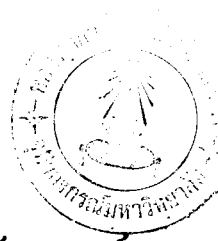# Bibliography

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Appendix

Appendix A.

What is a computer?

A computer is a device for solving problems by accepting data, performing prescribed operations on the data, and supplying the results of these operations.[1]

The computer may be classified into two types according to the way it works: analog computer and digital computer. The analog computer takes a measured amount of information, performs a set routine of processing, and presents the answer in a measurable form. This computer represents numbers by some physical quantity, such as length, rotations of wheels, or electric current. The most common form of an analog computer is the speed meter. Tire revolutions are converted to miles per hour and translated to digits on a dial. The digital computer represents numbers by separate devices for each digit. This kind of computer produces the desired result based upon computations of numbers, while the analog computer determines the desired answer based upon physical amount.

Computers may also be classified according to the jobs they can do. General purpose computers are able to perform many kinds of jobs. They may be used in banks, department stores, schools,

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[1]Martin H. Weik, Standard Dictionary of Computers and Information Processing (New York: Hayden Book Company, 1970), 79.

or libraries. A special purpose computer is designed for just one job, such as helping to guide a space vehicle.

Most digital computers are general purpose computers. These computers are so widely used that the word "computers," when used alone, usually means a general purpose, digital computer. This study will focus upon digital computers since this is the type of computers often used in the library.

Components of a computer

The computer has five basic components: input, memory, arithmetic-logic, control and output. All are connected by electrical cables so as to function as a system (Figure 18)
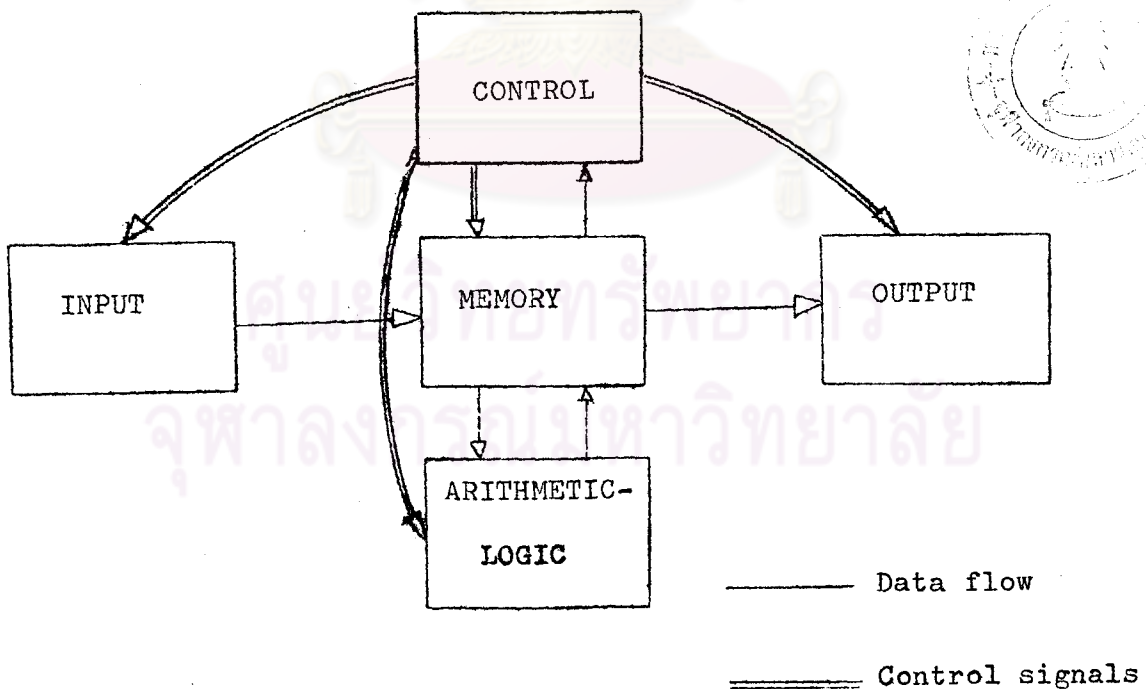

Figure 18: Components of a computer

The input unit accepts information from various input devices in a form sensible to the computer, such as punched cards, magnetic tape, punch paper tape, magnetic disk and magnetic drum.

A punch card measures $7\frac{3}{8}$ by $3\frac{1}{4}$ inches and is 0.007 inches in thickness.[2] The card is composed of 80 vertical columns, numbered from left to right. There are 12 vertical punching positions in each column. Each column of the card is designed to accommodate one of the digits 0 to 9, the letters A to Z, or certain special characters, such as $ and *. Information is punched into cards on a keypunch, a keyboard machine similar to a typewriter. The punched holes are read electronically by wire brushes or photosensing mechanism located inside the machine. Once the information is punched onto a card it becomes a permanent record which can be repeatedly processed at machine speeds. Many records may be prepared from the same cards and the need to recopy the information is eliminated.

Punched cards are the most widely used primary sources for computer input. There are many devices developed to provide special handling services for them, such as sorters and verifiers. Sorters can group cards in numeric or alphabetic sequence according to any classification punched in them. Verifiers are the machines that check the accuracy of the original punching. However, punched

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[2]Douglas A. Colbert, Data Processing Concepts (New York: McGraw-Hill Book Company, 1968), 10.

cards also have some disadvantages. The punched card can record only 80 characters. Folding or stapling of the cards, humidity effects, etc. may cause operational problems, for example, misinterpretation of data or jaming of the machinery. Card-reader speeds vary from about 250 cards to 1,500 cards per minute, which punch speeds vary from 100 to 500 cards per minute.[3]

A magnetic tape is made of a mylar base coated with magnetic oxide. Reels vary from 2,400 to 3,000 feet of $\frac{1}{2}$, $\frac{3}{4}$ or 1 inch width. A 2,400 - foot reel of tape can store 16 million characters or the equivalent of 200,000 fully punched cards.[4] Information is stored or "written" on magnetic tape by forming spots of small magnetized regions on magnetic media in a predetermined pattern. Stored data are read from the tape by a read head which transmits an electric signal after sensing the magnetized spots. Numeric and alphabetic characters are represented by a specific pattern of locally magnetized spots.

Unlike punched card, magnetic tape can be used again and again, because the information no longer useful can be erased by recording new data on the tape. Reading speeds can be up to 340,000 numeric characters per second.[5] Some short comings of magnetic

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[3]Herbert Maisel, Introduction to Electronic Digital Computers (New York: McGraw-Hill Book Company, 1969), 39-40.

[4]Colbert, op. cit., p. 123.

[5]Ibid., p. 124.

tapes are that they are often susceptible to stray magnetic fields, dust, shock, heat, humidity, etc., and that their patterns are not visible to human eye and must be sensed electrically as the tape passes the read-write heads.

Paper tape is similar to magnetic tape. Instead of magnetic spots, information is recorded in the form of punched holes. Reading is accomplished by a photoelectric sensing device, which senses the presence or absence of holes in the tape. The tapes hold 10 characters per inch and are read at rates between 10 and 1,000 per second.[6] Although not so fast as magnetic tape, paper tape is cheaper than magnetic tape. A reel of paper tape will usually be about 1,000 feet long and from $\frac{5}{8}$ to 1 inch wide.[7]

Other forms of the magnetic recording concept are magnetic drum and magnetic disk. A magnetic drum can be thought of as continous rings of tape wrapped around a drum ranging in size from the bulk of an electric fan motor to that of a 50 gallon oil drum. Drums are used to serve as randon-access storage. Access times for the drums are in the order of 5 to 20 milliseconds.[8] A magnetic disk is an auxilary memory device for mass storage consisting of a stack up to 50 disks. Access times for disks are of the order of

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[6] Smith & Meyer, op. cit., p. 42.

[7] Maisel, op. cit., p. 41.

[8] Ibid., p. 48.

75 to 200 milliseconds.[9]

The memory unit receives information from input machines and holds it until needed by other parts of the computer.

The control unit controls the entire system. Its prime function is to obtain instructions stored in memory in the proper order and to interpret and execute the instructions. All operations are coordinated and directed by the control unit.

The arithmetic-logic unit performs operations of addition, subtraction, multiplication, division, and certain simple logical operations, such as comparing two numbers to determine whether they are equal; or if they are unequal, to determine which is larger. Whether a number is zero is also determined by the arithmetic-logic unit.

The output unit displays information and communicates with the outside world when the processing is completed. This is accomplished through various output devices, such as electric typewriters, line printers, punched cards, magnetic tapes, punched paper tapes, and TV tube displays. A computer's output may be sent over telephone line, or by radio signals, to equipments thousands of miles from the computer, called remote terminals. Teletype writers, cathode-ray tubes and light pens are some kinds of remote devices.

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[9]Ibid., p. 50.

Appendix B.

Cost study of computerized serials systems of AIT Library
and Information Center, NIDA Library and Information Center and
the Union list of serials project.

	AIT	NIDA	Union list of serials project
System analysis	5,000	3,750	5,000
System programming and debugging	5,000	4,400	18,000
Data preparation	-	2,500	-
Material Cost			
Cards and card punching	7,500	4,290.65	4,000
Tape hiring	-	2,248.50	-
Computer time	1,600	3,000	5,000
Printing*	3,000	6,600	6,000
Postage and printing of Data Preparation Guide	-	-	2,000
Total	22,000	26,789.15	40,000

*Numbers of copies issued for AIT, NIDA and the Union list
of serials projects are 100, 200 and 50 respectively.

Data preparation could not be estimated for AIT project and union list of serials project. For AIT project, the preparation was negligible because it involved copying the already prepared information from kardex to the periodical input data cards only. For union list of serials project, there were many libraries involved and each library spent some amount of money on the preparation at its own expense.

Union list of serials project also used two magnetic tapes. However the tapes were provided free of charge by the AIT computer center.

The cost of the union list of serials project is much more than the systems of AIT and NIDA. However, each participant has to pay about 1379.31 baht. The cost for the next updated issue will be less because it has to cover only few card changes, computer precessing time, printing and materials.

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