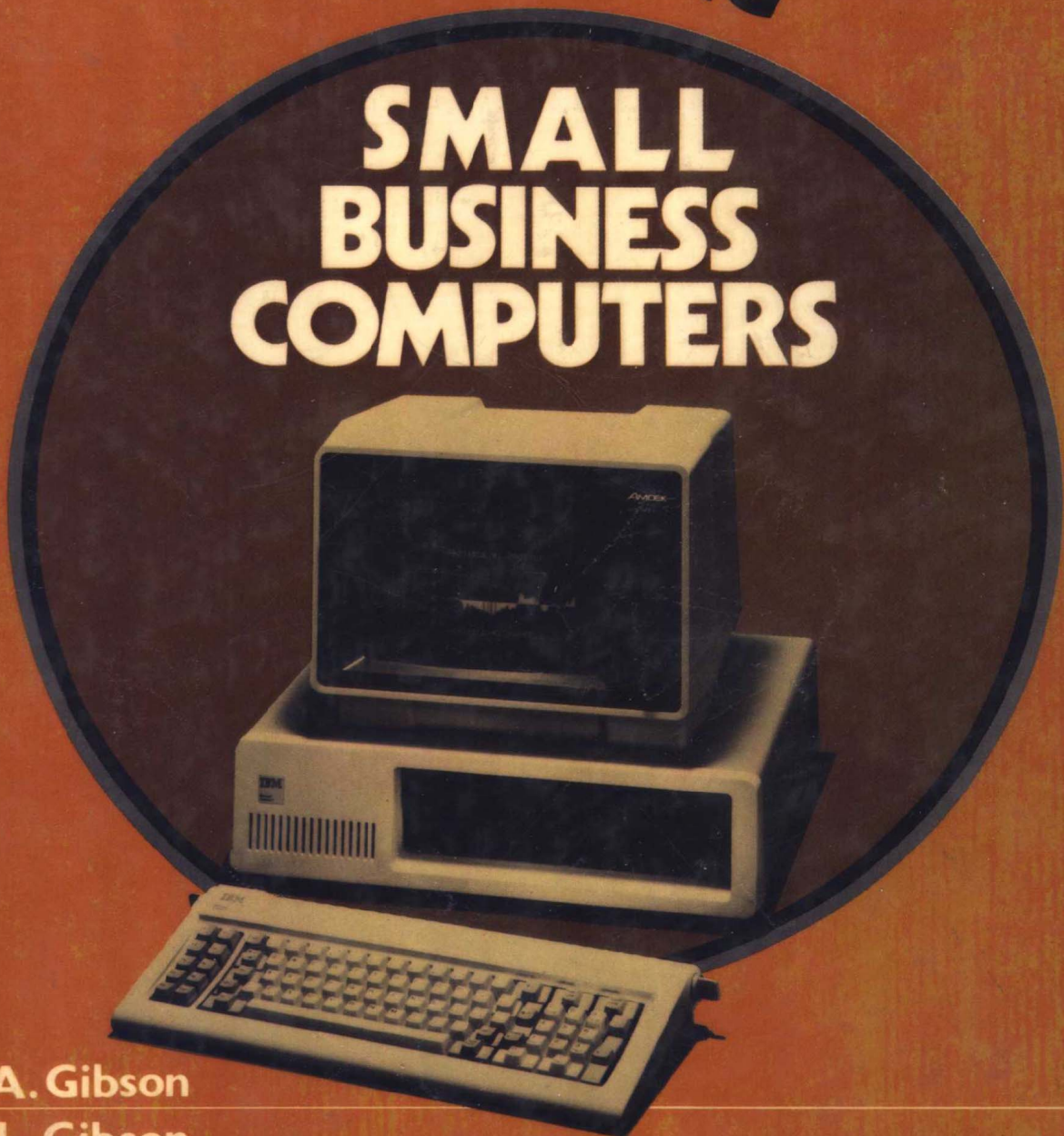
UNDERSTANDING AND SELECTING

SMALL BUSINESS COMPUTERS



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Library of Congress Cataloging-in-Publication Data

Gibson, Glenn A.
Understanding and selecting small business computers.

Bibliography:
Includes index.
1. Small business—Data processing.
2. Microcomputers—Purchasing. I. Gibson, Mary L.
II. Title.
HF5548.2.G523 1986 658'.022'0285416 85-12324
ISBN 0-13-937046-3

Editorial/production supervision and interior design: *Ellen Denning*
Cover design: *Photo Plus Art*
Manufacturing buyer: *Gordon Osbourne*
Cover photograph courtesy of Amdek Corporation and IBM.

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

ISBN 0-13-937046-3 025

PRENTICE-HALL INTERNATIONAL (UK) LIMITED, *London*
PRENTICE-HALL OF AUSTRALIA PTY. LIMITED, *Sydney*
PRENTICE-HALL CANADA INC., *Toronto*
PRENTICE-HALL HISPANOAMERICANA, S. A., *Mexico*
PRENTICE-HALL OF INDIA PRIVATE LIMITED, *New Delhi*
PRENTICE-HALL OF JAPAN, INC., *Tokyo*
PRENTICE-HALL OF SOUTHEAST ASIA PTE. LTD., *Singapore*
EDITORA PRENTICE-HALL DO BRASIL, LTDA., *Rio de Janeiro*
WHITEHALL BOOKS LIMITED, *Wellington, New Zealand*

UNDERSTANDING AND SELECTING SMALL BUSINESS COMPUTERS

PREFACE

It is the purpose of this book to bring a working understanding of computers to those who need to study, use, or select small computers. The book is designed to introduce the student, businessperson, or professional who knows nothing about computers to all of the fundamental computer concepts and terminology. There are review exercises at the end of each section that are intended to reinforce the material in the section so that it will not be so easily forgotten. The answers to these exercises are placed just after the exercises so that they can easily be found. The book could be used as the text for a one-semester course at a community college, data processing school, or university, or for a continuing education course.

The following is a paraphrased excerpt from an advertising brochure published by a major manufacturer of small computers:

> The XYZ operating system is included with all Model ABCs and ABC upgrades. It has the modules required to easily set up and operate a multiuser system. XYZ includes a hard disk initialization routine, a text editor for modifying system parameters, and utilities to transfer files from UVW diskettes.

This paragraph is typical of what a person looking into the computer marketplace encounters. It is the aim of this book to bring the reader to a point that will allow him or her to understand such statements. This does not mean that the reader will comprehend the inner workings of an operating system or multiuser system, but will know how such things relate to specific applications and affect computer users. It is this level of knowledge that is needed by a person who is facing the world of computers for the first time and must make rational decisions about buying and using small computers.

The presentation proceeds by first explaining the overall ideas and then returns to examine the details of the individual items. It is divided into three parts. Part 1 (Chaps. 1 through 5) discusses the uses of small computers and then considers how they work, how they store their instructions and the data on which they operate, and how one can make them perform their tasks (i.e., create and execute programs). Part 2 (Chaps. 6 through 8) discusses how the components are put together to form a complete system and looks more thoroughly into the major components of small computers. These components include the processing portion of the computer, the storage facilities, the equipment for communicating with the computer, and the intangible part of a computer system known as software. By the end of Part 2 all the principal features of small computer systems will have been examined. At this point the foundation will have been laid for serious discussions of the most common applications of small computers. These discussions constitute Part 3 (Chaps. 9 through 13) and incorporate the terminology defined in the earlier chapters, thus allowing the reader to become more familiar with the language sometimes referred to as computereze.

Although the amount of computer jargon created in the last thirty years is overwhelming, the authors have concentrated on keeping this presentation concise, eliminating that terminology which is important only to computer scientists or engineers. By explaining the concepts in ordinary language and carefully defining that jargon which is necessary, the authors have attempted to make the material as readable as possible. The key words and phrases are italicized the first time they appear and it would be wise to pause and examine the context surrounding them. To further help the reader learn computer-oriented terminology, a glossary has been included immediately following Chap. 13.

The authors would like to thank the College of Business at The University of Texas at El Paso for the use of an IBM PC and Lotus 1-2-3 software, the Electrical Engineering Department for its general support, Digital Equipment Corporation for a loan of a DEC Rainbow 100+, and several El Paso computer stores for providing brochures and answering questions. They would also like to thank friends and reviewers for constructive criticism while the book was being prepared.

GLENN A. GIBSON
MARY L. GIBSON

Note to instructors, also by Mary L. Gibson . . .

LABORATORY WORKBOOK: UNDERSTANDING AND SELECTING SMALL BUSINESS COMPUTERS

Designed to supplement this text by providing a combination of tutorial and projects on *DOS*, *BASIC*, WordStar, SuperCalc[3], Lotus *1-2-3*, and dBASE II. A master *diskette* and *Instructor's Guide* are available to support the workbook and text.

CONTENTS

Part 1

Introduction

1

WHAT A SMALL COMPUTER CAN DO

It is the intent of this portion of the book to present all the general material needed to understand the fundamentals of a computer system and how a computer system does its work. It begins by considering the uses and major classifications of small computers, then describes small computer systems and how they operate, and finally, describes how the computer is told what to do.

A computer is nothing more than a machine, and as a machine, can do only what it is instructed to do by its operator. It is, however, one of the fastest, most versatile, and most complicated machines in existence. Unlike most other machines, whose outputs reflect only their current inputs, a computer's actions may depend on past inputs as well. This is because a computer has a memory. An automobile will speed up, slow down, or change directions only according to the current positions of the accelerator, brake, or steering wheel, but when a computer operator gives a command to a computer it may print a business report or perform a scientific calculation, depending on previous instructions and data stored in its memory.

Although the circuitry that allows the computer to make calculations electronically certainly contributes to the computer's speed, without being able to store instructions a computer would be a simple calculator and its speed would be limited to the operator's ability to key in commands. Also, if a computer could not store the data to be operated on, it would have to wait while its user finds and enters each piece of information. Therefore, despite the fact that the computer could make its computations very quickly, the overall time needed to perform a task would depend primarily on the human operator. But a computer is not solely dependent on immediate inputs, and its size and power are closely related to the amount of information it can conveniently access without human intervention.

This book is concerned with small computers that can accommodate only a moderate amount of storage. The purpose of this chapter is to describe small computers, introduce the most basic terminology associated with them, and present a few typical tasks that can be performed by them. In contrast to these examples, a small computer would *not* be capable of handling a large airline reservation system or thousands of student records at a university. On the other hand, it could be used to keep patient records in a doctor's office or to automate the payroll and accounting of a small company.

In addition to their limited size, the computers we will concentrate on here will be of the general-purpose variety. The phrase "general purpose" means that they are for data processing in general, and are not restricted to a specific application such as controlling a printing press or performing some other fixed, repetitive task. Even though we will consider all types of small, general-purpose computers, we will focus on computers that are useful to a person running a small business or to a professional, and give little attention to those computers that are only big enough for entertainment or educational purposes.

1-1 BASIC PARTS OF A COMPUTER

All *computers,* regardless of size, are machines with memories that can rapidly input, process, and output information. The memory is divided into two categories. One category consists of the storage facilities that can be accessed directly and very quickly by the computational part of the computer and is referred to as the *main memory,* or simply, the *memory.* The other consists of a variety of facilities that can store huge quantities of information, but due to mechanical motion or electronic construction, operate much more slowly. These facilities are generally referred to as *mass storage,* and a piece of equipment for supporting mass storage is called a *mass storage unit* or *device.* The most familiar example of a mass storage device is the diskette (or floppy disk) drive. As with many other mass storage devices, its medium (i.e., diskette) is removable. This allows a single drive to store information on an unlimited number of diskettes. Another type of mass storage that is often a part of a small computer is the hard disk, which generally can hold more information than a diskette, but is not removable. A picture of a diskette drive with a diskette being inserted appears in Fig. 1-1. Ordinary cassette tape drives (recorder/players) are sometimes used for mass storage on very small computers, especially those that are used mainly for playing games. Hereafter, this book will use the word "memory" to refer to main memory and the term "mass storage" to denote all other storage components.

In addition to its storage facilities, a computer must include components that will permit it to perform its inputting, processing, and outputting. A small computer characteristically includes relatively slow and uncomplicated input and output devices, although it would certainly be possible to design a small computer with fast and sophisticated input and output equipment. A keyboard, similar to that of a

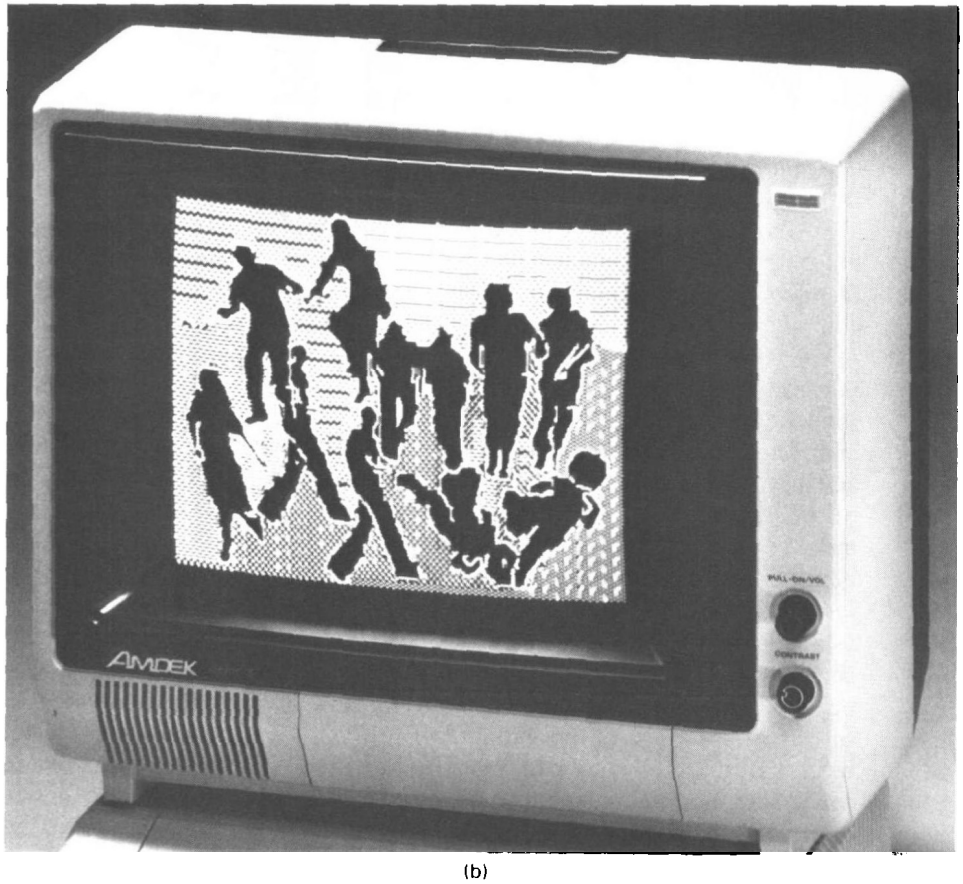
Figure 1-1 Diskette drive with a diskette being inserted in it.

typewriter, is the most prevalent input device, and a printer is the most common output device. Sometimes a keyboard and printer are put together to form what is known as a *printing terminal,* which can provide both input to and output from the computer. More often a keyboard and TV-like—cathode ray tube (CRT)—monitor are used to produce an input/output terminal, with a separate printer being used to output printed material. A keyboard/CRT display combination is called a *video display terminal* (VDT). A photograph of a keyboard by itself is given in Fig. 1-2(a). Photographs showing a monitor by itself, two VDTs, and a printer with no keyboard are given in Fig. 1-2(b) through (d), respectively. A general reference to inputting and/or outputting is normally shortened to the term *input/output* (I/O); for example, a device used for input and/or output may be called an I/O device.

The processing part of a small computer consists of circuitry that is most often put onto a single small surface. Small electronic circuits such as this are called *integrated circuits* (ICs) or *chips.* If the processing part of a computer is on a single chip, it is called a *microprocessor* and the computer is called a *microcomputer.* Most of the computers considered in this book are microcomputers in this sense, except that some of them contain two microprocessors, a feature that enhances their versatility. A picture of the popular Intel 8086 microprocessor is given in Fig. 1-3. A complete microcomputer is shown in Fig. 1-4. In this photograph, the CRT monitor and keyboard are physically separate but are connected electrically. In the middle of the picture is an enclosure that contains the microprocessor, the memory, two diskette drives, a hard disk, and the circuitry needed to connect the keyboard/monitor to the microprocessor. Such an enclosure and its contents are referred to as a *system unit.*

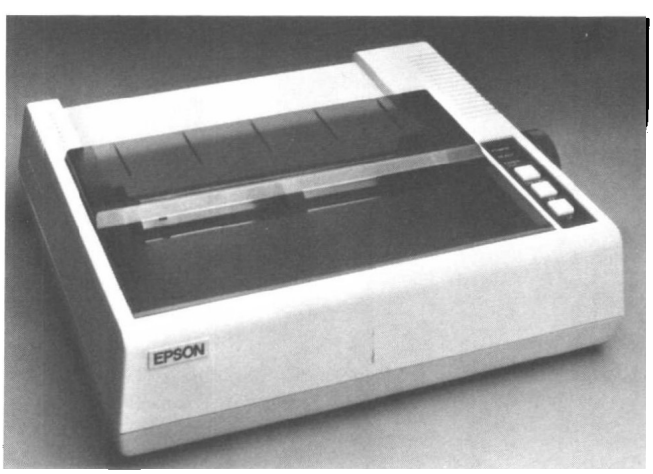
Figure 1-5 illustrates the construction of a small computer. An illustration such as this is known as a *block diagram.* The blocks represent the major components and the lines represent the connections between these components. Diagrams of this nature are used throughout this text to show the basic structures of the systems discussed. The block diagram in Fig. 1-5 is of a computer that consists of a processing element, memory, mass storage unit, printer, and terminal. As on all computers, large or small, the processing element is called the *central processing unit* (CPU).

(a)



(b)

(c)



(d)

Figure 1-2 Typical input/output devices: (a) keyboard; (b) monitor; (c) VDTs; (d) printer. [(b), Courtesy of Amdek Corporation; (c), courtesy of Qume Corporation, a subsidiary of ITT; (d) courtesy of Epson America, Inc.]