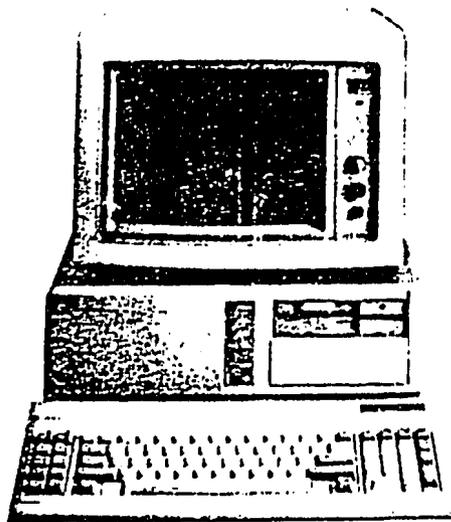


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AN INTRODUCTION TO COMPUTERS



* by *

Tahir Wadood Malik

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FORESTRY PLANNING & DEVELOPMENT PROJECT

Government of Pakistan-USAID

COMPUTERS

Tahir Wadood Malik
Training and Communications Coordinator

INTRODUCTION

Our weekly television fare has enough to intimidate us as far as Computers are concerned: programmes showing helicopters, space craft and cars doing the computers bidding, are enough to add to the mystique of the computer, and keep the uninitiated at bay.

A computer, however, is neither an intelligent being nor is it a phenomena to stand in awe of, it is just a man made machine, and like all man made machines, it is capable of doing only that what it is made to do, albeit at a very fast speed.

Thus by definition :

A Computer is an electronic calculating and measuring machine, that stores data and instructions, and performs a sequence of operations to process this data at high speeds.

Let us examine the main terms in this definition:

1. Data:
 - a. Information that forms the basis of calculation and giving of result, in a form suitable for processing.
 - b. Collection of facts or other reports, (numeric, alphabetic or mixed), used as a basis for the above.
2. Instruction: That part of a computers programme that tells the computer what function to perform.
3. Processing: Manipulation of data into useful form or into information; information is processed data.

Thus a Computer is but a machine, that has been given certain instructions, i.e., Programmed, to perform all the magic associated with it, take away this programme and the magic cannot be performed ... the computer is reduced to the status of just a dumb box with a lot of circuitry in it.



Winrock International

Technical Assistance Team

USING COMPUTERS

Use of a Computer can be divided into two categories, that depend on the skills of the user, these enable him to utilize the equipment to his best advantage. These are:

1. Programming a computer by using a Language.
2. Using a Package.

Language: An intermediate step that allows humans to communicate with a Computer.

There are a number of languages (a special set of symbols, letters, numbers, rules etc., used for the transmission of information), in use today, e.g., BASIC, FORTRAN, COBOL, RPG, PL/1, ALGOL, AML etc., these allow direct interaction between the user and the Computer, including error detection and correction as the work is done.

Package: Pre-programmed software written in any of the computer language(s), to fulfill a particular requirement, thus obviating the operators need to know a programming language.

Generally speaking, packages are of the following 5 types:

1. Educational: To impart educational instruction to users in any given subject like Math, Chemistry etc.
2. Personal Enhancement: To meet ones personal needs of progress in Dieting, TOEFL, GMAT, exercises etc.
3. Games: Children and adult games, to pit a player against the machine, come in many varieties and types.
4. Business applications: Packages that meet specific business requirements, e.g., word processing etc.
5. Arts and craft: To enable learning or improvement of the skills of arts, music, drawing etc.

Over the years the term "Computer literacy" has gained more and more acceptance in daily usage, computerese (the technical language or jargon of the computer profession), forms part of our daily discussions, in fact we are now talking in terms of the 3 R's of computer literacy as:

1. Read about computers.
2. Gain real hands on experience.
3. Write a computer programme.

TYPES OF COMPUTERS.

Computers are big or small or can perform some functions, based on both of these categories computers are divided in to various types, by virtue of performance or size of memory and

processing speed. Performance wise computers are divided into:

1. Digital: Computers that process data expressed as a combination of data, represented by separate individual units, arranged in code (language) for, processing. These are the most commonly used type of computers.
2. Analogue: These work on an analogy, i.e., two things that are alike in one way are thought to be alike in other ways also. These perform arithmetic functions upon numbers represented by some physical quantity, e.g., electric current, heat etc. Used in industrial applications and avionics
3. Hybrid: This term refers to any mixed computer system that combines features of both the above. Used primarily in On line simulations, wind tunnels, weather forecasting etc.

The divisions for size of memory/processing speed are. (Generally this division is applicable to digital computers):

1. Main frame: The term actually refers to a system having a computer and many peripheral devices (a device usually for entry or retrieval of data, connected to a computer and under its control to some degree), generally speaking a main frame itself is not accessible to the operator. These could be small, medium or large, depending on memory and stations or terminals attached to it.
2. Medium: Small in size and usage, generally limited to one physical location.
3. Mini: The result of the chip, during 1960 computers got smaller in size due to use of transistors. By 1965 there were an estimated 20,000 computers in the world, by 1970 over 140,000 were in use mainly due to mini computer boom.
4. Micro: The micro processor Z-80 in 1971, revolutionized the industry, and computers became smaller still, the 8086 and 8088 family of microprocessor followed by the 80286, 286, 386 and others, made the computer accessible to more and more people. Today Personal Computers (PC's) are considered large mainly due to their memory content.
5. Super: These are used for work beyond the realm of large main frames, CRAY-1 and CDC Cyber 205 in use in the USA are examples of this type. These computers use special cooling devices to prevent the system from melting due to the heat produced by its processor during processing. These can do 100 million floating point (high precision math) operations in one second, and cost between US\$ 5 million and US\$ 12 million, depending on type.

CAPABILITIES OF COMPUTERS

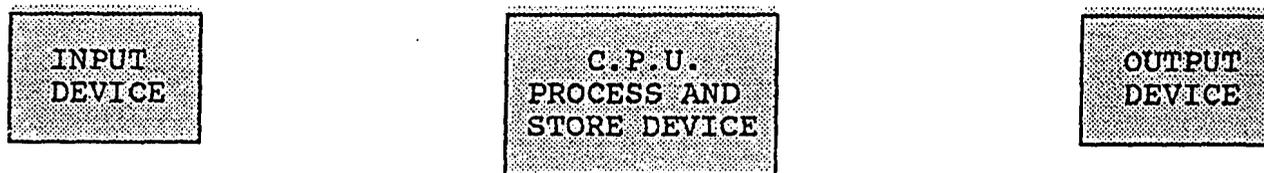
Computers are capable of:

1. Accepting information\instructions, interpret and memorize these.
2. Processing information according to a given sequence called control sequence (Programme).
3. Providing information by any of many means, Monitor (VDU, CRT, Screen), Hard copy (print out), Off line storage (disks, tapes).
4. Storing information for future use, (disks, tapes etc).
5. Reading stored information and automatically operate the stored programme.
6. Decision making, determination of true or false condition or value of data, and chose action accordingly.
7. Transferring or receiving information via a remote channel using a modem (tele processing).

CHARACTERISTICS OF COMPUTERS

1. Memory or compact storage. Calculated in kilo or mega bytes. 1 Kilo byte = 1024 bytes i.e., 2^{10}
2. Speed. The speed of processing of data, calculated in nano seconds (1/1 billionth of a second), it can do 500,000 additions in a second.
3. Accuracy. For a given sequence the results will be the same.
4. Uniformity of action. All functions are performed uniformly.
5. Diligence/tireless operation.
6. Automation.

LAYOUT OF A COMPUTER



INPUT DEVICES:

Key board, Punch card, Punched paper tape, Bar codes, Magnetic ink character recognition, Optical character recognition, Mark sensing, Voice recognition, Light pen, Mouse, Joy stick.

OUTPUT DEVICES

Monitor, Hard copy (Dot matrix, Laser, Line, Daisy wheel printers, Plotters), Speech synthesis.

STORAGE DEVICES

Magnetic tape, Magnetic disk or hard disk, Winchester disk (1973), Optical disk, Magnetic drum and cards, Floppy disks or diskettes (5 1/4 and 3 1/2 inches).

COMPUTER CODES AND ARITHMETICS

Computers work in Binary system, this has a base of 2 , that is only two digits are used to express a value, 0 and 1, hexadecimal system i.e., base 16 , is also used. All values, numeric and alphabetic are converted to binary before processing, all characters on a keyboard have a binary value, generally of one byte of eight bits, thus "A" is 1010 0001, "D" is 1010 0100 and so on. The equivalents of Decimal numbers in Binary, Hex and Octal are given in Annexure C.

HISTORY OF COMPUTERS

Estimation or calculation of things is as old as man kind itself. Without figures man would probably be lost. History tells us that aids to calculation have been in use for a very long time, about 6000 B.C the Chinese are known to have been using an Abacus, a calculating machine like a child's toy of today.

Logic had a part to play in the development of computers, Aristotle (384-322 B.C) laid the foundation of modern logic (Syllogistic or Traditional logic), his logic " All men are mortals, Socrates is a man, Therefore, Socrates is mortal" has stood the test of time, based on this man has made progress in various fields.

APPLICATION OF COMPUTERS

Computers have found wide spread usage in business, industry, banking, scientific research, medical sciences, education and in fact in all spheres of human endeavour.

When did you last use a computer, can't think of it ?, well probably in the last 30 minutes !, how ?, well, did you look at your watch ?, it probably has a computer; make a phone call ?, connections made by computer; used a calculator ?, most certainly a computer the list could go on and on inexhaustibly.

CONCLUSION

As can be seen from this brief introduction, computers are not all that formidable, once one gets to know what makes a computer go it is easy to get rid of the fear and get down to work, a computer makes life easy, without mess and fuss and helps in the development of diverse ideas and actions.

So let us shed the fear of the Computer and get to work on a computer.

Annexure's:

- Annexure A: Glossary of terms.
- Annexure B: Chronology of development of the Computer.
- Annexure C: Equivalent values in different number systems.
- Annexure D: Pictures/diagrams to illustrate the text.
- Annexure E: Bibliography.

GLOSSARY

A

- **access arm.** A part of a disk storage unit that is used to hold one or more reading and writing heads.

alphabetic character. A letter or other symbol, excluding digits, used in a language.

- **alphanumeric.** Pertaining to a character set that contains letters, digits, and usually other characters, such as punctuation marks. Synonymous with alphabetic.
- **analyst.** A person who defines problems and develops procedures for their solution.

APL. A programming language. A problem solving language which offers special capabilities for handling arrays and for performing mathematical functions.

assembler language. A source language that includes symbolic machine language statements.

B

- **backup copy.** A copy of a file that is kept for reference in case the original file is destroyed.

BASIC. Beginners All-purpose Symbolic Instruction Code. An easy to use programming language for business and engineering applications.

batch processing. An approach to processing data where a number of similar items are grouped for processing during the same machine run.

binary code. A code that makes use of exactly two distinct characters, 0 and 1.

bug. A mistake or malfunction.

byte. (1) A sequence of adjacent binary digits operated upon as a unit, (2) The representation of a character.

C

cathode ray tube. An electronic vacuum tube, such as a television picture tube, that can be used to display graphic images.

C.E. Customer Engineer.

- **character printer.** A device that prints a single character at a time. Contrast with "line printer."
- **COBOL.** COmmon Business-Oriented Language. A business data processing language.
- **code.** A set of unambiguous rules specifying the way in which data may be represented.
- **compile.** To prepare a machine language program from a computer program written in another programming language.
- **compiler.** A program that compiles.
- **console.** The part of a computer used for communication between the computer operator and the computer.
- **copy.** To reproduce data in a new location or other destination, leaving the data unchanged.
- **CRT display.** Cathode ray tube display.

cursor. A movable character (underscore) on a display screen, used to indicate where the next character keyed by the operator will appear in a data field.

customer engineer. An individual responsible for field maintenance of IBM hardware and software. Abbreviated C.E.

customer support functions. Programs designed to perform common tasks such as copying files, initializing diskettes, etc.

cylinder. The tracks of a disk storage device that can be accessed without repositioning the access mechanism.

D

- **data.** A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing.

data base. A collection of stored data.

data communication. The processing of data that is received or sent to locations that are remote from the central processor.

data entry. The process of the initial recording or transcription of data from its source into a machine readable form.

data file. A collection of related data records organized in a specific manner.

- **data processing.** The execution of a systematic sequence of operations performed upon data.

data processing system. A network of components capable of accepting information, processing it according to a plan, and producing desired results.

- **debug.** To detect, locate, and remove mistakes from a program or malfunctions from a computer.

- **decimal digit.** In decimal notation, one of the characters 0 through 9.

direct access. Retrieval or storage of data by a reference to its location on a disk.

disk. A rotating storage device for storing data files and programs. See "magnetic disk."

diskette. A form of disk storage that utilizes an inexpensive flexible plastic disk.

disk storage. Direct access storage that uses rotating magnetic disks to store programs and data files.

display screen. The part of a display station on which data, messages, or other information is displayed.

display station. An input/output device that has a keyboard for data entry and a display screen on which data is displayed.

E

- **edit.** To modify the form or format of data; for example, to insert or delete characters such as page numbers or decimal points.

- **electronic data processing.** Data processing largely performed by electronic devices. Abbreviated EDP.

erase. To obliterate information from a storage medium, for example, to clear, to overwrite.

F

field. In a record, a specified area used for a particular category of data.

- **file.** A collection of related records treated as a unit.

- **file maintenance.** The activity of keeping a file up to date by adding, changing, or deleting data.

- **flowchart.** A graphical representation for the definition, analysis, or solution of a problem, in which symbols are used to represent operations, data, flow, equipment, etc.

- **FORTTRAN.** FORMula TRANslating system. A language primarily used to express computer programs by arithmetic formulas.

H

- **hardware.** Physical equipment, as opposed to the computer program or method of use, for example, mechanical, magnetic, electrical, or electronic devices.

hash total. A summation for checking purposes of one or more corresponding fields of a file that would ordinarily not be summed.

- **head.** A device that reads, writes, records, or erases data on a storage medium.

I

indexed file. A file organization in which record keys and disk addresses are kept in an index, permitting direct access to individual records.

- **input area.** An area of storage reserved for input.

• American National Standard Definition

- **input data.** Data to be processed.

input/output. (1) Pertaining to either input or output, or both. (2) A general term for the equipment used to communicate with a computer, commonly called I/O.

inquiry. A request for information from storage; for example, a request for the number of available airline seats, or a machine statement to initiate a search of library documents.

interactive. The ability to enter data and receive a rapid response from the system, based on the data entered.

- **I/O.** Input/output.

J

job. A specified group of tasks prescribed as a unit of work for a computer.

K

K. 1024 bytes; used in referring to storage capacity.

key. One or more characters within an item of data that are used to identify or control its use.

L

library. An area of a disk or tape reserved for program storage.

- **line printer.** A device that prints all characters of a line as a unit. Contrast with character printer.
- **load.** (1) To enter data or programs into storage; for example, to load master files. (2) To prepare an input/output device for operation; for example, to load paper into a printer.
- **logging.** The procedure of recording on a storage device, the occurrence of a particular type of transactions or system activities.

M

- **machine language.** A language that is used directly by a machine.

- **magnetic card.** A card with a magnetic surface on which data can be stored by selective magnetization of portions of the flat surface.

- **magnetic disk.** A flat circular plate with a magnetic surface on which data can be stored by selective magnetization of portions of the flat surface.

- **magnetic ink character recognition.** The machine recognition of characters printed with magnetic ink. Abbreviated MICR.

- **magnetic tape.** A tape with a magnetic surface on which data can be stored by selective polarization of portions of the surface.

- **main frame.** Unit of a computer that includes the circuits controlling the interpretation and execution of instructions.

- **main storage.** Storage available in the processing unit where all logical, arithmetic, and control operations take place under program control.

- **master file.** A file that contains relatively permanent data.

megabyte. One million bytes.

menu. A list of choices on a display station which the operator may select to perform an operation.

- **MICR.** Magnetic ink character recognition.

microsecond. One-millionth of a second.

millisecond. One-thousandth of a second.

N

nanosecond. One-billionth of a second.

network. In data communications, a number of communication lines connecting a computer with remote terminals.

- **numeric.** Pertains to digits 0-9.

O

- **object program.** A compiled program that is ready to be loaded into the computer. Contrast with "source program."
- **offline.** Pertaining to equipment or devices not under control of the central processing unit.
- **offline storage.** Storage not under control of the central processing unit.
- **online.** (1) Pertaining to equipment or devices under control of the central processing unit. (2) Pertaining to a user's ability to interact with a computer.
- **online storage.** Storage under the control of the central processing unit.
- **output.** Data delivered or ready to be delivered from a device or program, usually after some processing.
- **output area.** An area of storage reserved for output.

P

picosecond. One-trillionth of a second.

printer. A device that writes output data from a system on paper or other media.

processing unit. The parts of a computer that perform the processing and control functions for the system, perform operations on data, and control output.

- **program.** (1) A sequence of instructions to a computer, written in a special form the computer can interpret. A program tells the computer where to get input, how to process it, and where to put the results. (2) A set of instructions that tells the computer which operations are to be done and how to do them.
- **programmer.** A person mainly involved in designing, writing, and testing computer programs.

program product. An IBM-written, licensed program for which a monthly charge is made. A program product performs functions related to processing user data.

- American National Standard Definition

Q

query. To extract, from a file, records based on a requested criterion. For example, listing all of the customers in a file whose balance is greater than \$1000.

R

- **record.** A collection of related items of data, treated as a unit.

remote job entry. Submission of job control statements and data to a computer from a remote terminal, causing the jobs to be scheduled and executed as though encountered in the computer's input stream. Abbreviated RJE.

report program generator. A processing program that can be used to generate object programs that produce reports from existing sets of data. Abbreviated RPG.

runbook. A book of operator instructions for the running of programs or jobs.

S

screen. The display surface of a CRT display device.

S.E. Systems Engineer.

sequential file. A file whose records are organized on the basis of their successive physical positions, such as on magnetic tape.

serial printer. A device that prints characters one at a time. Contrast with line printer.

- **software.** A set of programs, procedures, and possibly associated documentation concerned with the operation of a data processing system.

solid logic technology. Miniaturized modules used in computers, which result in faster circuitry because of reduced distance for current to travel.

- **sort.** To segregate items into groups according to some definite rules.

- **source program.** A computer program written in a source language. Contrast with "object program".

- **special character.** A character other than alphabetic or numeric; for example, *, +, % are special characters.
- **storage.** (1) Pertaining to a device into which data can be entered, held, and retrieved at a later time. (2) Loosely, any device that can store data. (3) Synonymous with memory.

supervisor. The part of a control program that coordinates the use of resources and maintains the flow of CPU operations.

- **system.** (1) An assembly of methods, procedures, or techniques united by regulated interactions to form an organized whole. (2) An organized collection of men, machines, and methods required to accomplish a set of specific functions.

systems engineer. An individual located at an IBM computer center to provide technical guidance and assistance to IBM customers.

T

terminal. Any device capable of sending and/or receiving information over a communication channel.

- **track.** A complete circle on a disk or diskette where data is recorded.
- **transaction file.** A file containing relatively transient data to be processed in combination with a master file.

U

update. To modify a file with current information according to a specified procedure.

V

- **verify.** To determine whether a transcription of data or other operation has been accomplished accurately.

W

work station. A device or component that allows communication between the user and the computer.

- **write.** To record data in a storage device or a data medium. The recording need not be permanent, such as the writing on a cathode ray tube display device.

CHRONOLOGY OF DEVELOPMENT OF THE COMPUTER

<u>DATE</u>	<u>INVENTOR</u>	<u>INVENTION</u>
<u>Dark Age's</u>		
circa 6000 B.C		Abacus in use in China
circa 5000 B.C		Decimal system in use in Indus valley of India (Mohenjodaro \ Harrapa era).
circa 1430		Jamshed bin Masud bin Mahmood Ghias ud din al Kashi
		1. Astronomical observatory at Samarkand
		2. Calculated value of 2Pi to 16 places
		3. Made "Plate of Conjunctions to calculate time when two planets will be on same longitude.
1614	John Napier	Napier's Bones
1621	William Oughtred	Slide rule
1642	Blaise Pascall	First mechanical calculator for adding figures
1700	Leibniz G. Wilhelm	Improves Pascalls machine to divide and multiply also.
1823	Charles Babbage	Differential engine leading to Analytical machine, the first computer model, used punch cards. Could not be completed as the technology available at the time was not up to what was needed by him.
<u>Middle Age's</u>		
1890	Herman Hollerith	Founded IBM, calculated US census on punched cards in 3 months against 3 years for previous census. Invented many other machines.
<u>Modern Age</u>		
1944	Howard G. Atkins	Mark 1, first actual Computer having ALU and memory.
<u>First Generation of Computer's</u>		
1946-59		ENIAC, EDVAC and many others made, the UNIVAC 1 of 1951 was the first computer used in business in 1954 by General Electric Corp.

Second Generation of Computer's

1959-65

Use of transistors, magnetic core memory, I/O devices, reduction in size.

Most popular IBM 1401 of which 15000 were made.

UNIVAC 2, Philco 2000, GE 635 and NCR 300 were pioneers.

Third Generation of Computer's

1965-1970

Improved secondary storage, I/O devices, higher processing speeds, Software development.

IBM System 360 and 370, UNIVAC 1108 and GE 600.

Fourth Generation of Computer's

1970 to date

Micro processor, packages, desk tops, lap tops, enhanced features, proliferation of software, local are networks, contribute to the global village concept.

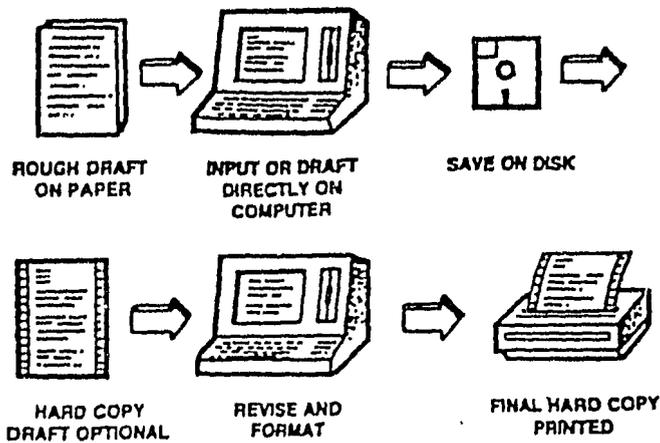
IBM, Panasonic, Epson, Sinclair and many others join in the manufacturing of computers.

EQUIVALENT VALUES IN DIFFERENT NUMBER SYSTEMS

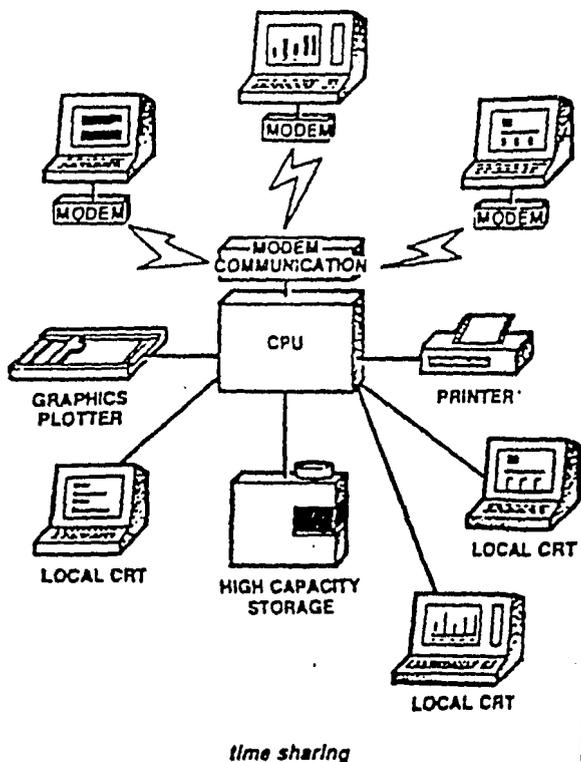
<u>Decimal</u> ₁₀	<u>Binary</u> ₂	<u>Hexadecimal</u> ₁₆	<u>Octal</u> ₈
0	0	0	0
1	1	1	1
2	10	2	2
3	11	3	3
4	100	4	4
5	101	5	5
6	110	6	6
7	111	7	7
8	1000	8	10
9	1001	9	11
10	1010	A	12
11	1011	B	13
12	1100	C	14
13	1101	D	15
14	1110	E	16
15	1111	F	17
16	10000	10	20

FIGURES AND PICTURES TO ILLUSTRATE TEXT

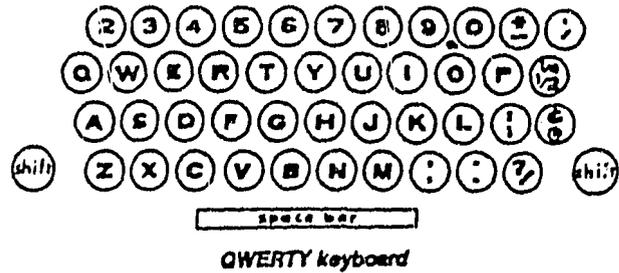
word processing The implementation of word processor software on a computer for writing, editing, revising, manipulating, formatting, and printing text for letters, reports, and manuscripts.



time sharing (T/S). An installation in which a central processing system, usually a mini- or main-frame computer, serves more than one user, either locally or by telecommunications.

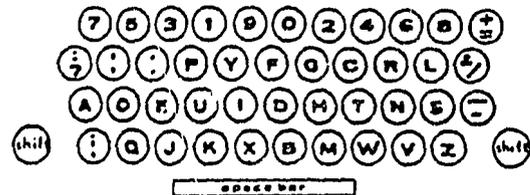


time sharing



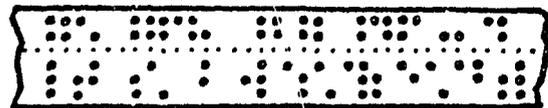
QWERTY keyboard

Dvorak keyboard A keyboard arrangement that is easier and faster to use than the standard QWERTY keyboard. Programs are available to simulate the Dvorak keyboard as an overlay for the standard QWERTY keyboard.

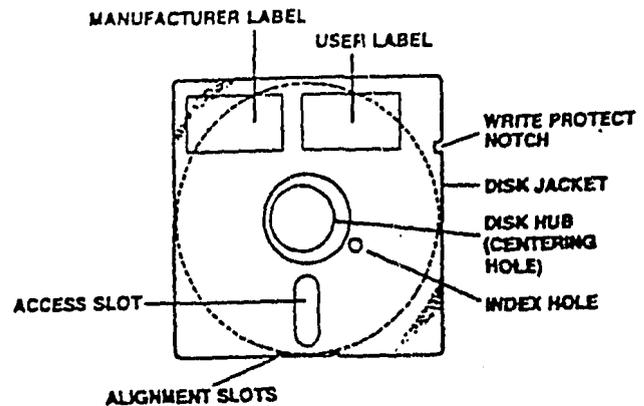


Dvorak keyboard

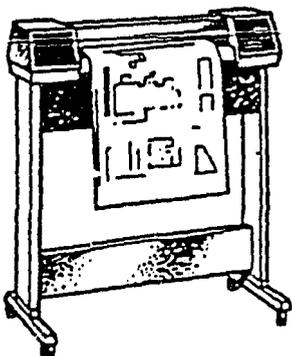
paper tape An old but reliable storage medium by which data are stored as punched-hole sequences on a paper tape. The technique is slow but inexpensive.



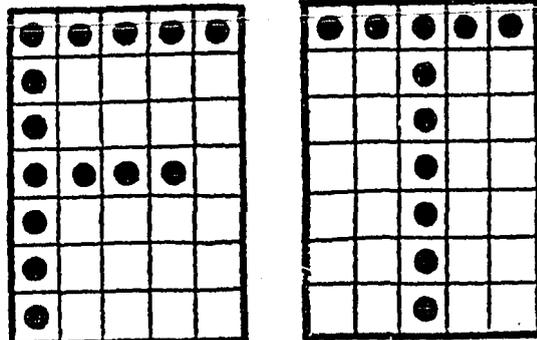
paper tape



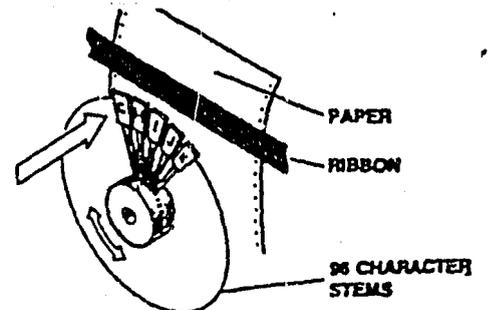
floppy disk



plotter



dot-matrix character representation



daisy wheel

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