英汉对照石油科普丛书

计算机及其应用

石 油 工 业 出 版 社

[illegible]普丛书

计算机及其应用

杨 磊 万永熙 译

冯 卓 校注

石油工业出版社

英汉对照石油科普丛书

计算机及其应用

杨 磊 万永熙 译 冯 卓 校注

*

石油工业出版社出版

(北京安定门外安华里二区一号楼)

北京地质出版社印刷厂排版

北京顺义燕华营印刷厂印刷

新华书店北京发行所发行

*

787×1092毫米 32开本 $3^1/_8$印张 66千字 印1—2,000

1990年10月北京第1版 1990年10月北京第1次印刷

ISBN 7-5021-0301-5/TE·297

定价：0.90元

出 版 说 明

英国石油公司出版的《Our Industry Petroleum》一书，迄今为止已重版（包括修订）了五次。这本书对于刚刚投身石油事业的工作者，对于希望概括了解石油工业结构、历史和各个生产部门情况的人士，起到了指南的作用。

我社以此为蓝本，按章（或几章）分册出版这套“英汉对照石油科普丛书”，旨在向自学英语的同志，特别是石油系统广大职工和有关院校的学生提供一套全面介绍石油基本知识的英语读物。这套丛书计划出十二个分册。每一分册约3～5万字，并尽可能配用与内容密切联系的插图。为便于读者自学，除采用英汉两种文字相互对照的形式外，还对英语中某些语言难点（包括复杂的句子结构、短语等）作了必要的注释。因此，凡具有相当于理工科大学二年级英语水平的读者，都可以毫无困难地阅读这套丛书。为了保证丛书的质量，每一分册都先由熟悉专业的同志提供通顺可诵的准确译文，然后统一请南京大学大学外语部的教师对译文作进一步校订，并加做必要的语法注释。但能否真正收到预期的效果，则要由读者作出评定了。我们衷心希望能得到广大读者的批评、指正。

石油部科技情报所的张焱同志，倡导并协助我社组织了“英汉对照石油科普丛书”的编译工作，在此再次表示感谢。

Contents 目　录

THE COMPUTER

HIDDEN IMPACT OF COMPUTERS

It is a paradox that some twenty years ago, when few companies had computers, and those computers were so limited in power that their functions could*have almost no impact on the work of the company, or on the activities of its employees, many people expressed anxiety about the future effects of computers; yet today, when most companies have computers which are involved in many aspects of those companies' work, and whole areas of clerical work have been automated, computers are*taken for granted[2], and the subject arouses little interest. How does this paradox come about? And how can* one prevent it hiding[3] the fantastic impact of computers on the oil industry?

Part of the problem is that we take figures and figure work for granted. But no commerce or technology could exist without numbers and mathematics, the ability to raise an account or make a calculation for a simple engineering design. And without such "number-based" commerce and technology, *our civilisation would be extremely primitive[4].

Of course other human activities-travelling, lifting, speaking-have been"strengthened and lengthened"by the assistance of machines: the chariot or aeroplane, the lifting tackle or modern crane, the semaphore or telephone are well-known examples.

But until almost yesterday, it seems, the mathematics of commerce and science depended on human brainpower, supported to a limited extent by fairly crude labour-saving devices. But the computer has arrived, developing in rather less than twenty years from a laboratory toy to a reliable machine. It is *as if[5] the history of the development of ships, from the classical galley to the modern tanker, had been compressed into twenty years.

And so the computer, arriving almost overnight, has penetrated into commercial and scientific tasksand altered them-almost without *the layman noticing[6]

The aim of this chapter must be to give an overall view of the computer's role-or roles-after first saying a word about what the computer is.

WHAT A COMPUTER IS

In simple terms, the computer is an electronic machine which can be made* to read[7] and write at short or great distances, to calculate, and to handle information in its widest sense. The next few sections supply the minimum detailed information to expand that one-sentence definition. If the reader wishes to master one or more of the many aspects of computing he would be well advised to read the appropriate book on the subject, or to consult his company's computer department.

For some readers it may be necessary to remove a misconception—since computers are sometimes referred to as "electronic brains". This is an unfortunate misnomer—the fact is that no computer ever had an original thought. The computer is just another tool. It is similar to an immensely fast calculating machine and has an enormous capacity for digesting and analysing information whether of a numerical or* more general nature[8]. Its strength, however, lies in its ability to store a long series of instructions and obey them quickly and accurately, to repeat a sequence of instructions with complete consistency and to make certain choices within its paths of calculating, *dependent on certain foreseen circumstances, according to its instructions[9].

It is common to think of computers as calculating machines which operate only on numbers, but this is not correct. In their internal workings, they operate on strings of "yes/no" pulses, called "bits", which can be interpreted as numeric digits, or alphabetic characters, or symbols, or as instructions to the computer itself, according to the circumstances.

THE COMPUTER-FOUR MAIN PARTS

There is a danger in making too firm statements about the constituent parts of the "typical" computer, since computer design develops and changes rapidly.

What is essential for the general reader-and indeed for the computer professional-is that he must so discipline his thinking, that he thinks of the computer as*combining[10] four separate devices:

input devices,
processor,
store,
output devices.

and he must see separately in every computer application the clearly distinguishable elements:

(1) the*input of data into[11] the internal store

(2) the processing, usually including:

-marrying, in the store, input data with file data

-processing

-marshalling the processed results in the store

(3) the*output of results from store to[12] output devices.

*Of the four main components[13](input devices, processor, store, output devices) it is most helpful to consider the processor first, followed next by the store, since the two work closely together.

THE PROCESSOR

The precise details of the "processing heart" of each computer naturally vary, from one manufacturer to another, but for the general reader we need to distinguish two main logical functions – the arithmetic function and the control function: in some computers the processor contains separate units to carry out these functions.

The arithmetic unit is a name which has become accepted over many years in the computer industry, but as a name it is rather unfortunate, in the sense *that[14] it misleads the layman into thinking it is concerned solely with arithmetic functions. In fact the arithmetic unit is capable of carrying out*, one at a time, each "instruction"[15] that the computer has in its repertoire. These instructions cover a range of tasks including the input and output of information, and the manipulation of information inside the machine, as well as arithmetical processing in the strict sense of the term.

The faster instructions are those which manipulate information in the machine, starting and finishing in the rapid access internal store. Instructions which refer to external devices are necessarily slower, and such instructions are confined to the input and output of information.

Computer users do not need to know exactly how the arithmetic unit works(*nor do most computer professionals[16]!). The mechanical antecedents of the computer used wheels (or beads on string!), but the modern electric computer holds numbers in its arithmetic unit as electrical states, and hence is able to work at the speed of electricity–a million simple additions in a second is*not untypical of[17] the larger computer.

Within the processor functions the "control" function is very closely associated with the arithmetic functions, but nevertheless it is possible to identify its tasks separately.

Control is responsible for extracting the program instructions from the store one by one and putting each in turn into a special part of the processor (the"instruction register") from where all the actions implied in a complex instruction can be carried out; and for*seeing that[18], once the instruction has been fully carried out, the next sequential instruction is extracted from the store and obeyed.

By careful use of certain types of instruction known as"conditional" or "jump"instructions, the programmer can vary this strictly sequential extraction of instructions, i. e. *he can make the different parts of a program be carried out, or ont carried out, as different circumstances require[19].

The control function also includes the task of supervising the actions of the input output and storage devices.*the point here being that[20] these devices work with timings which are dictated by their mechanical construction, and hence they require the attention of the computer at times not foreseeable by the computer program. Physically this input/output control is frequently exercised by a separate unit controlled by the processor but not using its arithmetic and logical capacity.Hence, the processor can continue with-another task while the input or output operation is taking place.

THE STORE

We look first at the computer's internal store,then at the"secondary","supplementary" or "backing" storage devices.

The store accepts pieces of information (numbers or alphabetic information) from the input devices and holds them in readily accessible locations within itself. It makes them available to the arithmetic unit, and accepts and holds in further readily accessible locations within itself, *results[21] produced by the arithmetic unit, *ready[22] for releasing to the output devices. All this might be described as the store's task of holding data, *whether unprocessed, part-processed or fully processed[23].

The store has, however, a second and equally important task; *that[24] of storing the program instructions which control the running of the machine on any one job. (Program is the American spelling: but in the UK it has become the standard way of spelling the computer's program, in order to distinguish it from the sort of programme one buys in the theatre.) A program instruction is not—in essence—different from the type of instruction one might give to a trainee filing clerk. Naturally, the actual repertoire of instructions used by a computer is more precise than the average spoken sentence; and the actions and locations normally spoken in plain English are represented in the computer's program instructions, by code numbers. And hence these instructions can be held accessibly, in the store, as easily as the numeric and alphabetic data.

There has been a historical development in the techniques of holding information in the computer's internal store. In the early 1950s, mercury-filled delay tubes were used. This type of store was superseded by the magnetic core store, which consists of a large number of minute, easily magnetisable, ferrite rings. Each ring represents a 0 or a 1 according to*whether it is magnetised in a clockwise or anti-clockwise direction.[25] It is possible either to read the status of a core'smagnetisation, or to changeit, in time intervals as small as three-quarters of a millionth of a second.

Core stores are still widely used, but faster alternatives have recently begun to be used-semiconductors, bubble stores and plated wire.

The size of any computer's internal store (sometimes called the "immediate access store") varies according to the type of machine and the purpose for which it is to be used. As an example, the London Office Central Computing Facility computer at Harlow has an internal store* made up of[26] some 196,000 "words" of plated wire memory and some 524,000 "words" of semi-conductor memory, where a "word" represents:

either six alphabetical characters,
or a single number (with a value up to about 34 thousand million),
or a single program instruction.

Internal stores, * whatever their method of construction[27], are expensive, and cheaper forms of supplementary storage are required to hold the vast quantities of data required for the typical file.

A common form of backing store is a magnetic drum or disc from which data can be read or on to which data can be recorded through fixed or moving heads. Again sizes vary, but a drum can store up to 12million characters and a disc up to 114 million characters. On many disc units it is possible to remove the discs: this means that a larger library of information can be held for the machine, even though only one disc at a time is mounted on the disc drive, and is thus accessible* to[28] the computer.

An equally common form of backing store is magnetic tape: its most typical uses are for the permanent storage of data files, and for the storage of programs. The reel of magnetic tape is easily removed from the tape deck, and thus a large and inexpensive library may be maintained.

The practical procedures involved in reading and writing a tape make*it desirable always to work forwards[29], and this in turn means that magnetic tape is used for files which are to be processed "sequentially" rather than "randomly".

COMPUTER INPUT

It is technically possible to design a computer which can read data from hand-written documents or can listen to numbers spoken into a microphone; but design complications, and the associated expense, ensure that such devices do not* get[30] beyond the laboratory toy stage. In actual practice, the handwritten or typed data is passed to a punch room where operators punch it into a suitable medium. Until a few years ago, the suitable medium was almost always either eighty column punched cards, or paper tape. More modern data preparation devices, however, now permit the operator to record the data directly on to magnetic tape.

Whatever the medium used, the information punched consists of strings of:

numeric digits (e. g. "5"),
or alphabetic letters (e.g. "B"),
or punctuation marks (e.g. ";"),
or symbols (e.g. "£").

*To save time[31]*when referring to[32] this range