 ASSIGNMENT3

- Explain what is meant by the term input device? Give three examples of input devices. Also give possible advantages and disadvantage of the same.
- Explain what is meant by the term output device? Give three examples of output devices. Also give possible advantages and disadvantage of the same.
- What are different types of printers? What differentiate a plotter from a printer?