Computers

A Workshop on

The basic way it works

A guide of the basic way a computer works that will lead to a more comfortable use of this wonderful tool.

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Information Technology, the workings of a computer after many years still conjure up a mystical meaning to many, something that is only understood by a select few.

It could be mystical, instead of manually keeping books, records, writing letters, doing calculations, collating data, setting up presentations, collecting information, drawing up reports, communicating by post and storing information, you have this wonderful tool where all can be done from one point at the touch of fingertips.

Make no mistake anything is possible with a computer and suitable programs. The challenge is understanding it and keeping it running smoothly

Better Understanding Lead to Easier Use

Introduction

Originating from a basic accounting machine invented in 1642 by Blaise Pascal and developed to modern powerful electronic counting machines that contain millions of elementary electronic components that can convert words into numbers, rearrange them, convert them back into words and by similar conversions, edit photo's, draw pictures, play movies and music, make a telephone call, send and receive faxes, control your washing machine……

Computers have always processed information. First in limited ways and now, vast quantities of information can be processed and stored. This information includes stored programs or software instructions that manipulate data in different ways to needs of users.

Modern computers are electronic devices that process information (data) to the requirements of the user with suitable instructions.

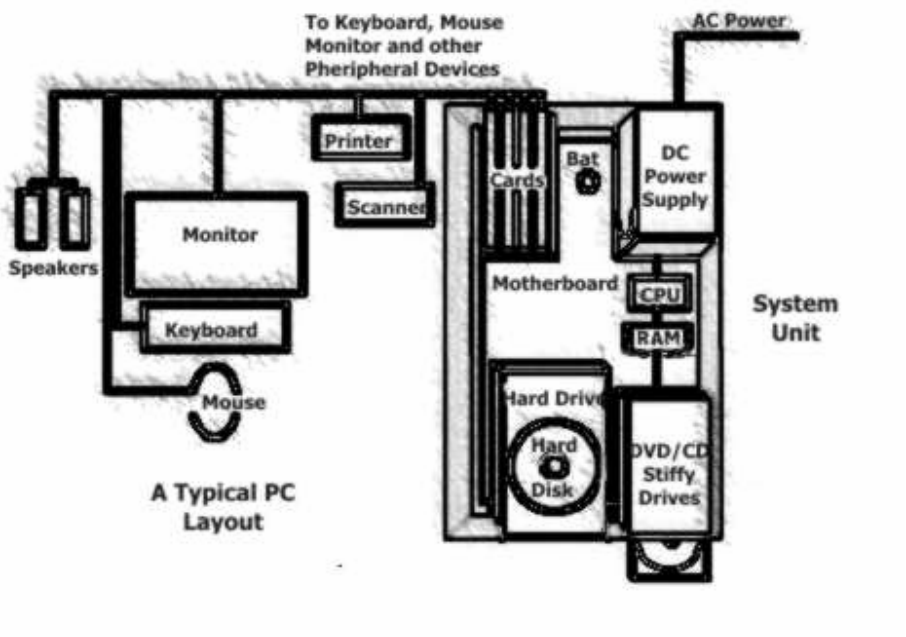
Electronic means that electrical power is required for these devices to work.
Devices may be a computer chip in a car or a fully automated household system.
The workings for all these devices are similar, it requires an input of data or instructions, it has a central processing unit for the processing of the instructions and data, it stores the data and it gives an output as required.

Our particular device is the Personal Computer or PC and variants thereof.

The Personal Computer - PC

Requirements

Power, Hardware and Software is required for a PC to work.



Power

Electrical power is required for the Computer to function.
The Power Supply converts AC electricity from a power outlet to DC electricity.
An on/off button switches the power on or off.

The second power supply is a small battery, housed on the motherboard that supplies continual power for the initial start up program. This power is always on and available. If this battery is flat, normally after five years, the PC will not work.

Hardware

Hardware are all physical components permanently or temporarily attached to a PC, including cables, the mouse, keyboard, CPU, printer, monitors, disks, disk drives, electronic components..

The System Unit

Everything housed in a PC case, the collection of electronic components.

Motherboard - Main board

The Main board is the main base of a computer, a compact electronic circuit board consisting of millions of electronic components and inputs and outputs for the connection of all other hardware. Various different types of connections to the motherboard attach all hardware, directly or indirectly.

Bus

A shared communications path through which the data moves.

Central Processing Unit – CPU - Microprocessor - The Chip

This is the brains of the computer, a small electronic chip attached directly on the motherboard. It consists of a Program Control Unit, an Arithmetic Logic Unit and a small store, cache, for data waiting for processing through them. All processing are done here. It select, sort and calculates data at enormous speed measured in Megahertz (MHz).

The speed of processing data ever increasing, from a 286 through 386, 486, Pentium 1 to the latest Pentium 4 also known as the Prescott.

Due to speed generated during processing heat builds up. A small cooling fan keeps the processor from over heating. Over heating will cause the PC to stop functioning.

The main manufacturers of these units are Intel and AMD.

Bios Basic Input Output System

Fixed memory chips that store the system's basic setup program. The first set of instructions the PC uses when starting. It contains the systems configuration and settings. Power is obtained from a small battery attached directly on the main board. The setup information is always retained even when the main power supply is off.

By pressing Delete on the keyboard during starting up the BIOS menu appears. The PC's basic configuration is changed here. Wrong configuration and the PC will not function.

Random Access Memory - Ram

A grouping of microchip memory modules, attached directly to the motherboard. Active data, data currently processed by the computer, including entered data by the user and programs processing the data are loaded to RAM. Data is only written to the Hard Disk Drive and stored when the data is saved or the program normally ended. If the computer is switched off or reset, work in progress will be lost. Save work frequently.

If RAM capacity is insufficient for the program, data continuously flow between the hard disk and the RAM modules. This causes delays in processing the data and lead to frustrations. Increase the RAM by adding additional modules onto the motherboard. The more RAM available the faster programs will work.

Be certain that the RAM module matches the Motherboard specifications.

Disk Drives

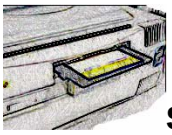
Disk Drives housed in the PC case connect directly to the motherboard. Data, written and stored on the disks are available for use as required. External drives are also available.

Hard Disk Drive

The main internal permanent fixed storage unit containing a higher capacity drive and a fixed disk that stores very large amounts of data. The operating system, programs and all data are stored here. When saving data the hard drive writes the data to this disk for later use.

On failure of the Hard Disk, all data could be lost. Making copies of work (backups) to other disks is advised.

More than one Hard Disk Drive can be attached to the motherboard. Settings on the Hard Disks need to be changed to accommodate two drives.



Stiffy Drive

Reads and write to a portable 3.5" plastic disk

Stiffy Disk

In a rigid plastic casing, is a thin circular plastic disk on which data is magnetically written and stored. The stored data can be read, copied, or deleted. The smallest storage facility.

Keep Stiffy Disks away from magnets and magnetic devices as data can be deleted or wiped by magnetic fields.

DVD/CD Drives

An optical drive that reads and writes data to disc. DVD – movies CD- music and other data.
A DVD Read/ Writer can read/write CD Disks but a CD Read/Writer cannot Read/Write a DVD Disk

Flash Drive

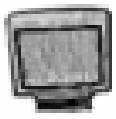
Is a very compact plug in electronic storage device that stores up to 1 Gigabyte of data and connects to the PC via an USB bus port.

Keyboards

An input device used to enter information into the computer.

Mouse

A small input device, usually consisting of two buttons and a scrolling wheel at the top and a round ball on the bottom enabling the duplication of the movement of the hand on the screen allowing the selection and manipulating of icons and items.



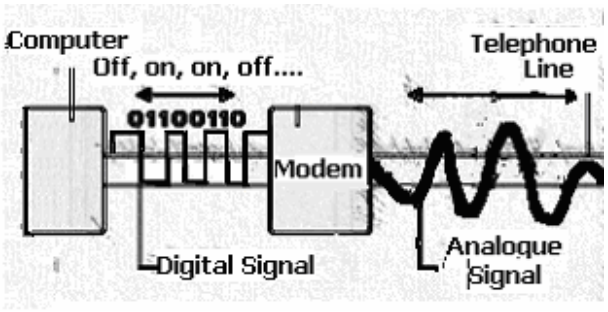
Monitor

The computer monitor, an output device, displays the output of data on screen.
Most monitors have their own power switch and controls that allows adjustment of the display.

Printers

A printer transfers output, graphics and text from the PC to paper.
There are different types of printers (laser, ink jet, dot matrix) with differing quality of output. Quality is measured in dpi (dots per inch) and ppm (pages per minute), the higher the better.

Modem



The modem plugs into a standard telephone jack and allows the PC to transmit and receive information through telephone lines.

A computer use digital signals and the telephone system, analogue signals. The modem converts the data from digital to analogue signals. Latest models operate through cable or by satellite.

Modem speeds are measured in bits per second, the higher the speed quicker data and information is processed. Email electronic mail or faxes can be sent or received and direct audio and visual communication is possible.

Electrical storms can damage modems.

Scanners

Copies printed material and save it in a graphic file format for display on the PC monitor. Similar as taking a photo.

Speakers

Speakers, an output device delivers audio to the PC. Listen to music, multimedia Web sites and even converse with other parties through an input device, a microphone.

Software

Software is any instructions, programs used by a Computer and data that can be stored electronically. This includes the operating system, games and other applications. Software is usually stored on disks.

Software provides the instructions data for a computer.

Software comes in two categories: **System Software and Application Software**

System software

This includes

Bios Setup Software is the start up systems configuration and settings programs that is stored on a small separate memory chip powered by a small battery.

Operating System Software makes the PC easier to use. It provides the user interface in order to manage files, start programs, customizes computer settings, other tasks and provides the fundamental computer functionality for programmers.

Intel and AMD based PC's use the Microsoft Windows operating system with the latest system, Windows XP. Operating System Software is stored on the Hard Disk. Other operating systems are also available e.g. Linux.

Application software

Are specially developed programs of software, which uses the operating system, to suit the requirements of users and provides the real functionality of a PC.

MS Word a text application for writing letters and drawing up various documents.
MS Excel a spreadsheet application for calculations.
MS Access a Database application.
MS PowerPoint a visual presentation application.
Winfax a faxing application to enable sending and receiving faxes
Netscape Navigator or MS Internet Explore, Internet Browsers.
Coral Draw a graphics application used in advertising.

The applications are endless, with suitable software, instructions may even vocally be sent and received.

Application software is developed to work with specific operating systems and hardware.
Software specifications will specify the operating system and hardware requirements in order to function.
Modern software is large and requires sufficient Ram and Processor speed to function correctly. If insufficient, programs will hang (take a long time to process) and not process as required.

The Basic Workings

Power- Data Input-Data Processing–Data Storage - Output

Starting Up - Booting Up

Switched on power is supplied to the power supply converting AC currant to DC currant.

The Bios Program identifies collected data of all system devices in the systems unit and starts the operating system software. (Booting up the system) This program is stored separate of other programs and powered up by the small battery housed directly on the motherboard in the processor

The operating system starts, functions, and instructions loaded to Random Access Memory.

The Computer and system are ready for further instructions, Input from the user.

Input

Any information entered into the computer.

Processing of Data

Data is entered and processing begins when the enter button on the keyboard is pressed. By pressing keyboard, keys and mouse buttons during the processing of data additional commands are sent to the processor. Instead of resolving, a slow processing of data this action causes the processing to slow down even more.

Output

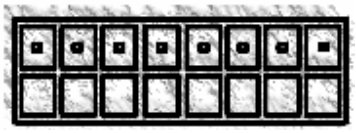
Any computer processed results.

The Language

Binary Arithmetic

Being an electronic device Computers react on electrical impulses that flows through switches that can be either on or off. These impulses are understood by the computer as either on or off states, or 1's or 0's, also known as Base 2, the binary numbers system (2 digits). Compare that to Base 10 our decimal system that uses 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, (10 digits). All instructions to the computer for processing must be converted to Base 2, the binary language understood by the Computer.

Bit Binary digit, a digit either on or off, the smallest unit of information that can be processed by the Computer.



Byte Eight bits

A byte consisting of a string of 8 bits (a bit, 2 states either on or off, 1 or 0), have 256 different combinations, 2 to the power of 8 or 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 = 256.
Each of these combinations of on or off states represents a character 0, 1, 2, 3, A, a, B, b...etc. This data can be recognized and processed by the computer.

Kilo Byte	**kB**	1,000 bytes, a thousand bytes
Mega byte	**MB**	1,000,000 one million bytes
Gigabyte	**GB**	1,000 Megabyte's

Text Files

Text files are the most basic form in which written documents can be stored on a PC. ASCII American Standard Code for Information Interchange is a universal code that converts Basic English letters and other characters into binary numbers that computers can process. In this format, file sizes are much smaller compared to a word processor program such as MS Word. Using MS Word, endless functions are possible in a document.

Text Editors such as MS Notepad are used when editing text files whilst a word processor program as MS Word is used when editing a word-process document.

Word processing programs can convert the document in basic text file form, losing then the more intricate format, different fonts, graphics, etc.

The various types of word processor programs available are able to edit any basic text file and using this basic form when working with different word processing programs are very useful. Difficulty could arise when producing a document in MS Word and trying to read it in another word processing program.

Fonts:

Fonts are characters of various shapes and sizes used in creating words on paper. The font used in this document is Tahoma. The Times New Roman font is normally used in Newspapers. There are two categories of fonts, serif, as Times New Roman, **with** little feet at the bottom of the character and sans serif, **without** the little feet.

Format:

Text

Formatting text means all additionally added to basic text such as different fonts used in shaping the lettering, the layout and styling of the text in a document such as line spacing, margins.

Files

Different programs have different file formats. In order for different programs to recognise and process data from each other, file formats requires conversion to the user program. The different file formats are usually visible as an extension of a file name e.g. file.doc

Disks

Preparing disks to receive and store data.

Digital Signals

Signals in separate bits on or off

Analogue Signals

Smooth continual signal that vary in frequency and power.

Programming

Written programs, instructions firstly that the operating software can recognize and process, and then converted to binary form that the computer can recognize and process.

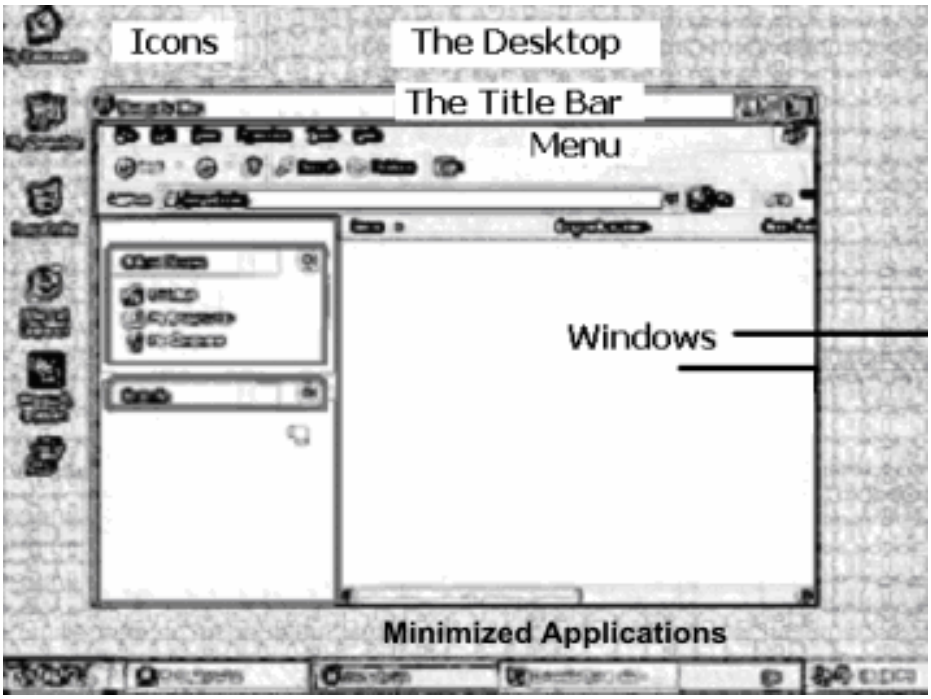
Network

A group of computers connected with each other. It may be connected by direct cable, telephone line, fibre-optic or any other linkage. Once connected, computers on a network can share files, send large amounts of information very quickly, and enable multiple users to communicate.

Operating Systems

Examples of the Microsoft Windows operating system generally used.

Windows



Title Bar
Located at the top of the window, tells you what program you are using.

Menu Bars
Located below the title bar, are specific to each program.

Task Bar
Located at the bottom of the window, tells you what programs are open.

Scroll Bars
Located on the side and on the bottom, enables you to scroll up/down or right/left.

Windows

Windows is an operating system that uses a graphic interface, in the form of windows, to display information on a screen. It allows users to view the contents and to manipulate graphic items with a mouse. These Windows can be opened, closed, stacked, sorted, resized, and moved.

This system is much easier to use than typing instructions on a blank screen for the PC to process.

When opening a program, a new window is created much like starting work on a new blank page. Each window is separate. Multiple windows can be open at the same time. The more

windows open, the more programs are open and because open programs are loaded to RAM the slower the computer will process data.

Windows can be resized, minimized and closed.
When closing, a question heading appears if the work must be saved. Yes, means that it will be saved to a file, no means the work will be deleted and lost and cancel will return the user to the document.

Visual Aids

Mouse Pointer

The visual position of the mouse on the screen.

Cursor

The visual position of your action in a program. The cursor allows you to insert or delete text at that point. By right clicking and keeping the mouse button depressed, items or text may be selected, copied moved or deleted.

Icons

Small graphic images located on the Desktop representing computer Applications - programs.
Left-clicking (Using the left button on the mouse) twice on an icon, will open the icon and show what it represents.
Right–clicking (Using the right button on the mouse) will open a menu with various options. Choosing the delete option will delete all the contents.

The Enter button

By pressing the enter button on the keyboard instructions are sent to the processor and processing begins. Every time an instruction is sent, it will be processed in the order sent.

If processing is slow, further instructions will slow the process down even more and output results not perhaps the results required.

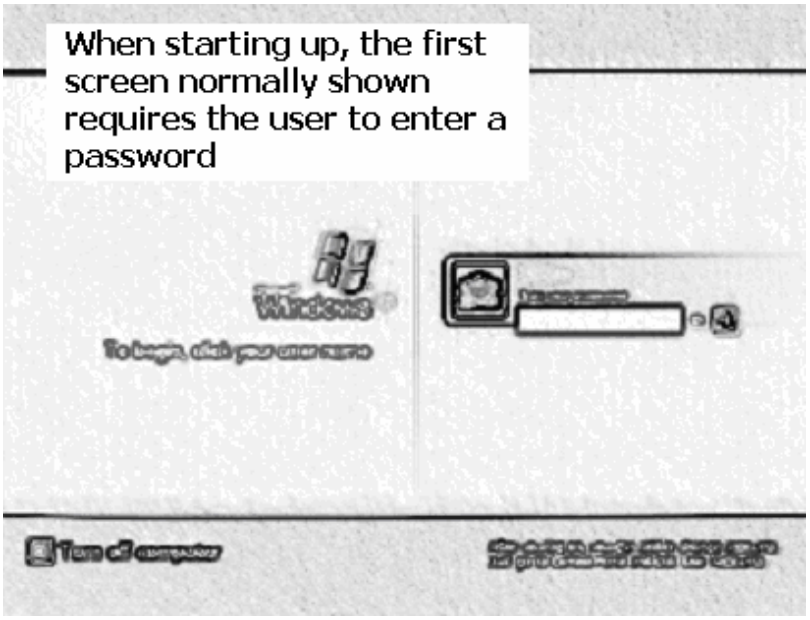
Delete

Deleting items will show a second window where the delete instruction is confirmed. On confirmation, the item will be deleted. The deleted item is transferred to a special file where all deleted items are stored, The Recycle Bin. Opening the Recycle bin by left clicking twice will show the contents, all the deleted items. By right-clicking file on the top menu, options are available. If the instruction Empty Recycle bin is entered all the items in this file is finally deleted and not again available.

If a file was mistakenly deleted all items in this file can again be made available by restoring the item.

Files

Electronic information stored under a name.



The first screen that appears when starting up is normally requires a password.

Type in your password and press the enter button on the keyboard.

The PC is ready to receive instructions.