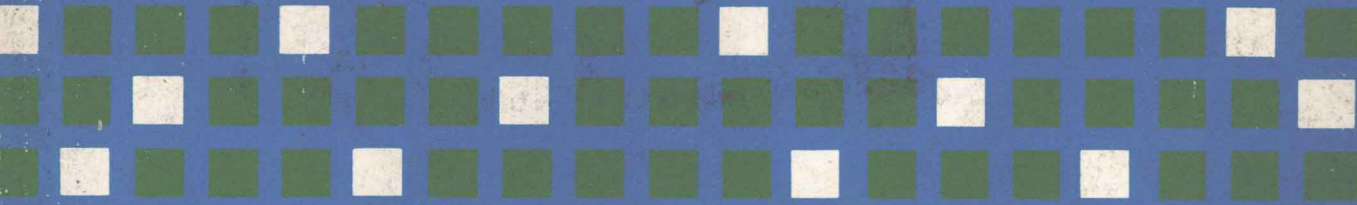


BASIC PROGRAMMING



FOR BUSINESS

V. THOMAS DOCK

BASIC

PROGRAMMING FOR BUSINESS

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BASIC

PROGRAMMING FOR BUSINESS

To Mary, Steven, and Jordanna. . .
my wife and children

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PREFACE FOR STUDENTS

The BASIC language, as implied by its name (Beginner's All-purpose Symbolic Instruction Code), is designed to provide a simple, easily understood means for a student to communicate with a computer via a terminal. The objective of this textbook complements the design of the BASIC language by explaining the language in a manner such that the student can learn it in a relatively short period of time and with little or no supervision. Thus, this textbook is especially appropriate for those *business* courses in which profitable use of the computer can be made via the BASIC language, but the lack of time prevents teaching the language as part of the course and/or the course does not require a formal programming course as a prerequisite.

Chapters 1 and 2 introduce the computer, the BASIC language, time sharing, and the terminal. The BASIC key words essential to writing fundamental programs are discussed in Chapters 3 through 5. The reader can begin programming at this point. Chapter 6 discusses key words which provide the flexibility necessary for advanced BASIC programming. The remaining chapters explain key words providing the ability to take advantage of the full potential of the BASIC language.

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CHAPTER 1

INTRODUCTION TO THE COMPUTER AND BASIC

A discussion of BASIC generally assumes that the reader has a fundamental understanding of the computer and, specifically, the type of computer that he will use to execute his BASIC program. Thus, the following is a brief discussion of the general implications of the term "computer" and the two main types of computers.

DEFINITION OF A COMPUTER

The term "computer," while validly applicable to any machine capable of arithmetical calculation, generally implies a machine possessing the following characteristics:

1. Electronic. Achieves its results through the movement of electronic impulses rather than the physical movement of internal parts.
2. Internal Storage. Has the ability to simultaneously store program statements and data. This ability enables the computer to consecutively execute program statements at a high rate of speed.
3. Stored program. Executes a series of *statements* in its internal storage which instruct it in detail as to

both the specific operations to perform and the order in which to perform them.

4. Program-execution modifications. Can change the course of the execution of program statements (branch) because of a decision based on data in its internal storage and/or the results of one or more arithmetic or logical operations.

In summary, a computer is an electronic machine possessing internal storage capabilities, a stored program of instructions, and the capability for modification of the set of instructions during the execution of the program.

ANALOG AND DIGITAL COMPUTERS

There are two main types of computers: digital and analog. A *digital computer* operates directly on numerical representations of either discrete data or symbols. It takes input and gives output in the form of numbers, letters, and special characters represented by holes in punched cards, spots on magnetic tapes, printing on paper, and so on. This is the type of computer most commonly thought of and referred to when the word *computer* is used either by itself or in context.

Digital computers are generally used for business and scientific data processing. Depending upon the particular characteristics of the digital computer and the precision of the data it is processing, the digital computer is capable of achieving varying degrees of accuracy in both intermediate and final values of data. Digital computers are the most widely used type of computers in business. Thus, unless stated otherwise, the discussion of computers in this textbook concerns digital computers.

The *analog computer*, in contrast to the digital computer, measures continuous electrical or physical magnitudes; it does not operate on digits. If digits are involved at all, they are obtained indirectly. Such physical quantities as pressure, temperature, shaft rotations, and voltage are directly measured as a continuous function. The output of an analog computer is often an adjustment to the control of a machine. For instance, an analog computer may adjust a valve to control the flow of fluid through a pipe, or it may adjust a temperature setting to control the temperature in an oven. For these reasons, analog computers are often used for controlling processes such as oil refining or baking. Digital computers can also be used for controlling processes. To do so, analog data must be converted to digital form, processed, and then the digital results must be converted to analog form. A digital computer possesses greater accuracy than an analog computer, but the analog computer can process data faster than a digital computer.

THE CONVERSION OF A SOURCE PROGRAM INTO AN OBJECT PROGRAM

The BASIC program written by a programmer consists of a set of program statements. This program is called a *source* program. However, the computer is only capable of executing statements constructed in its language—machine language. Thus, as illustrated in Figure 1-1, the BASIC statements composing the source program must be converted (compiled) into machine language prior to their execution by the computer.

The translation process is called *compilation* and is accomplished through what is called a Language Translator Program or, more specifically, a compiler program. This program also produces appropriate diagnostic messages when it detects errors in the source program during compilation. The compiler program is located in the computer's Central Processing Unit (CPU) during the compilation process. The operating system of the computer controls the compiler program's operations.

The compiled program is called an *object* program; this is the same set of program statements composing the source program, except that they are in machine language rather than in BASIC language form. As with the compiler program, the object program also operates under control of the computer's operation system. The object program can be executed immediately or stored for a period of time on an output medium such as a disk, tape, or punched cards.

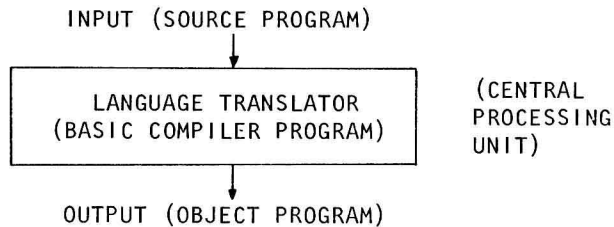


Figure 1-1: The Compilation of a BASIC Program

INTRODUCTION TO BASIC

The acronym BASIC is derived from the term Beginner's All-purpose Symbolic Instruction Code. BASIC is an easy-to-learn language, possessing good mathematical and alphabetic capabilities. The language was originally developed in the middle 1960's at Dartmouth College. BASIC can be used for a variety of educational, engineering, mathematical, statistical, and business applications. Today, the language is widely used by problem solvers working at terminals.

The objective of this textbook is to demonstrate the use of the BASIC language within a *business* environment. Therefore, all of the illustrations depict a business-oriented problem.

CHAPTER 2

TIME SHARING AND THE TERMINAL

If you have never programmed or have only programmed in a *batch-processing* mode, you will find the use of a terminal to be quite different. Batch processing is a technique in which the program and, in most cases, data are entered into the computer together, and the computer executes the program. In most situations, the program and data are collected into groups (batched) to permit convenient and efficient processing. Two differences in using a terminal will be the use of different terminology and a significantly advanced approach to problem solving. The following is a discussion of these differences.

TIME SHARING TERMINOLOGY

A *terminal* is an input and/or output device which is physically located a distance from the computer. The two possible types of terminal devices which can be used for BASIC programming in a time-sharing environment are the typewriter (Figure 2-1) and the cathode ray tube (CRT) (Figure 2-2).

A terminal can be either *online* or *offline* to a computer. If a terminal is offline, it is not possible to communicate (transfer and receive data) with the computer. However, if a terminal is online, it is possible to communicate with the computer.

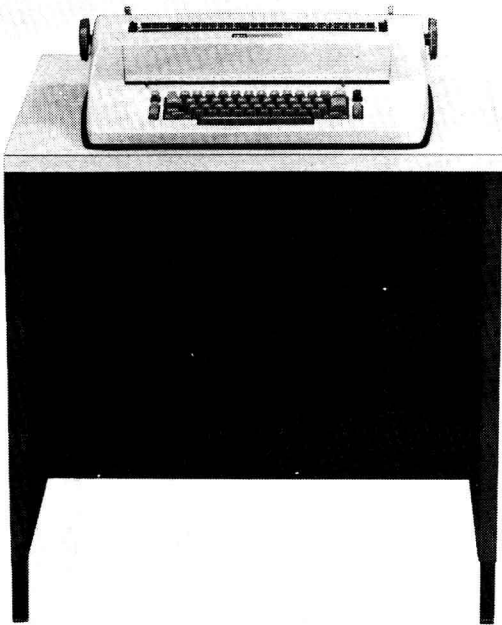


Figure 2-1: The IBM 2741 Typewriter



Figure 2-2: A Cathode Ray Tube

Date can be transmitted to a computer from an online terminal. The computer may either batch process the data or process it in a *realtime* mode (fast-response online computer processing, which obtains data from an activity or a process, performs computations, and returns a response rapidly enough to control, direct, or influence the outcome of the activity or process). In many situations in a business organization, data transmitted from a terminal to a computer is batch processed. The disadvantage of batch processing is that data files are never more current than the time interval between processing runs. However, in a continuously increasing number of problem solving situations, data is being processed in a realtime mode. This results in the elimination of all delays in processing the data and receiving the results. Therefore, when a terminal is in an online, realtime mode, transactions are transmitted to the computer, processed immediately by the computer, and the results are returned to the problem solver from the terminal.

BASIC is an *interactive* processing (conversational) language. Interactive processing differs from batch processing in several ways. First, a program and data can be entered into the computer from the terminal in parts. Second, the computer can request additional information or data during execution of the program. Third, one or more of the program statements can be changed from the terminal during execution of the program. Thus program statements and data can be changed, added, or deleted during processing of the program. Finally, the programmer is in continuous direct communication with the computer.

Time sharing, as the name implies, is a technique that allows several users to simultaneously use terminals that are in an online, realtime mode with the computer. Each user operates the terminal he/she is using independently of any of the other users. Although several users are sharing the computer for problem solving, the speed of the computer allows it to give almost immediate response to each user. Thus, each terminal user is seldom aware that he/she is "sharing" the computer with several other terminal users.

In many instances, terminals are located a considerable distance from the computer—terminals may be scattered across a university campus, across the country, or even around the world. This long-distance processing of data is called teleprocessing, to reflect the fact that data is transferred from the terminal to the computer via some communication medium, such as a telephone line, and after being processed by the computer the results are transferred back to the terminal.

OPERATING SYSTEM COMMANDS

The use of the BASIC language requires two types of statements. One type of statements is referred to as *program* statements. As indicated under the topic "Definition of a Computer" on page 1, program statements instruct the computer in detail as to both the specific operations to perform and the order in which to perform them. This type of statement is the subject of this textbook.

The second type of statements is called *operating system* commands. These commands, in contrast to program statements, instruct the time-sharing system as to what action is to be taken concerning the program itself. The nature and extent of operating system commands vary between computer systems.

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