Introduction to Personal Computers

Katherine Murray
DEDICATION

To Leslie,

who knows all my words
before they're spoken

-km
Katherine Murray is the president of reVisions Plus, Inc., a writing, editing, and desktop publishing company that deals primarily with the development and production of microcomputer-related materials. Author of Using AppleWorks GS; Using Professional Write; Using PFS: First Choice; Using PFS: First Publisher; the IBM PC, XT, and DOS Workbook; and the IBM PC, XT, and DOS Instructor's Guide, as well as a contributing author to Using HyperCard: From Home to HyperTalk and 1-2-3 QuickStart, Katherine has also published many family-related articles in national general interest publications.
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When the idea behind *Introduction to Personal Computers* was originally conceived (still a light bulb floating somewhere over Que's collective brain), this book was meant to be a nontechnical, friendly introduction to the somewhat intimidating area of personal computing. Because computers are almost everywhere you look—from the gas station to the library to your child's nursery school classroom, the need for a general book that explained computers in basic, no-jargon words was becoming more and more obvious.

Settling down to write such a book was not a small task—simple books can be so deceivingly *unsimple* to write. As we all worked to create a book that provided all the qualities and information we felt were important, we kept coming back to the basic message: *Introduce computers—for new users.* For the secretary who walked into work Monday morning and found an IBM Personal Computer sitting on her desk. For the business owner who wants to automate his bookkeeping system but isn't sure what he needs or why he needs it. For the person who has been considering buying a computer but has been confused by an industry run amuck with jargon and technological buzz words.

All books require the input of many people, but this book—more than most—represents quite a meld of brain power—from the initial outline revisions of Shelley O'Hara and Karen Bluestein to the in-depth scrutiny of Tom Neuburger, the technical editor, to the valuable new-user's perspective of Heidi Weas Muller, to the last-minute, author-life-saving catch of Jerry Ellis (thanks thanks thanks), to the unfailingly good and friendly edit of Jeannine Freudenberger and her terrific editors (Jo Anna Arnott and Jay McNaught), *Introduction to Personal Computers* has grown from its initial outline to the finished book because of the insight and effort of a number of terrific and talented people.

In *Introduction to Personal Computers*, you'll find basic information about several popular personal computers. We didn't try to cover everything—or everyone—and undoubtedly there are some computers and software programs not mentioned in this book that you just *know* are out there. Because of our basic goal—wanting to keep the book simple and usable—we chose several popular computer types and many different types of programs and explained every-
thing from a user's point of view. We've also included references to other materials you can use to further your investigation of hardware and software options. For that reason, because we've had to pick and choose in order to stick to our carefully designed approach, our highest hope is that *Introduction to Personal Computers* meets the goal it has been striving for: To introduce you to the world of personal computing in a nontechnical, educational, and friendly way.
Introduction to Personal Computers caused a ripple effect that was felt in many lives. What an experience this book has been! I want to thank (thank is not a strong enough word, but what is?) the following people who have contributed unmeasurably to the quality of (1) the information in this book, (2) the accuracy of the material, (3) the strength and clarity of the book, (4) my sanity (or lack thereof) during the course of the project, and (5) lessons we've all learned in the process.

My family—Bob, Kelly, Christopher, and the menagerie—for understanding that I tend to be somewhat compulsive about my writing and for not discouraging me when the going got tough.

Doug Sabotin, my partner in crime at reVisions Plus, Inc., for doing most of the research for the back half of this book while still keeping everything running better than ever—and for all the BK Broilers, flying footballs, Monty Python imitations, and drugged cows that make our business as crazy as it is.

Jerry Ellis, for jumping in at the last minute and saving the day with a flawless catch on the 5 Yard Line (it's hard to think of author review in terms of football, but I guess if I wadded up the manuscript...).

Bob Murray, for putting up with six months of technical questions (that I wouldn't allow him to answer "technically")—and for being right most of the time (all of the time about technical stuff).

Lee A. Driggers, for providing me with much of the important purchasing and printing information that wound up in the finished versions of Chapters 5 and 6 and for introducing Richard Bach into our lives.

Jeannine Freudenberger, whose good nature and gentleness baffles me when she has had to deal with an author like me over a period of months... a terrific editor who made this book significantly better by remembering all the little things I forgot and fixing all the things I remembered wrongly. (It's been great working with you.)

Shelley O'Hara, who shepherded me right through the course of this book, not being too sympathetic when I dropped off the schedule (just the right touch) but always being encouraging and remaining
fixed on the overall goal we were reaching for. Her many comments and suggestions have contributed immeasurably to the scope, clarity, and message of this book, and it truly would not be here without her.

Patty Brooks, who helped us tie up the loose ends, always with a smile, no matter how tedious the task or how many other things she had to do.

Thomas Neuburger, the technical editor on this project, whose skillful and conscientious edit made us all look closely at the manuscript, considering our audience and our goal every step of the way. His insight helped us reaffirm our direction and helped us clarify areas that could have been confusing to new users.

Lloyd Short, Publishing Director of Emerging Topics, for all the things he’s done throughout this book’s evolution, for both the author and the author’s work. Sometimes it’s the unseen, intangible efforts that go farther than any others. Thanks, Loid.
Introduction to Personal Computers uses several conventions of which you should be aware. They are listed here for your reference.

Information that you are to type (usually found in examples with numbered steps) is indicated by italic type. For example, "At the prompt, type cd \." Messages and prompts that appear on-screen are represented here in a special typeface (Printer number).

Special tips and questions asked often by new users are highlighted by a box. Icons (symbols) have been used to call your attention to different computer types. For example, the following icons have been used in this book:

- **IBM**
  This icon tells you that information in that area relates to PCs.

- **Apple**
  This icon tells you that the marked information relates to Apple computers.

- **Macintosh**
  This icon highlights information particular important for Macintosh users.
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ACKNOWLEDGMENTS

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Computers are everywhere. The office, the grocery store, the library... almost every place you look, computers are making life easier for someone.

At the office, personal computers automate tasks that often can be dull and repetitive—such as filing, scheduling, and creating form letters. Additionally, personal computers can reduce the error margin by performing your calculations, searching for and finding certain items of information you need, and reminding you of appointments for which you need to prepare.

At home, personal computers are becoming more “personal.” Today, finding families competing for computer time is not unusual. Because personal computers are being used in the schools, kids are not intimidated by the changing technology of the personal computer. Adults, becoming proficient with their computers at work, carry the benefits over into their home lives as well. Once you’re used to composing correspondence on a computer, going back to writing longhand is difficult. Checkbooks seem much easier to balance when the computer does the balancing for you. Planning a budget seems less painful when the budget is on-screen.

Computer programs have been created to fill all sorts of needs. Do you need to create a list of potential clients? Send follow-up form letters to clients you have already contacted? Create a graph showing projected sales? No matter what you want to
accomplish—whether that task involves working with words, numbers, pictures, or sounds—chances are, you will find a computer program to do the trick.

*Introduction to Personal Computers* is a guide for beginners who are considering purchasing a computer, who already have one, or who use computers in their work. If you fit into one of those categories, you will find a wealth of information about the various types of computers and software available.

If you have had no previous computer experience, this book gives you the chance to start learning how you can use the fascinating capabilities of the computer to make your work easier. If you have worked with computers before, and particularly if your first introduction was confusing or frustrating, you will find that the organization of *Introduction to Personal Computers* will lead you through the steps you need in order to feel comfortable with your new workmate.

### Why Do You Need an Introductory Book on Personal Computers?

Especially to new users, computers are intimidating. Even though personal computers are becoming commonplace in offices, homes, and schools, the learning curve for a new user may seem disheartening—if not insurmountable. Who has time to sit down and learn everything there is to know about a computer before producing a letter? And if you haven't purchased a computer yet, how do you know which one to buy? How much training will you get before the boss asks you to produce a printed report? You seem to have a great deal to learn in a short time. Why buy something to improve productivity if you have to become less productive while you learn to use it?

*Introduction to Personal Computers* addresses the most important questions asked by new computer users. For users who have recently inherited a computer at work or at home, the answers to questions like these are important:
What does the computer do?
What programs come with the computer?
What makes the computer work?
What do I do with the computer now?

For users—or rather, potential users—investigating which computer to buy, questions similar to these are important:

- What can a computer do for me?
- What type of computer equipment do I need?
- How do I set up my system?
- What type of software do I need?

*Introduction to Personal Computers* takes you from a basic introduction to the system—inside and out—to a hands-on section that shows you how to set up and perform a few basic operations with your new machine. The three major types of personal computers—PC, Apple, and Macintosh—are explained individually.

**Who Should Use This Book?**

If you are new to computers, you should use this book. Serving as a nonthreatening introduction to the workings and capabilities of the personal computer—without jargon and computer buzz words—*Introduction to Personal Computers* provides basic information in an easy-to-follow format. Specifically, *Introduction to Personal Computers* speaks to the following people:

- Office workers who have recently inherited a computer system
- Business people responsible for any variety of tasks that can be computerized
- New computer consumers who are investigating their options before buying a system
- Home users who want to understand the basic workings of their computers
Students learning about the computers available

Users and hobbyists who want to know more about the optional equipment and software available for their brands of computer

How Is This Book Organized?

Whether you plan to use your computer to accomplish a specific task (such as planning a budget) or to perform a variety of tasks, you will find that *Introduction to Personal Computers* leads you through a basic course from general ("What is a computer?") to specific ("Which type of monitor do I need?").

The book is organized in four parts:

- **Part I: Computer Basics**
- **Part II: Prepurchase Considerations**
- **Part III: A Computer Primer**
- **Part IV: A Software Review**

In Part I, "Computer Basics," you will find everything you need to know (and probably a little more) about the basic workings of the computer-inside and out. What does it do? How does it work? Why types of computers are available? Part I addresses questions most often asked by new users.

Part II, "Prepurchase Considerations," is especially important if you are still exploring options before you buy. The chapters in this part are divided according to hardware category (system, monitor, printer, and so on). Each chapter helps you determine what features are most important for your particular computer needs. Checklists help you analyze the most important aspects of the hardware you are planning to purchase.

Part III, "A Computer Primer," provides a hands-on introduction to assembling and working with your computer. PC, Apple, and Macintosh users all will find information for setting up their systems, starting the computer, performing basic disk and file operations, and shutting down the computer. Also in this section, quick starts offer you "steps only" versions of these basic computer procedures.
The last section of the book, Part IV, "A Software Review," introduces you to the variety of software available. Each major category of software is represented: spreadsheets, word processing, data management, integrated software, desktop publishing, graphics, communication, educational programs, and recreational software. In addition to an explanation of the software types, Part IV introduces you to a few of the most popular software packages available within each category.

If you run into a word or phrase that you don't recognize, look in the Glossary at the back of the book for the definition. Generally, new terms are defined within the text at the point where they are introduced. These terms are printed in italic type. Where appropriate, chapter references are provided, indicating that you can turn to another chapter for more information on that particular topic.

Because this book includes information important for IBM, Apple, and Macintosh users, special symbols have been used to highlight each computer type. These symbols are used to call your attention to both the hands-on procedures (in Part III) and the general information in earlier chapters. Additionally, these symbols are used in Part IV to indicate which software can be used with which computer type. The following list shows the symbols used for the computers:

- **IBM**
  This icon calls your attention to PC-related information and procedures.

- **Apple**
  This icon tells you that the marked information or procedure relates to Apple computers.

- **Macintosh**
  This icon highlights information or procedures particularly important for Macintosh users.
What Is Covered in This Book?

Although this book is organized so that you can proceed from a general description of computers to a more specialized application-oriented approach, feel free to read through the book in whatever order you want. If you are investigating your options before you buy, you may want to begin with Part II. If you have inherited a computer at work, you may not want to read Part II at all. Use the symbols, tip boxes, and checklists to guide you as you go. This section provides a breakdown of the individual chapters in this book.

Part I: Computer Basics

Chapter 1, "What Is a Computer?" helps you find out how much you already know about computers, dispel any computer myths you may have picked up, and understand the history and range of computer differences involved in computerdom today.

Chapter 2, "What Can a Computer Do for You?" shows you the benefits of using a computer for your work, home, or school tasks. This chapter serves as an overview of all types of computer applications: your tasks are bound to be in here, whether they involve writing, working with numbers, publishing, managing information, or playing Space Invaders.

Chapter 3, "The Computer: A Closer Look," introduces you to the various types of computers available. By first discussing the computer as a whole and then explaining the various components (disk drives, printer, monitor, and a variety of optional equipment) this chapter explains how the computer—and its parts—function.

Part II: Prepurchase Considerations

Chapter 4, "Purchasing Considerations," provides a series of questions specific to your computer needs. These questions will
help you determine which type of computer and computer peripherals best suit your needs.

Chapter 5, “Purchasing a Computer System,” builds on Chapter 4 by helping you identify the type of system you want to buy. Features of the three main personal computer types (PC, Apple, and Macintosh) are examined, and basic monitor information is included.

Chapter 6, “Purchasing a Printer,” helps you analyze the type of print quality you need for your applications and introduces you to the various printer types available.

Chapter 7, “Purchasing Computer Add-Ons,” covers important computer components that don’t fit into the stand-alone chapters. Information is included to help you determine which keyboard options you want and whether you need a mouse, modem, scanner, and other optional equipment.

Chapter 8, “Purchasing Software,” explains the major software types. Additionally, this chapter answers software-related questions often asked by new users. (More detailed information about software types is given in Part IV.)

Part III: A Computer Primer

Starting the hands-on section of this book are three quick starts designed to get you going quickly with procedures specific to your particular computer. The quick starts in this section of the book cover the following topics:

- Using Your PC
- Using Your Macintosh
- Using Your Apple IIgs

Chapter 9, “Setting Up Your Computer,” shows you what to do when you first get the computer home (still in boxes). Basic instructions are given so that you can unpack, assemble, and connect your system as easily as possible. Information for all three major personal computer types (PC, Apple, and Macintosh) is included.

Chapter 10: “Getting Familiar with the Operating System,” introduces you to the “language” your computer uses to communicate with you and accept your commands. This language
is the operating system. From a basic explanation of the various
types of operating systems to a discussion of how the operating
system affects the way you work with your computer, this chapter
provides the basics you need for understanding how your system
and operating system work.

Chapter 11, "Using Your Computer," includes everything you need
to know for your first computer session. From start-up procedures
to basic information about preparing your disks to store data,
rising applications software, making backups, and turning off the
computer, this chapter gives you hands-on experience with your
new system. The chapter concludes with a troubleshooting section
to help you (just in case . . . ).

Part IV: A Software Review

Part IV concludes the book by giving you a basic introduction to
the various software types and providing a library of popular
applications software. Each chapter in Part IV is organized in the
same way: at the beginning of the chapter, the type of software is
discussed generally. Then, after the general discussion, several
popular examples of that type of software are explored. The
chapters in Part IV as follows:

Chapter 12  Spreadsheets
Chapter 13  Word Processing
Chapter 14  Data Management
Chapter 15  Integrated Software
Chapter 16  Desktop Publishing
Chapter 17  Graphics
Chapter 18  Communications
Chapter 19  Educational and Recreational Software

Introduction to Personal Computers concludes with a
comprehensive glossary of computer terms for new computer
users.
One More Thing...

The first step toward learning anything new—whether you are learning to drive a stick shift or to speak French—is to relax and realize that you will not learn everything at once. Even if you feel as though you need to learn everything as quickly as possible, accept the fact that you will need to learn and relearn things as you go.

Computers don't need to be intimidating. By using this book, you will become more familiar with what's inside your computer, and you will feel comfortable with the foundation on which the rest of your computer experience will be built.

Now, let's get busy.
Introduction to Personal Computers
Part I provides you with basic information about computers—whether you are considering the purchase of a system or are pondering how to use the system you already have. Specifically, this part of the book includes

What Is a Computer?
What Can a Computer Do for You?
The Computer: A Closer Look
What Is a Computer?

A computer, according to Webster's, is "a programmable electronic device that can store, retrieve, and process data." True enough. This chapter takes that definition a little further by introducing you to the computer from several different perspectives. If this experience is your first with a computer, you may be wondering about a variety of questions:

- What does a computer do?
- How will I use the computer?
- What kinds of tasks can the computer perform?
- How does the computer work?

While the nuts-and-bolts discussion of how a computer works is reserved for Chapter 3, this chapter examines computers from a conceptual, "how can you use it" perspective. This chapter also helps you identify what you already know about computers and introduces you to some basic computer terms you will see used throughout this book and throughout your computer experience.
Introducing . . . Personal Computers

Chances are, you have at least seen a computer at one time or another. Depending on the “brand” of computer you will be using, your computer may look slightly different, but every computer has at least these three components:

- The monitor
- The system unit
- The keyboard

Figure 1.1 shows a typical personal computer. As you can see, the monitor is on top of the system unit. (Although this location isn’t mandatory, many people set up their systems this way.) The keyboard, logically enough, is placed in front of the system unit.

In Chapter 3, you learn about the functions of each of these computer components. For now, you need only to understand the basic functions of the individual parts: the monitor is a vital part of the system, allowing you to see what’s going on as you work with software. The system unit houses the computer’s “brain” (called the microprocessor), a special computer chip that performs all the “thinking” behind the scenes. Additionally, in most systems, the
system unit contains one or more disk drives, which you use to store, retrieve, and save programs and data. Lastly, the keyboard provides you with a means of communicating your commands to the computer. By typing information and using the function keys and arrow keys, you tell the computer and—more specifically—the computer program you are using, what actions you want performed.

Depending on the type of computer you are using, your system may look different from the one shown in figure 1.1. For example, if you are using an Apple IIgs like the one shown in figure 1.2, the disk drives are not housed inside the system unit; rather, they are attached outside the system unit as stand-alone devices.

Yet another type of personal computer is shown in figure 1.3. This computer is the ever-popular Macintosh. As you can see, the early Macintosh was almost one piece: the monitor and system unit were housed in one unit, and the keyboard was connected to the system unit by a cable.
These examples are by no means the only types of computers available. From small to large, simple to complex, beefed up to bare bones, all kinds of systems are available. In addition to these desktop personal computer systems, you have the option of choosing portable or laptop computers. (Chapters 3 and 4 explain more about the various types of computers available.)

Understanding the Basic Computer Types

Usually, when you are learning a new concept, the easiest way is to start at the most basic level. In the preceding section, you learned three basic components that all personal computers have. Now you explore a few of the most obvious differences among the computer types.

Not all computers are created equal. In fact, very few are. In this book, you will find information relating to three different types of
computers. Basically, the three most popular and widely used computers are

- IBM personal computers or IBM compatibles (Note: Throughout this book, IBM personal computers and IBM compatibles are referred to as PCs.)
- Apple computers (such as the Apple II, Apple II+, Apple IIGs, or Apple IIC)
- Macintosh computers (also created by Apple Computer, Inc., but different from the Apple II)

Each computer type has its own dedicated following. As you learn later in this chapter, the Apple II was the first personal computer on the market, and many Apple II enthusiasts have remained strong in their devotion. The first IBMs, thrilling in particular to hobbyists and people with a bent toward programming, also remain first in the hearts of a great number of people. Today, IBMs are widely used as the “standard” business computers. The seeming complexity of the IBM and a perceived lack of professional use of the original Apples led to the development of the Macintosh—a machine that combines ease of use with power for professional applications. Currently, Macintoshes are popular for business, home, and school uses and are particularly helpful for meeting graphics design needs.

The next section takes a brief detour, allowing you to examine any preconceived ideas you bring to your new computing experience. Take a few moments and mull over the true-or-false questions in the next section.

**Testing Your Computer IQ**

Before you start adding to your store of computer knowledge, find out what you already know. The following true-or-false questions will give you some idea of how much you already know about computers (or how far you have to go). If you run across any terms you don’t understand, look at the section “A Computer Glossary,” in this chapter.

1. Any computer can run any program.

   False. Unfortunately, nothing is that simple. As you will learn through the course of this book, matching a computer that
has the capabilities you need with the program you want is an important step in automating your office, home, or school-related tasks. Basically, in order to match hardware and software, you need to make sure that (1) you have the right computer to run the program (for example, you cannot run an Apple IIgs program on an IBM computer); (2) your computer has enough memory to run the software (memory requirements are listed on the side of the software's packaging); and (3) you have any optional equipment that may be necessary to run the program (such as a mouse or a joystick).

Part II of this book deals specifically with issues related to finding and purchasing the type of equipment you need for your specific applications.

2. Once you have purchased your computer, you have everything you need to get started.

False—unless you plan to use your computer as a rather expensive doorstop. A computer is pretty worthless without software, the program (or programs) that makes the computer run. To use your computer, you need a disk operating system that acts as the link between you and your computer—you tell the computer what to do by using the operating system. The type of operating system you use with your computer depends on the type of computer you buy. Operating systems are explained in Chapter 3.

Once you're armed with a disk operating system, you are two-thirds of the way there. You have the hardware and the operating system, but you still cannot perform specific applications—like writing letters, analyzing data, and storing information—without an applications program. An overview of the basic types of applications programs is presented in Chapter 8; and in Part IV of this book, you will find chapters that include software listings of various popular applications programs.

3. All computers are basically the same.

True ... and false. Depending on how you look at it, all computers do basically the same thing: process information. No computer can think for itself; every computer is only as good as the person sitting in front of it.
The capabilities of individual computers vary widely from machine to machine, however. Computers at the low end of the scale may be slow and inexpensive and have a limited amount of software available; more popular but expensive machines may process data with lightning speed and have a seemingly unlimited supply of software.

Later in this chapter, you will review the differences and similarities among computer types.

4. The smaller the computer, the less expensive it is.

Logical, but false. Because fewer materials appear to be used to construct the smaller machines, you may conclude that savings are passed on to the user. Generally, however, the smaller the parts, the more expensive the technology. Creating the smaller machines costs more, especially when you're considering laptop computers (covered in Chapter 4).

5. All monitors work with all system units.

False. As you learn in Chapters 3 and 5, a wide variety of monitors exists for a wide variety of computers. Frequently, you can purchase the monitor as part of the entire computer system. In some cases, however, you may want to select a monitor independently. Different types of monitors display characters and graphics by using different technologies. Although many available monitors can be used on several different personal computer systems, all monitors do not work with all computers.

Once you have found the monitor you want to go with your system, can your software work with the monitor? Chapters 4 and 5 give you the various points to consider when you are shopping for hardware and software items.

6. You don't need a computer unless you use the computer in your work.

False. Once upon a time, this statement was more or less true—back in the days when computers weighed a ton or more and required a major monetary endowment to purchase and support. With the advent of personal computers came "portability"—and the beginning of home computing. Now more than ever, users need to be able to take their computers with them—from home to the office and back again. Today, computers can be used to make a
variety of tasks easier and more entertaining—whether you are at work, home, or school.

7. Computers come already assembled; you just need to plug them in and get started.

Doubtful. Unless you have purchased a computer that comes all in one piece (like a laptop or portable computer), chances are, you will have some assembling to do when you unpack your system. Generally, the system unit comes in one box, and disk drives (unless they are included as part of the system unit); the monitor; the printer; and extra equipment (called peripherals) such as a mouse, joystick, or hand scanner, are packaged separately. Assembling the computer means positioning the components and connecting a few cables.

How did you do? If you missed more than a couple of questions, don’t worry. By the time you finish this book, you will be able to answer these and other computer quiz questions.

Taking a Brief Look Back

The original electronic computers were humongous dinosaurs that required space the size of a small room and the constant attention of a team of engineers. Far from being personal, the large mainframe computers were used primarily in large corporations that required the entry and maintenance of large volumes of data.

In the early 1970s, companies and hobbyists alike were beginning to experiment with assembling a smaller, more personal computer. Early computers were built from electronic bits and pieces only a techie could love—capacitors, chips, and LCDs. Only the electronically gifted could handle the assembly, trouble-shooting, and operation of the first “personal” computers.

In the mid-1970s, the collaborative efforts of Steve Jobs and Steve Wozniak led to the introduction of the first “real” personal computer—the Apple I. This first computer was built as a kind of toy that could perform only a limited number of tasks. The introduction of the Apple I, however, excited hobbyists and enticed budding computerists; everybody wanted one.
The success of the Apple I led, expectedly, to the Apple II. From there, the popularity of the machine exploded, almost overnight. A huge empire—Apple Computer, Inc.—was established. Apple computers became extremely popular in schools, providing a new curriculum in computer literacy. Teaching and reviewing important concepts for reading and math and basic decision-making skills became an important goal in educational software created for the Apple.

During this success period, other companies were developing their own personal computers. IBM got into the game, as did Atari, Radio Shack, and Commodore. IBM was the first on the market with a major personal computer outside of the Apple realm—the IBM Personal Computer, which became known as the PC. The IBM Personal Computer took a major step toward bringing the power and flexibility of personal computers to the average user; however, because the operating system used by the IBM required users to learn a number of commands, new users found the technology somewhat intimidating. At the outset, few programs were developed that made the computer easy for novices to understand and use.

The Macintosh was designed and manufactured by Apple Computer, Inc. Introduced in 1984, the Mac was touted as “the computer for the rest of us.” Designed to let users work with their computers the way they think, the Macintosh introduced a handheld device called a mouse, which allows users to move the cursor on the screen by moving the device on the desktop. Additionally, the Macintosh provides a terrific display, letting users select files, commands, and programs with the simple click of a mouse button.

As the popularity of the IBM Personal Computer grew, other companies rushed to manufacture their own PCs. A long string of machines similar to the IBMs—called compatibles—began trickling into the market. Today, an incredible number of compatibles compete with IBM in the marketplace, drastically outselling the “name brand” computers sold for business, home, and school applications. Compatibles bring to users the same power and capabilities that the computers from larger companies offer, but at a lower cost. Some popular compatibles include COMPAQ, Epson, Dell, Toshiba, and NEC computers.

Because of the way Apple Computer designed the Apple II and the Macintosh, few Apple-compatible computers exist in the market. The design of the machines is copyrighted, thus protecting the
basic engineering of the systems from being copied by competing companies.

Noting Computer Differences

What your computer can do depends on several things: (1) the type of computer you want to buy, (2) the amount of money you are willing to spend, and (3) the type of software you purchase to run on the computer. This section introduces you to some of the variables you should take into account as you are learning about computers. Remember that computers differ greatly in many areas—so before you buy a computer, you need to do your homework and find out which items are most important to you. (Part II of this book helps you with prepurchase considerations.)

If you have already purchased your system, you can use the information in this section to gauge approximately where your computer system fits into the realm of personal computers. Making this evaluation now will help you when you make further decisions about software types and devices you may want to add to your system in the future.

Speed

One major difference among computer types involves the speed at which the system processes information. For a new computer user, speed may not be an issue initially. (If you are used to sorting index cards alphabetically by hand, you will probably appreciate any speed your computer uses to sort the information for you.)

Processing speed is a major consideration for many people—especially people who have been working with computers for a while and are always in quest of a faster, more powerful machine. The speed of the machine is determined basically by the type of microprocessor chip used in the system unit. (You learn more about the microprocessor in Chapter 3.) Today's computers can process information as much as 20 times faster than the original personal computers.
What does this incredible time savings mean to you? The value depends on what you plan to use your computer for. If you are a writer, you will see a noticeable difference in the amount of time the computer takes to move from one end of the file to the other, save files, open files, delete blocks of text, and run spell-checking routines. If you are an accountant, you will see changes in the amount of time the computer takes to process changes in your formulas, sort information, and open and close files.

Basically, the faster the machine, the more expensive it is. Before you buy a computer, ask to see demonstrations of the various speeds and find out whether you can get by with a slower system. If you can, you may be able to save yourself a considerable amount of money.

Memory

Another variable that makes one computer different from another is the amount of memory the computer has. (Memory is the area where your computer stores programs and data while you work on them.) Until the last few years, memory was memory. Now, if you have been reading computer ads, you have seen the terms expanded and extended memory. (These terms are explained in Chapter 5.) The quest for the bigger (more memory) and faster machine continues as users explore more sophisticated applications and expect more speed and power from their computers.

Again, you pay more for a system with more memory than you pay for a system with a small amount of memory. Although you can cut corners on the memory issue, you need to consider carefully how much memory you need in the system now and how much you might need in the future. Think about how much room the programs you want to run will need. The amount of memory your computer has will play an important part in the software you use and your productivity.

Display Quality

Another major difference among personal computers is the type and quality of the display used. The quality of the monitor you buy for your computer is a significant issue if you will be using your computer daily for text-intensive operations or graphics
applications. Staring into a glaring screen with badly formed characters and poor resolution is not conducive to good writing, editing, or designing—or, for that matter, to good vision.

Some computers are offered as a “package” deal: You buy this computer, and you get this monitor. More often, however, you can choose the monitor you want with the system (unless it is physically part of the computer itself), although you may have to pay extra to get a better quality monitor than the one offered with the computer.

For now, you don’t need to understand why there is such a wide range of display quality options. The full discussion of the different monitor types is given in Chapter 5. For now, just knowing that the range exists will help you as you choose your system. Remember that the same rule applies: the newer and more advanced the technology, the higher the price tag. Before you buy the monitor for your system (if you haven’t already), read Chapter 5, “Purchasing a Computer System.”

Printer Quality

Similar to display quality, the quality of the printed output you get will vary depending on the printer you choose. A wide variety of printers are available; they are capable of producing print quality ranging from low-resolution dot-matrix print to high-quality near-typeset text. Few, if any, computer systems are sold with a printer included, so you probably will purchase the printer separately.

Remember that several different types of printers are available; and again, the higher the quality of output you desire, the more expensive the printer will be. For example, if you want a printer only to print an occasional letter, you can get by with an inexpensive dot-matrix printer for around $100. A dot-matrix printer is a low-cost impact printer that places characters on the page by pushing pins against a printer ribbon onto the paper. On the other hand, if you need a sophisticated printer capable of producing output in a variety of fonts that rival typeset text, you need a PostScript laser printer, which retails at around $4,000. A laser printer uses a technology similar to a copy machine’s to place characters on the page. Further, a PostScript laser printer is capable of producing unlimited type styles and sizes. The scope is enormous. Look carefully at your own needs (and your
checkbook) before you buy. The purchasing considerations in Chapter 6 should help you as you prepare for your printer purchase.

**Computer Costs**

As you can see from the preceding sections, cost is a major difference among computer systems. For a basic, low-end system with a system unit, one or two disk drives, a monitor, and a keyboard, you can pay around $1,000. When you begin adding features like a better monitor, a printer, a hard disk, or more memory, the cost of the system increases dramatically. Additionally, the microprocessor used in the machine greatly affects the speed—and cost—of the computer.

Another item that affects cost is not what's inside the system but where you purchase it. Remember that retail outlets get a percentage of every sale they make; you're paying for their overhead. But on the flip side of that coin, from a retail operation, you also get some kind of technical support and service, which you may not get from mail order. Mail order can be the answer in some situations, but you are also taking a big chance when you order a system sight-unseen from a computer magazine. Either side has risks and costs. Chapter 5 talks about examining your computer resources before you buy.

**A Computer Glossary**

This section covers some of the basic computer terms you will see throughout this book and throughout your computer career. These terms are basic and are by no means exhaustive. For other, fuller definitions, you may want to consult the Glossary in the back of this book.

*Application.* A specific use for a computer program. For example, you plan to use your computer to write books; that is, for a word processing application. (In some places, you will see the term *application software* used to describe specific types of programs.)
Cables. The long cords that connect your computer’s monitor to the system unit and the system to the printer and the keyboard. Inside each cable is a collection of wires through which the electronic signals pass.

Disk. A term used to refer to the medium on which you store information. There are two basic kinds of disks. Most hard disks are nonremovable disks housed inside the computer. The hard disk stores a large amount of information. (Removable and external hard disks also are available; for more information, see Chapter 3.) A floppy disk (also called a diskette) stores a limited amount of information and is placed inside a disk drive for data storage or retrieval. Disks are explained thoroughly in Chapter 3.

Disk drive. The device used to read and write information on a disk

Hardware. The actual computer itself and all physical parts of the system and system’s components

Keyboard. The device that looks similar to a typewriter keyboard and allows you to interact with the computer software

Memory. The amount of available space in which your computer stores programs and data while you are working with them

Monitor. The display device of your computer

Mouse. The hand-held device you use to position the cursor on the screen. (Many computer programs do not require the use of a mouse.)

Printer. The device that allows you to print information or graphics

Scanner. A computer add-on that allows you to digitize (that is, turn into electronic form) a printed image or document. You then can store the scanned image or document for use in other projects.

Software. Another name for a computer program

System unit. The element of the computer system that houses the “brain,” or the major data processing parts of the computer
Reviewing a Few Computer Rules

Learning anything new can be frustrating, no matter what the circumstance. If you're like most people, you need to work with something for a while before you feel really comfortable with it. Don't expect working with computers to be any different. Relax. Give yourself time to adjust to the new technology, and try not to be intimidated by it.

Generally, as you begin your excursion through this book and into the world of the computer literate, remember these simple guidelines:

- Relax and allow yourself to master one concept before you move on to the next.
- Realize that you have a great deal to remember initially, and keep resource materials (like this book and the instruction manual for your software) nearby so that you can refer to them if (and when) you get stuck.
- Don't be afraid to ask questions. Every computer user started somewhere, and you might be surprised to hear the computer orientation horror stories of some of your coworkers.
- Take a break every 30 minutes or so to allow your eyes to adjust gradually to the monitor.
- Learn in the way most comfortable for you. If you don't particularly care about how the computer works or what component is named what, you may want to learn only about the program you will be working with. Absorb only what you need in order to accomplish the goals you have set.
Conclusion
In this chapter, you have learned a variety of facts and philosophies about your impending introduction to computers. You have seen how computers can be used, how they came to be used the way they are, and how they differ from each other. In the next chapter, you learn how computers are used for a variety of applications.
What Can a Computer Do for You?

Whether you will be using your computer at work, at home, or at school, you may be surprised to find out how many tasks can be automated—or at least made easier—by your computer. If you enjoy writing letters, working with numbers, drawing pictures, playing music, or scrunching video aliens, you can get an application program for your computer that will let you do those things. If you currently use a pencil and paper, a calculator, a filing cabinet, or any variety of other “manual” tools, your computer will help you accomplish the same (or better) work in a shorter amount of time. Once you master the learning curve (which may not be as steep as you think), you will have a world of programs available to help you accomplish the tasks you want to accomplish.

As you probably realize by now, your computer is simply a machine that performs the actions you specify. To get your computer to do anything, you must purchase a program (also called software or an application) to perform the actual tasks on the computer. For example, if you want to create a list of clients' names and addresses, you must purchase a program that will allow you to do that—you will not be able to create and maintain the client list on the computer without the program.
Reviewing the Benefits of Using a Computer

Obviously, you are aware that computer ownership has some benefits, or you wouldn't be looking through this book. Reviewing the benefits will help establish why computers have become such an integral part of business, home, and school environments. In this section, you learn about the major perks of owning or using a computer.

Saving Time

The most obvious benefit of using a computer is the amount of time you save when you have computerized your work. "What?" you say, "With this kind of learning curve, I'm supposed to save time?"

At the outset, it may look doubtful that you're actually saving anything. Once you and your computer get past the initial getting-to-know-you stage, you will find that your work progresses quickly and your computer proficiency grows by leaps and bounds. Getting over that initial intimidation is more than half the battle.

After you're feeling a little more comfortable with your machine, you will see how the information processor will drastically cut down on repetitive and time-consuming tasks. In short, your computer will save you time—no matter what type of application you are using—for the following reasons:

- All information is saved on disk, where you can retrieve, change, and store it easily. No more re-entering information, typing anything twice, or retyping rough drafts.

- The computer can perform a myriad of calculations for you with (relatively) lightning speed, taking all the calculations off your shoulders and reducing the risk of error.

- You can cut down on the number of steps involved in your project. For example, suppose that you are creating a report. You write the rough draft, revise the draft, give the draft to your assistant to type, get the final copy back,
mark your corrections, and give the corrected copy back to your assistant to retype the final copy. With a computer (and a word processing program), you can type the report, revise the report, and print the final copy, taking the whole task off your assistant's shoulders.

- You can reduce the number of people involved in a project. For example, suppose that you are responsible for maintaining a manufacturing schedule for three departments. Each week, you send around three schedules—one for each manager. Each manager sends his or her schedule back, with the schedules for the department filled out. You then give the entire bundle to someone else to type a finished schedule, which goes through a revision, to the xerox machine, and out to the individual department workers. The entire process involves half a dozen people. With your computer and the right software, you can compile the entire schedule in less than an hour, by first gathering input from the managers (by phone) and entering the information yourself. You can then print the schedule in a format you choose, make copies, and circulate it as usual.

**Saving Money**

Another important benefit computer users enjoy is the money-saving aspect. Again, it may be hard to believe that you have just spent $2,000 on this system and now you're supposedly saving money. If you have analyzed how much money you have spent in the past accomplishing tasks that you will now count on your computer to do, you realize that the cash outlay for your computer has been (or will be) money well spent. For example, consider these possibilities:

- You can limit the number of outside costs you bring into a project. Say you're writing a term paper that will determine your final grade, and you want to make sure that your paper is in the best possible form, with all words spelled correctly and the format just the way the professor wants it. Before you had your computer, you wrote the term paper longhand (an arduous task) and turned the paper over to a "friend" who charged you five bucks an
hour to type it. And then, you found a mountain of typos in the finished work. With a word processing program, you can enter and revise your paper, check the spelling, control the formats, and even print a cover page and add headers and footers. You can produce a terrific-looking paper without laying out any cash (although the content is still your responsibility).

- You can reduce the amount of material you use. For example, suppose that as the head of the graphics art department at a small but progressive advertising agency, you are always concerned with the amount of art supplies your staff goes through. Paper, markers, paints, tape—all kinds of things are used and replaced every day. When you started two artists using computers and a powerful graphics program, you were surprised to see the drastic drop in supplies used. Because the artists are creating on the screen as opposed to the drawing board, less waste is created. Because the images on the screen can be modified over and over rather than being started from scratch time after time, the amount of money saved both in terms of hours and supplies is dramatic.

- You can lighten workloads, reducing the number of people you pay to do a specific task, freeing employees to do other less-repetitive tasks. So, in essence, using a computer either saves you money or increases productivity (which saves you money). For example, suppose that you have decided to computerize the Personnel department of your business. Previously, you had three people working in Personnel: one to maintain data records, one to keep track of the filing system, and one to serve as a troubleshooter. Now that you have computerized the database system and have trained the employees to use the system, you can do away with the “filing” position—reducing the Personnel department to two people. But wait—before you get worried about the computers-replacing-people argument—realize that this change frees you to move the extra employee to a new marketing position that will benefit your company and your employees more in the long run.
Reducing Your Workload

The final benefit addressed here (although you will find benefits peppered throughout this book) is the issue of reducing your workload. When combined with the programs you need, computers make your life easier by eliminating a great deal of work. For example, consider these aspects:

- You enter information only once. No more retyping names and addresses on letters, labels, forms, and envelopes: just enter the information once and have the computer print the repetitive information for you.

- You can reduce the amount of time you spend performing repetitive tasks. For example, suppose that every month you are responsible for changing and printing an inventory report. You have to go to the warehouse, get the most recent sales, shipping, and ordering reports, and compile all three sheets into one up-to-date inventory report. With the right program, you can keep all this information stored in your computer so that when you receive the reports, you can make a few changes in the numbers and print the current report. You just type a few numbers and print a report.

- You can lighten your workload by allowing the computer to do what it does best: compute. If numbers aren't your long suit, you can rely heavily on the computer to perform a myriad of computations for you. All you have to do is choose the program you need to get the results you want, enter the data, and choose the commands to make the program work. Let the computer come up with the answers.

- You can also significantly reduce your margin for error. Spreadsheets perform calculations for you, keeping track of equations, functions, and formulas; word processors can check your spelling and even edit your grammar. And because you enter the data only one time, once it's in there right, it's in there... you don't have to risk a misspelling or transposed numbers; the computer has stored the data for you. For example, suppose that you use a spreadsheet to calculate payroll at the end of every pay period. Rather than recalculating tax amounts and net pay for each employee, you can simply enter the number of
Part I: Computer Basics

hours worked and let the spreadsheet do all the calculations for you.

This section has provided you with just a few of the major benefits you will discover as you begin working with your computer. In the next section, you learn about some of the specific applications for which computers are used.

Exploring Computer Uses

This section gives you an overview of the various ways in which computers are used, whether you use your computer at home, in business, or at school. The examples used here are not—with one or two exceptions—brand-specific; that is, a specific brand of computer is not recommended over another for a particular application. This statement is true also of software; although certain types of software are explained, one particular software package is not meant to be shown as the "end all" for that particular use. Wherever possible, pictures of the screens have been provided to help illustrate the type of program being discussed.

Writing Letters

Writing is a common part of everyday life. Whether you write using crayons, a typewriter, a ball-point pen, or a word processor, writing is going to take some time and effort. With a computer and a word processing program, writing takes less effort than it takes using any other method.

A *word processing program* is, as you might expect, a program that processes words, allowing you to type, edit, format, correct, and print documents. Word processing has many advantages over more "traditional" methods of writing:

- Reusable text
- Easy corrections
- Simplified formatting
- Use of different type styles
- Spelling checker
When you write a letter on a typewriter, you compose the words in your head and type the letter on the page. There they are, placed on the paper for posterity. But what happens if you want to send a similar letter to your friend in New Jersey, and you want to use two paragraphs out of the letter you just typed? Answer: You have to type the two paragraphs again.

If you are composing the letter by using a word processing program, you can make a copy of the paragraphs you want to use and insert them into the New Jersey letter at the appropriate point.

Because the words you type are saved in a file, you can use the text over and over. If you create form letters for your business, you can type a letter once and print the letter any number of times. Additionally, you can use the text with a program that keeps track of names and addresses and have the computer insert the names and addresses at the top of each letter—a process known as mail merging.

Another major benefit of word processing is the ease with which you can edit what you type. Few people type everything correctly all the time. Word processing takes some of the sting out of making mistakes—no more globs of correction fluid on your business correspondence, no more red-penned corrections showing rerouting of text or glaring punctuation errors. With word processing, you enter the text, read it over, make any necessary corrections, and print the letter. With most word processing programs, the letter you see on the screen closely resembles the printed letter (see fig. 2.1). If you find something else that needs correcting, you simply open the file, make the correction, and print the letter again.

The formatting aspect of letter writing can be tricky when you’re using a typewriter. How many tabs over was that indented list? Three...oops, no, four. Now the page is messed up. Rip the page out and start over. With word processing, you can have the program control many formatting features. By setting margins and indents and specifying where (and whether) you want headers and footers, you can produce a professional-looking document without the headaches and hit-or-miss mentality that using a typewriter mandates.

Many word processing programs also allow you to choose different type styles—for instance, boldface or italic—for your text. To some people, this option is imperative. Of course, some typewriters also
Fig. 2.1. A letter composed with a word processing program.

offer this option. You can change a type ball to get a different look and feel in your correspondence. Word processing, however, drastically reduces the time and effort involved in selecting and modifying type styles. The capability to change type styles depends in a large part on the capabilities of your computer's printer. As word processors (and printers) evolve, more styles are available, with a wider selection and better quality. Figure 2.2 shows a report produced with a word processing program. Notice that the headings are printed in a type style different from the body text.

Word processing programs have always been competitive and continue to get more competitive. Each year brings "new and improved" word processing programs that offer increasingly more powerful and flexible features. Some word processing programs allow you to lay out the text in a variety of column formats; some allow the importing of art directly into the file; most offer additional features like a spelling checker and an electronic thesaurus.

If you are a graduate of the "phonetic" school of spelling, your writing will benefit from the expert "eyes" of a spelling checker. A spelling checker goes through your word processing file, checking each word against its own internal dictionary. When the spelling checker does not recognize a word or it has been misspelled, the spelling checker alerts you and offers alternative spellings. A
1989 has been a record breaking year for BrightStar Toys, Inc. This report will detail the overall changes that have occurred in our company in the last 12 months; namely, the changes in staff, in housing, and in operations. Perhaps it would be quicker to list the areas that haven't changed!

Beginning on page two of this report, you will see material written by each of the departmental managers, summarizing the activities that have taken place in their departments during the last calendar year. The last three pages of the report are dedicated to future plans for 1990. Inserted inside the back cover of the report, you will find an Employee Response Card. Carrying on our tradition of the last 15 years, we ask you to fill out this card, listing your best and worst moments of the last year, and making any suggestions you might have for improvements in BrightStar's future. Thanks very much for your support during the last year.

New Hires/ New Promotions

As you know, BrightStar has added some very important people to our staff in the last year. In this section, you will be introduced to each of these people and find out a little more about their roles at BrightStar.

In Operations, Mary Lou Beasley was hired as a balance and distribution clerk. Coming from a ten-year employment with AT&T, Mary Lou brings BrightStar a solid understanding of employee needs and will assist Mark Homeston with payroll on a regular basis.

In Marketing, Roger Reynolds joins us from the prestigious Ridge, Watson, and Wheeler advertising firm in Boston, MA. Roger will be our Junior Marketing Manager and will be responsible for the Dinobots line, the CurGo line, and the Powerpuff Dolls.

Lindy Walker has also joined the Marketing department in order to use her copywriting skills to help us create some innovative new campaigns for this season's hottest toys. Welcome aboard, Lindy!

Janice Hopkins, Associate Production Director, has come to BrightStar from a fast-paced computer assembly company. She brings with her a fundamental understanding of both electronics and computer hardware and will greatly benefit the production lines of all our toys.

The Publications staff would like to announce the promotion of Summer Davidson to Desktop Publishing Director. In her new role, Summer will instruct and direct her staff to produce all materials previously typeset on our new desktop publishing systems. (Next year, you can expect to see the Annual Report done on desktop, as well!)

Other promotions/hires include the following:

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**Figure 2.2.** Using different type styles in a word processed report.

Thesaurus also works from an internal dictionary, but it offers synonyms for words you specify.
Maintaining Financial Records

Finances are an inescapable part of life, no matter where you look. At school, you have expenses to worry about; in business, you have a mountain of financial numbers to work through; and at home, you have the household budget and a variety of “what if we buy this” topics to consider.

A spreadsheet program takes the place of your trusty, well-worn calculator or adding machine. A spreadsheet program organizes data in columns and rows, like an accountant’s pad. Spreadsheet programs can be used for automating calculations, reducing the error margin, and playing around with a variety of financial situations.

Suppose that you are balancing your checkbook. You’re sitting at your desk, with your checkbook, bank statements, canceled checks, pencil, and calculator in their respective places. You look over the statement, make sure that all the checks have cleared, and total the balance.

If you use a spreadsheet program to balance your checkbook (checkbook-balancing programs are written specifically to perform this task), you simply enter the check amounts and have the program figure the current balance, the average balance, and other data analyses with the push of a few buttons. Figure 2.3 shows an example of a worksheet created with a popular spreadsheet program.

Spreadsheet programs can be as complicated or as simple as you like. A wide range of features are available in spreadsheet programs, including the following:

- Reusable data. Again, similar to the major benefit of word processing, reusable data is an important perk for spreadsheet users. Why write the same balance sheet month after month? With a spreadsheet program, you can create a balance sheet—once—and use the sheet month after month by simply plugging in new data. Let the program perform the calculations for you. You can also copy sections of spreadsheet files, copy and move data, and perform a variety of other operations on the data you enter only once.

- Automatic recalculation. The spreadsheet program recalculates the equations each time you make a change.
Chapter 2: What Can a Computer Do for You?

With a conventional accountant's pad and pencil, you have to calculate the new totals manually in order to show how the values change when you modify a number or equation.

What if. The flexibility of the spreadsheet allows you to play with numbers and work out several possible scenarios. For example, suppose that you are trying to decide whether you can afford a new car. You can plug the payment amount, interest rate, and down payment into your monthly budget spreadsheet and determine whether you can afford another monthly commitment. With a few simple keystrokes, you can try different interest rates and see how the change affects your monthly cash flow.

Automatic data entering. The program can enter numbers for you automatically by copying existing values or by increasing or decreasing the increment by a specified value. With the manual accounting method, you need to write repetitive or incremental values over and over by hand.

Easy formatting. You can control the way numbers are displayed (for example, in dollar format, with a certain number of decimal places, or with negative numbers in parentheses) by selecting a few simple commands. If you
are working with pad and pencil, you write all the numbers—in the correct format—longhand.

Some spreadsheet programs include a feature that allows you to create a graph of the information in the worksheet (see fig. 2.4). These graphs can be a great asset when you need to show your financial status in a "quick look" format.

Organizing Information

Everyone needs some method of organizing data. Whether you are keeping track of Little League batting records for the New Ulm Patriots or you need to enter and maintain an elaborate system of information for a company with 1,200 employees, you will always need some way to organize the information you gather.

Traditionally, for small organizing jobs (like the batting records), a set of 3-by-5 index cards does the trick. You write the player's name at the top of the card and then, at each game, write the date of the game and the batting statistics. In another column on the card, you can keep a running total of the batting average from week to week (see fig. 2.5). A pen, some cards, and something to put the cards in, and you are set.

Fig. 2.4. A graph produced from a spreadsheet.
For larger tasks (like keeping personnel records for 1,200 employees), a different set of tools is in order. You need filing cabinets, file folders, and a dedication to keeping the data system organized correctly with each paper in its place. Most important, you had better have an unfaltering love of filing, because with records for 1,200 employees, you will be on a constant track back and forth between file cabinets.

Computers have drastically reduced the work involved in setting up and maintaining any type of data system—small or large. By using database programs (programs that allow you to enter, organize, and update information), computer users can enter the data they want to store and have the computer perform a variety of operations with the data.

As with any type of program, the features available with database programs vary greatly. You can purchase a simple program that does nothing more than accept names, addresses, and phone numbers—allowing you to create client mailing lists, telephone lists, and keep track of changes in your client base (see fig. 2.6). Many—if not most—database programs, however, allow you to sort the information in a variety of ways, search for specific data, use calculations in the database, and even program the database. If all this information sounds a little complicated, don’t worry—for now you should just understand that the basic function of a database is to store and organize data in a manner easy for you to access.
Some of the benefits available with database programs include the following:

- **Reusable data.** The benefit of reusable data cannot be underrated, no matter what type of application you use. Because you enter the information only once, there is no retyping of names and address, no manual typing of W2 forms, no typing of mailing labels, no entering each employee’s name and address at the top of each form letter. A database program allows you to insert that data at the appropriate point, freeing you from retyping the same information over and over.

- **Finding information easily.** The computerized database makes searching for and finding a specific item easy. Suppose, for example, that you need to change the withholding status of employee Jill Redmond. With a manual system, you go to the filing cabinet, look under R, and keep your fingers crossed that the file is under R and not J. With a computerized database system, you simply type Redmond in one place and have the computer find the information for you. Taking this example one step further, you can also have the database program find more
than one record that meets the criteria you specify. For example, suppose that county taxes in Hamilton County have been increased and you need to search for all the personnel records of employees living in that county and show the increase on their payroll records. With a manual system, this update would be quite a job. With a computerized database system, you can easily have the program search for, find, and display the records of all employees living in that county (see fig. 2.7).

Sorting capabilities. Similar to the capability to search for and display information is the sorting capability of a database program. With a database program, you can sort items in a variety of ways: in alphabetical order (ascending or descending order), in numeric order (ascending or descending), by ZIP Code, by product, by county, and so on. The ways in which you may want to sort your data are dictated by the type of data you are organizing, but the sorting capabilities of a database program are fundamental to the effectiveness of the system you set up.

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Fig. 2.7. Information displayed by county in a different database program.
Reporting capabilities. All database programs give you some way of getting the data out of the computer. What good is a method of storing data if you cannot print the data when you need it? The capability to print the data you store, called here reporting capabilities, is an integral part of working with the data you collect. Want to print mailing labels? Have the database program do the printing for you. Need to insert employee names and address at the top of each form letter? The reporting—or printing—feature of the program can print them. Want to see a report including all employees in Hamilton County, the amount of county tax they paid previously, and the amount they will pay now? With just a few simple keystrokes, you can have the program print this type of report. Printing a report like this takes you literally hours to assemble and type using conventional filing and reporting methods.

Some really sophisticated database programs also include a programming aspect that allows users to "program" the way data is entered, accepted, and accessed. These programmable databases are more complicated than need be discussed here. For now, just remember that you can find a database program—or for that matter, any program—that does what you want it to do, whether your needs are simple or complex.

Publishing Materials

Another major arena of computer activity involves the publishing world. Unforeseen on the horizon a decade ago, desktop publishing has become a new force in publishing materials. The phrase desktop publishing refers to the capability to create—from start to finish, right from your desktop—a piece that looks professionally typeset. The personal computer, along with desktop publishing software, makes that capability possible.

Think about conventional publishing methods. Like anything else, the way you publish material can range from ultra simple to extremely complex. Perhaps you create a simple church newsletter. Maybe you write the news items out by hand, type the stories on master sheets for the mimeograph machine, trace over some art (or draw your own), and run the master sheet through
the machine. That method is pretty outdated by now, but it is still used (see fig. 2.8).

Fig. 2.8. A sample document produced by hand.

If you are involved in a more professional publishing process, you use different methods. Perhaps you are responsible for publishing the quarterly reports for a major corporation. Your job involves gathering the copy, roughing out the art, hiring an artist to create the art (or supervising the artwork in-house), sending the text to a
typesetter, checking the work from the typesetter, and every step of the way making sure that reports are assembled properly and prepared as quickly as possible. Generally, you have to count on the hard work of a number of people; you are also at their mercy concerning work flow and deadlines.

Desktop publishing can take the place of as many steps in this process as you need. You can control as much of the process as you want to—from writing, to designing, to printing. All desktop publishing programs allow the importing of art created in graphics programs (computerized drawing programs), and some desktop publishing programs even include a library of ready-made art (called clip art) that you can use in your own publications. (Figure 2.9 shows one of the clip art files available with an inexpensive but powerful desktop publishing program called PFS:First Publisher.)

![Fig. 2.9. A sample of the clip art packaged with PFS: First Publisher.](image-url)
With the right types of hardware and software, you can produce publications that rival those created with highly sophisticated publishing methods—at a fraction of the time and cost. You simply display a predesigned template and begin your work (see fig. 2.10).

Fig. 2.10. A sample screen of a popular desktop publishing program.

Again, the old reminder: The range of desktop publishing programs is great—from very simple to very complicated. Basically, desktop publishing brings to the desktop these undeniable benefits:

- Keeping control of the project. Each time you add another person to a project, each time you add another step (like sending out to a typesetter, a proofreader, and an indexer), you expand the length of your project. Desktop publishing lets you reduce the number of steps in publishing your materials. In fact, depending on how involved you get, you can use desktop publishing to do everything in basically one step. You can publish a brochure—from conception to printing—in one day or less if you do everything yourself. If you rely on outside help to publish your brochure and follow more-or-less conventional publishing methods, you can extend your project from one day to several weeks.

- Designing and implementing your own format. With desktop publishing, you can have full artistic control. Do you want 14 columns on a page? The text might be a bit
difficult to read, but if you're the boss—and the controller of your own publication—you can produce just about any type of printed material in any format you want. This capacity provides a wonderful freedom, particularly if in the past you left your design in the hands of people who have less creative vision than you do. With the capability to design and create your own format, you make your publication yours.

Lowering publishing costs. Although the initial cash outlay for a good desktop publishing system isn't small, the savings compared to conventional methods are astronomical. Depending on the type of computer and program you need, your costs will vary. If you are publishing simple newsletters, you can purchase a terrific, easy-to-use desktop publishing program for around $100. If your publishing needs are more sophisticated and you are responsible for publishing a professional-quality document as part of your work or business, you may need a higher-end program and a computer system that can give you the power and speed you need. Even with the fastest, most powerful system and the most expensive desktop publishing software, the savings over conventional methods are significant.

Making revisions easily. Because the files you create and publish are stored on disk, you can easily make changes in content, layout, style, and placement of the items on the page.

Don't like where the header is positioned on the page? With conventional methods, you have to tell the typesetter or the paste-up person where to put the header. Depending on whether the paste-up person is in- or out-of-house, this method can require sending page proofs back and forth or at the very least a phone call. With desktop publishing, you just open the file and move the header.

Achieving faster turnaround rate on published materials. Again, there is a well-known reality in publishing: Just because the project is your priority doesn't mean that the project is going to be their priority. "We will get to your project as soon as we can," is a pretty standard—and not unfair—answer. But what happens when you stay up until 3:00 a.m. trying to complete a project on time and then
the project sits at the typesetter for two weeks? If you use
desktop publishing to complete the project yourself, you
may be able to finish everything . . . before sunup.

- Reusing data. Reusable data is an issue in desktop
publishing as well. Because the publication is stored on
disk, you can access and use bits and pieces of the
publication at any time. Suppose, for example, that you are
preparing four different reports for area hospitals: one
section in the middle of the report is unique to each
hospital, but another section, at the beginning of the
report, is the same for all reports. You can use the section
you created in each of the other reports without retyping
or laying out the section again. You don’t need to do
anything more than copy the section from one file to
another.

Creating Presentation Materials

An effective presentation is a persuasive tool. Armed with self-
confidence, an enthusiasm for your topic, and great visual aids, you
can sway a group of your most dedicated detractors. (Like the guy
who sold the Edsel idea to the car industry. He must have put on
one heck of a good show.)

Presentation materials offer yet another outlet for computer talent.
Instead of using press-on letters and art on acetate sheets, you can
now create, display, and print a variety of presentation materials
that look inviting and professional, and convey your message in the
clearest way possible. Figure 2.11 shows a transparency created
using a popular presentation manager program.

Programs are now available to help you evaluate and create
presentations that hit the mark. Working on a financial analysis that
will make or break your position with the Board of Directors?
With the right program, you can use your computer to produce
impressive materials that communicate your point clearly.
Drafting and Graphic Arts

That personal computers have found yet another home in drafting, engineering, and graphic arts is no surprise. Each of these areas requires the capability to put visions onto paper (or onto the screen).

Plans typically created with conventional drafting methods require hours of hard work, revisions, and more hard work. No matter what item is being illustrated, the item must shown from a variety of angles with the highest possible accuracy. With the advent of personal computers and CAD (computer-aided design), the person responsible for the design can use the screen as a drafting board and a digitizing tablet, stylus, mouse, keyboard, scanner, and plotter in place of conventional drafting tools. And instead of redrawing the item from a variety of perspectives, the designer can have the CAD program rotate the item created on the screen, drastically lessening the creation time and reducing the margin for error. Figure 2.12 shows the screen of a popular CAD program.

With graphics programs, the artist uses the screen as a canvas and selects from a number of tools, colors, and pattern palettes to control the way items are drawn on the screen. Like everything else, graphics programs can be as simple or as complex as you
need. From a simple paint program that splashes color on the screen with a few rudimentary tools to a highly sophisticated graphics program that mixes graphics tools and CAD capabilities to give the artist supreme control of the computer creation, graphics programs are available with an incredible scope of features.

Figure 2.13 shows the screen of a simple paint program, and figure 2.14 shows the screen of a more sophisticated graphics program.

### Accessing Information Services

What your computer can do does not rely wholly on what's inside the system. With the right equipment and communications software, you can connect your computer to another computer across the office, the town, or the world.

*Information services*, such as CompuServe, are electronic databases run by huge mainframe computers. These databases store a wealth of information about a variety of topics. You connect your computer to the information service through the use of your
telephone line and a special device called a *modem*. (A full explanation of modems is included in Chapter 3.)

By using the modem and communications software, you can hook up to an information service and get information on an incredible range of issues, including

- World news
- Games and entertainment
Chapter 2: What Can a Computer Do for You?

- Business management issues
- Computer and technology forums
- Stock information
- Educational and reference exchanges
- Shopping networks
- Home and family information forums
- Financial, banking, and brokerage services
- Reservation scheduling
- Vacation planning
- Health information services
- Aviation forums
- Weather information

A variety of information services is available. Some services are powerful with a seemingly unlimited storehouse of knowledge; others are smaller services that relate, for example, to a specific group of computer users or answer questions about an individual software product.

For large information services, you usually pay an initial start-up fee and then pay by the hour for the time you are connected with the service. For smaller services, a donation or a small initial charge for hookup may be requested. Chapter 18 explains more about information services and communications and provides a table of the various communications services currently available.

You can also use your computer, the modem, and the software to connect to another computer in the same office or across town. Suppose, for example, that you want to send a file you have been working on, to your company's warehouse manager, who is over on the other side of town. You can use your equipment and software to send the file to his computer (and he can return files in the same fashion).

Writing Music

Your keyboard may not look much like a musical keyboard, but looks can be deceiving. If you have the right hardware and software, you can actually write and play music, using your computer system.
Inside every computer is a speaker. The speaker is what makes the sound when you press the wrong key at the wrong time and the computer "beeps" at you. In most computers, the capability to produce sound is limited at best. A beep or a squawk—and that's it for their musical talent. Two computers currently on the market—the Amiga and the Apple IIGs—have sound capabilities that are much better than those in the average PC. For that reason, these computers are often used in music writing and production.

A special kind of connection, called a MIDI interface (short for Musical Instrument Digital Interface), is used to connect an electronic musical instrument to the computer. With the proper software, the sounds are turned into electric pulses and stored in the computer as a file. You then can edit, rearrange, and make a variety of changes to the music. Much of the music you hear on the radio and on television has been generated or edited electronically; the MIDI interface allows you to perform those operations in your own office or home with your own equipment.

Granted, music generation may be a specialized area of computer use. But consider how your presentations could be enhanced by a specially written melody. If you are at all musically inclined, working with computerized music is another fascinating facet of computer potential.

Teaching with Computers

From their earliest days, personal computers have been at home in schools. One reason that the Apple II, an ancestor of today's Apple Ile, Iic, and IIGs computers, was propelled to fame was an overwhelming enthusiasm by educators for this easy-to-use computer.

All personal computers have some type of educational software available. Educational programs have been written for all ages, all skill levels, on almost every subject imaginable. Color graphics and cartoon characters make watching the screen enjoyable; music and voice-generating routines keep interest piqued. Most educational software is designed so that the software doesn't feel like “school” at all. Kids are learning that working at the computer is “fun stuff.”

Figure 2.15 shows an example of educational software designed to teach basic problem-solving skills. Color, sound, and humor are all
used to make the child's time with the program enjoyable and productive. Many educational programs use well-known characters (such as the one shown here, which uses Ernie and Big Bird from "Sesame Street") to help teach concepts.

Educational software is available for adults, too. Want to learn typing? (A useful tool if you plan to be using the computer a great deal.) Plan on traveling to France? There's a program to help you learn basic French conversation techniques. Chances are, if you want to learn something, you can find a computer program to help you learn it.

Playing Games

Although computers are showing up everywhere—from the grocery to the bank to the gas station—they aren't always the serious, business-oriented machines they appear to be. Sure, you paid hundreds (or perhaps thousands) of dollars for the computer, and you should be productive with it. But don't forget that the computer also has a great capacity for fun—whether fun to you means playing electronic poker, shooting aliens, flying a fighter jet, or racking your brain over a tight-fisted game of computerized chess.
Computer games have been around as long as the personal computer itself. A great source of skill-sharpening, mind-stretching, and just plain diversionary tactics, computer games can give you a break just when you need it. Figure 2.16 shows a popular game called Majhongg, based on the ancient game of Chinese tiles. (Some games are even available with a special "cloaking" device: Suppose that you are playing your favorite chess game and your boss walks into your office. If you have one of these programs, you don’t need to panic. Just press a certain key and a fake spreadsheet is displayed on-screen instead of the chessboard. If your boss looks over your shoulder, he will think you’re working hard.)

![Majhongg Screen](image)

**Fig. 2.16.** A screen from Majhongg.

---

**Conclusion**

In this chapter, you have learned what your computer can do for you. From a general discussion of overall benefits of computer use, this chapter progressed into an exploration of various ways computers are used. In the next chapter, you will learn about your computer from the nuts-and-bolts angle—exploring what makes your computer work.
This chapter is your guide to the nuts and bolts of personal computers. What makes the computer work? What are the individual pieces called, and—more important—what do they do? How do you get the computer to make the programs work? This chapter takes you through a system tour, introducing you to the basic parts of a personal computer system. Then, after you have become familiar with the parts, you learn about the whole—three popular computer systems: the Apple, IBM, and Macintosh personal computers.

In the first part of this chapter, you learn about the following pieces of your computer system:

- System unit
- Keyboard
- Disk drives
- Monitor
- Printer
- Modem
Depending on the type of system you are using (or planning to use), you may not have all these pieces. With many—if not most—systems, for instance, the disk drives are part of the system unit.

The second half of this chapter highlights the most popular personal computer systems available from Apple and IBM, including the Apple II, IBM PC, and Macintosh families. From this section, you will be able to identify the important computer elements in your own system.

Understanding Your System's Components

Every personal computer is the sum of many parts. Although some systems are housed completely in one unit—that is, the monitor, keyboard, and system unit are all packaged together (as in a laptop computer)—most computer systems are actually several individual pieces of equipment connected by cables.

Figure 3.1 shows an IBM PS/2 personal computer. As you can see, this system includes several different components connected by cables. In comparison, figure 3.2 shows the original Macintosh. Notice that the system unit and the monitor are included inside the basic "body" of the system.

Fig. 3.1. An IBM PS/2 personal computer.
In this section, you learn what role each important computer element plays. Table 3.1 introduces each element and provides a basic idea of the element's function. Later sections discuss these elements in more detail.

The System Unit

The outside of the system unit looks somewhat unspectacular; just a simple box with a disk drive or two and maybe a reset button and a few lights on the front (see fig. 3.3). Inside the system unit, however, lies the magic of your computer. Every time you power up the computer, each time you press a key—any operation you perform with the system is controlled and processed by a single chip—called the microprocessor—housed inside the system unit.

If you pop the cover off your system unit (not recommended unless you have a comfortable amount of technical savvy), you will see a variety of boards and chips—which may mean nothing to you if you are not technically inclined. Here are a few generalized
Table 3.1
Personal Computer Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>System unit</td>
<td>Unit that performs all data processing operations; houses power supply</td>
</tr>
<tr>
<td>Disk drives</td>
<td>Units that enable you to load programs and data to and from floppy disks</td>
</tr>
<tr>
<td>Hard disk</td>
<td>Special disk that provides a large amount of storage space for programs and data; housed in the system unit or available as an external unit</td>
</tr>
<tr>
<td>Monitor</td>
<td>Computer’s display screen</td>
</tr>
<tr>
<td>Printer</td>
<td>Device used for printing a variety of computer-generated items (such as mailing labels, reports, letters, and so on)</td>
</tr>
<tr>
<td>Keyboard</td>
<td>Typewriter-like component you use to enter data, issue commands, and generally interact with the computer and software</td>
</tr>
<tr>
<td>Mouse</td>
<td>Small hand-held device used for selecting commands, choosing options, indicating cursor placement, and performing a variety of other program-specific tasks</td>
</tr>
<tr>
<td>Modem</td>
<td>Communications device that you use to send and receive data through phone lines or through a cable connected directly to another computer (Depending on the computer type, modems can be internal or external.)</td>
</tr>
</tbody>
</table>

definitions of terms you will see used in discussions of the system unit:

*Boards.* Originally known as *circuit boards*, boards are used to house computer chips. Chips are attached to the board, and the board is plugged into the appropriate *slot* inside the system unit. The slots are part of the most important board, the *motherboard*, which holds the computer's microprocessor chip.
Chips. Computer chips, technically called *integrated circuits (ICs)*. Although most computer chips look much the same, different types of chips perform different operations: the *microprocessor (CPU)* chip is responsible for all operations performed by the computer; the *memory chips (RAM and ROM)* store programs and data; other chips, such as a *math coprocessor chip*, enable your computer to perform other operations.

*Power supply.* The small boxlike device inside the system unit, that channels to the system the electricity it needs or converts AC power from house current to DC power for the computer

*Cooling fan.* A small fan that keeps the boards and ICs cool

*Expansion slots.* Slots built into the motherboard to allow for expansion of the system. For example, you might want to expand the system by adding a printer, a mouse, or a graphics tablet.

*Expansion ports.* The plug-in receptors in the back of the system unit, that allow you to attach other devices such as a printer, modem, and other external items

Figure 3.4 shows the inside of the IBM system unit displayed in figure 3.3. (Remember that if you have an Apple or Macintosh computer, the inside of your system may look different.) The sections that follow examine these items in more detail. Table 3.2 lists the system unit elements and tells which systems contain which items.

![Fig. 3.3. The outside of the system unit.](image-url)
![Fig. 3.4. Looking inside the system unit.](image)

**Table 3.2**

<table>
<thead>
<tr>
<th>Element</th>
<th>Computer Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microprocessor (CPU)</td>
<td>All computer types</td>
</tr>
<tr>
<td>Motherboard</td>
<td>All computer types</td>
</tr>
<tr>
<td>Expansion slots</td>
<td>Most IBM and IBM-compatibles, all Apples except the Apple IIc, and all currently available Macintoshes</td>
</tr>
<tr>
<td>RAM chips</td>
<td>All computer types (The amount of RAM depends on the system.)</td>
</tr>
<tr>
<td>ROM chips</td>
<td>All computer types (The amount of ROM depends on the system.)</td>
</tr>
<tr>
<td>Power supply</td>
<td>All computer types (The strength of the power supply varies, depending on system type.)</td>
</tr>
<tr>
<td>Cooling fan</td>
<td>Most IBM and IBM-compatible systems (Some Apple and Macintosh computers do not include fans.)</td>
</tr>
</tbody>
</table>
## The Computer: A Closer Look

<table>
<thead>
<tr>
<th>Element</th>
<th>Computer Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk drives</td>
<td>All IBM and IBM-compatible systems, most Apple and all Macintosh computers include at least one internal disk drive. Apple IIgs computers have no internal drive in the system unit, so you must purchase external disk drives to use with the system.</td>
</tr>
<tr>
<td>Expansion ports</td>
<td>All computer types</td>
</tr>
</tbody>
</table>

### The Microprocessor

The computer's "brain" is known as the microprocessor, or the CPU—an acronym for central processing unit. This brain is a small computer chip that is responsible for all the data processing done by your machine.

Figure 3.5 shows you a typical CPU. To get an idea of the size of the chip, consider that the CPU which runs your computer is no bigger than the size of your thumbnail.

![Fig. 3.5. A typical central processing unit (CPU).](image)

The microprocessor is attached to your computer's motherboard, the main circuit board in your computer. Different computer types use different microprocessors: generally, older personal computers (such as the IBM XT, the Apple II, and the early Macintosh) have older, slower microprocessors. As the technology evolves, faster and more powerful microprocessors are introduced. Table 3.3 lists the microprocessors in various models of personal computers.
(This list of personal computer models is incomplete. These examples were chosen only to show the range of differences.) For more information about microprocessors (CPUs), see Chapter 5.

Table 3.3

<table>
<thead>
<tr>
<th>Personal Computer Microprocessors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Computer Model</strong></td>
</tr>
<tr>
<td>IBM PC</td>
</tr>
<tr>
<td>IBM PC XT/286</td>
</tr>
<tr>
<td>IBM PS/2 Model 25</td>
</tr>
<tr>
<td>IBM PS/2 Model 80</td>
</tr>
<tr>
<td>Apple II</td>
</tr>
<tr>
<td>Apple IIe</td>
</tr>
<tr>
<td>Apple IIc</td>
</tr>
<tr>
<td>Apple IIgs</td>
</tr>
<tr>
<td>Macintosh</td>
</tr>
<tr>
<td>Mac Plus</td>
</tr>
<tr>
<td>Mac SE</td>
</tr>
<tr>
<td>Mac II</td>
</tr>
<tr>
<td>Mac IIcxi</td>
</tr>
</tbody>
</table>

Memory

Another important element found inside the system unit is your computer's memory. Memory is a term used somewhat loosely to describe the place where information is stored. Technically, memory can be any one of the following:

- RAM (random-access memory). Random-access memory chips store the programs and data you load during your current work session. When you turn off the computer, the information in RAM is lost.

- ROM (read-only memory). Read-only memory chips contain important information that your computer needs in order to perform basic functions and run built-in programs, such as the program the computer uses at start-up. This type of memory is permanent and retains the information recorded on the chip when power is turned off.
What's the Difference between RAM and Disk Storage Space?

New users are often confused about the difference between RAM (or memory) and hard disk or floppy disk storage space. If RAM stores the programs and the data, what does the hard disk store? If a hard disk offers 20M of room for program and data file storage, why is 512K of RAM so important?

An analogy best answers these questions. Imagine that you are at the library, doing research for a new educational product currently under development. You have found a file of 100 manila folders from which you need to gather the necessary statistics. You also have five sheets of instructions given to you by your boss on how to refer to various research facts. You sit down at a library table, open several folders, and lay out only the instruction sheets you need for this part of the research—after all, a library table can hold only so much.

When you finish gathering data from the first set of manila folders, you put those folders back and get the second set. Similarly, when you complete the instructions on the first pages of instructions, you put those pages back and get the remaining pages.

You can think of the library table as the RAM in your computer. RAM stores only the instructions and the data you need during that portion of your work session. RAM is the work area used as you work with files in your program.

The 100 manila folders are stored in disk storage—whether on a hard disk or floppy disks. In the program, when you request to see another file or section of a file, it is retrieved from storage and loaded into RAM. Sometimes, depending on how limited the available RAM space is, the computer may discard a file that is not being used in order to make room for the incoming file. By keeping in RAM only the files needed for the current work session, you can work much faster than if you had to retrieve data from disk storage while using these files.

Before you leave the library, of course, you clear the table and return all the folders to the shelves. In the same way, when you finish your work session on the computer, you return all your files to disk storage.
When you first go computer shopping, you will see various machines with various amounts of random-access memory. You will see a variety of terms used to describe the amount of RAM included with the system. Here's what the most often used terms mean:

<table>
<thead>
<tr>
<th>Term</th>
<th>Example</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit</td>
<td>Bit</td>
<td>The smallest measurement of data. Taken from the term <em>binary digit</em>, a bit is an electrical representation that is either 0 or 1.</td>
</tr>
<tr>
<td>Byte</td>
<td>Byte</td>
<td>Roughly, one character, or the equivalent of eight bits</td>
</tr>
<tr>
<td>Kilobyte</td>
<td>640K</td>
<td>1,024 bytes of information; 640K is read as &quot;640 thousand bytes.&quot;</td>
</tr>
<tr>
<td>Megabyte</td>
<td>4M</td>
<td>One million bytes of information; 1M is read as &quot;one megabyte&quot; or &quot;one meg.&quot;</td>
</tr>
</tbody>
</table>

Because your computer stores in RAM the actual program you run and the data you work with, the amount of RAM in your machine must be large enough to hold the program you want to use. For example, if your computer has 256K of RAM and you want to use a program that requires 640K, you need to add memory chips to your system so that the computer can run the program you need. Whether you can add memory chips directly to the system or you must add a memory board (with memory chips plugged in) depends on the type of system you use. Either way, check with your local computer dealer before you purchase or install the additional memory.

One other term you may see is *cache memory*. As computers evolved and microprocessors became increasingly powerful, users wanted to access programs and data in memory faster than before. High-speed memory chips solved the speed problem but introduced another one: exorbitant cost. In an effort to keep costs down and still give users of high-end machines the faster access times they wanted, developers introduced cache memory.

Cache memory is a special RAM segment that is available in addition to the basic amount of RAM packaged with the system. This special section runs off a few high-speed memory chips, but RAM uses the traditional, low-cost memory chips. The result—significantly increased processing speed without a large jump in price.
As you investigate the different types of systems available, if you are looking at IBM or IBM-compatible computers, you will undoubtedly run into the terms extended and expanded memory. Put simply, extended memory is a kind of memory similar to RAM. Introduced with the IBM PC AT, extended memory allows you to set aside an extra amount of RAM space in the form of a disk cache (a separate segment of RAM you can use for programs and data in the current work session). Expanded memory, on the other hand, uses a different memory-addressing technology to give users more available RAM. In order for you to use expanded memory, you must have a program that supports EMS (Expanded Memory Specifications). To find out whether your software supports EMS, consult the program's documentation or contact your dealer.

ROM is the place where your computer stores the programs and data it needs to get things up and running when you turn on the power. Without ROM, your computer would just sit there when you pressed the power switch. The information in ROM has been burned onto the memory chip—the information is permanent and cannot be erased. When you turn on the power, the computer reads the information in ROM to find instructions for loading the operating system or locating a particular file or program. These instructions are often called the boot program.

Let's make a clear distinction between memory and disk or mass storage: memory chips inside the computer store the programs and data you use during your current work session, and data storage devices (such as disk drives, hard disks, tape units, CDs, and WORM drives) store the programs and data you load into your computer's memory (RAM) when you need to use the information. As you may know, CDs are used to store large amounts of data. Currently, few available devices allow you to reuse CDs. Typically, you can store data on a CD one time only; you cannot erase the CD and use it again for other data. Similarly, optical storage devices, also known as WORM (write once read many times) drives, are used for storing massive amounts of information.

For example, suppose that you have started your computer, but you have not yet run the program you want to use. You need to get that program into the computer; that is, you need to load the program into RAM. How do you do that?

The way in which you load the program depends on the method of data storage you use. If you use a hard disk, which is actually housed inside the system unit, you probably have simply to type a
command or click the mouse button. If you use a disk drive system without a hard disk, you need to insert a disk that stores the program in the appropriate disk drive and then type a specific command or click the mouse button (see fig. 3.6).

![Floppy disk](image)

**Fig. 3.6.** Loading a program into RAM through the floppy disk drive.

After you enter the command (or click the mouse button), you may hear a bit of chunking and whirring as the computer reads the program from either the hard disk or the floppy disk. When the computer is finished, the opening screen of the program is displayed. The program has now been loaded into RAM, and the first part of the program has been executed.

**Note:** Depending on the size and type of the program you are using and the amount of available RAM in your computer, all your program may not be stored in RAM at any one time. Some software packages have the capacity to swap parts of the program in and out as necessary. With some computers and programs, this swapping may be transparent—you may not notice anything except the red light on the drive clicking on and off occasionally. With other computers, you may be asked to remove one disk and insert another so that the computer can access the information it needs.
Expansion Slots, Power Supply, and Fan

Some types of computers also have expansion slots inside the system unit on the motherboard. These slots provide places for you to plug in additional boards that run other pieces of your computer system. You add an expansion board, for example, when you add a printer, a modem, a mouse, or a graphics tablet.

Also inside the system unit is the power supply, which channels to the computer the electricity it needs, and, in some systems, a fan that keeps the boards cool.

Disk Drives

In the front of the system unit, you see the disk drive (or drives) of your machine (see fig. 3.7). Depending on the type of system you use, your drives may look different from the ones shown here.

What is a disk drive? Basically, a disk drive is a device that reads information into and writes information from the computer. You can think of a disk drive as a kind of tape recorder—you push the Record button, and the recorder captures sounds on the tape; you push Play, and the recorder plays back the recorded information. Similar to a tape recorder, a disk drive writes information on a disk and reads information from a disk. The disk drive doesn't store any information itself; the disk drive simply writes recorded information on a disk prepared to receive the data.
The mechanism inside the disk drive that does the reading and writing is known as the head. Floppy disks have two heads; hard disks have two for each platter. The read/write head sends the electrical impulses to the disk, reading both the top and bottom portion of the disk at one time.

Here are two definitions that will come in handy as you learn about disks and disk drives:

*Floppy disk drive.* A device that allows you to store and read programs and data to and from a removable, flexible (floppy) disk, which you place in the computer.

*Hard disk drive.* A device that allows you to store and read programs and data on a nonremovable, inflexible (hard) disk, which is housed inside the drive unit (see fig. 3.8).

*Note:* When the term *hard disk* first was introduced, it meant exclusively *nonremovable* and *internal.* Technology has introduced both *external* and *removable* hard disks in the last few years. External hard disks are independent of the system unit and are attached to your computer by a cable; removable hard disks are hard disks that you slide into a slot in the front of the system unit.

![Fig. 3.8. A hard disk drive.](image)

Later in this chapter, you learn more detailed information about how floppy disks work; first, however, let's address the disk drives themselves.
Floppy Disk Drives

Most computers have at least one floppy disk drive. To use this drive, you insert a disk and close the drive door. What happens then depends on what you are doing. If you are loading a program, for example, you type the command necessary to start the program; then the computer reads the program from the disk you inserted into the drive and places a copy of the program in RAM. If you are saving information to the disk, you issue the necessary commands from within the program you are using, and the computer writes the file to the disk. Either way, you know that the computer is reading from or writing to the disk because the access light, located on the front of the drive, is turned on (see fig. 3.9).

Floppy disk drives come in two sizes: 5.25-inch (called minifloppies) and 3.5-inch (called microfloppies). Original PCs were equipped with only the 5.25-inch disk drives, but early Macintoshes started the trend toward 3.5-inch disk drives. As computers evolve, more and more PCs are appearing with 3.5-inch disk drives.

Some IBM computers and compatibles have half-height drives; named as such because the disk drive is only half the height of a "normal" disk drive. Half-heights come only in 5.25-inch versions and offer two capacities: 360K and 1.2M.

Another difference in floppy disk drive types depends on where the drive is placed. Chances are that when you bought your system, it came equipped with at least one disk drive. This drive, housed in the system unit, is known as an internal drive. External
disk drives are also available, giving you an option of adding a floppy disk drive if your needs warrant that addition. For example, suppose that your office has been automated with a variety of PC computers. Most of the PCs have 5.25-inch drives, but newer models have 3.5-inch drives. What happens when you want to use a 5.25-inch disk on the machine with 3.5-inch drive? One option is to purchase a 5.25-inch external drive, which would allow you to swap compatible files as necessary from one disk drive type to another. Figure 3.10 shows an example of an external floppy disk drive. You use the disk drive the same way whether it is internal or external; you still insert the floppy disk into the drive and close the drive door.

![An external floppy disk drive.](image)

The following list shows some of the most popular computers and the disk drive types used with those machines:

<table>
<thead>
<tr>
<th>Computer</th>
<th>Disk Drive Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM PC, XT, AT</td>
<td>5.25-inch</td>
</tr>
<tr>
<td>IBM PS/2</td>
<td>3.5-inch</td>
</tr>
<tr>
<td>Apple II</td>
<td>5.25-inch</td>
</tr>
<tr>
<td>Apple IIgs</td>
<td>3.5-inch</td>
</tr>
<tr>
<td>Macintosh</td>
<td>3.5-inch</td>
</tr>
<tr>
<td>COMPAQ</td>
<td>5.25-inch</td>
</tr>
</tbody>
</table>

**Hard Disk Drives**

A hard disk drive stores and retrieves information from a disk, just the way a floppy disk drive does; both types of disks are divided into tracks and sectors. The main difference is that instead of
reading and writing information on a removable disk, the computer stores data on a nonremovable circular disk that is permanently housed inside the drive itself. The entire hard disk unit may be internal (inside the system unit), external (outside the system unit), nonremovable (permanently housed inside the system unit), or removable (capable of being removed from the system unit). Figure 3.11 shows the inside of a hard disk unit.

![Figure 3.11. The inside of a hard disk unit.](image)

**Hard Disk Facts**

1. Many computers today come equipped with a hard disk built into the system unit.
2. Hard disks give you considerably more storage space than micro- or minifloppies.
3. Hard disks provide faster access to programs and data than micro- or minifloppies.
4. You can purchase hard disks that have capacities from 10M to 300M; although hard disks are available with capacities of up to 800M, anything more than 300M is specialized and therefore expensive.

A major advantage the hard disk has over the floppy is speed. With some hard disks, you can retrieve and store information almost 100 times faster than you can using floppy disks, resulting in an enormous time-saving when you are working with large volumes of data or many different files. The speed comes in part because hard disks are always spinning, but floppy disks have to be started for
each new access. This constant spinning is the reason you should not move the computer when it is running—any movement can cause damage to a spinning hard disk.

Because you don't actually do anything to the hard disk, in the form of opening and shutting drive doors, removing a disk, and so on, you may have difficulty telling when the computer is using the hard disk. No matter which type of computer you use, you should be able to find on the front of the computer a light that indicates when the hard disk is being accessed. In addition, you may hear a soft churning noise, which tells you that the computer is reading or writing something to the hard disk.

**Disks**

A disk is the medium on which you store the programs and data for your computer. Similar to the cassette tape in your tape recorder, the disk holds the information sent to it, and you can play back the information when necessary.

Basically, personal computers use two types of floppy disks: *minifloppy disks* and *microfloppy disks*. Minifloppies are 5.25-inch disks that are encased in a flexible jacket; microfloppies are 3.5-inch disks housed in a hard plastic casing. Figure 3.12 shows a typical minifloppy disk.

![Fig. 3.12. A minifloppy disk.](image)

The *read/write hole* is the only place on the minifloppy where the recording heads in the disk drive actually touch the surface of the disk. This place is very sensitive to outside elements. For this reason, you should never touch this exposed portion of the disk and risk losing or damaging your data.
On a 3.5-inch microfloppy disk, the read/write hole is covered by a metal piece known as the shutter (see fig. 3.13). When you insert a 3.5-inch disk into the disk drive, the shutter is automatically pulled back, opening the read/write hole so that the computer can read and write on the surface of the disk. When you remove the disk, the cover slides back into place. Because of the plastic casing and the shutter, the 3.5-inch disk is much less vulnerable to damage than its 5.25-inch counterpart.

Fig. 3.13. A microfloppy disk.

Other elements on the disk include the spindle hole, which the disk drive uses to hold and spin the disk (This hole is visible only on the back of the 3.5-inch microfloppy.); the index hole, which the disk drive uses to count revolutions of the spinning disk and to make sure that the disk is spinning properly; and the write-protect notch. This notch, as you can see in figures 3.12 and 3.13, looks different on the two types of disks. On the 5.25-inch disk, the notch is in the upper right corner of the disk. The notch looks as though it has been “cut out” of the disk. On the 3.5-inch disk, the write-protect notch is a switch you can move to the desired position.

You write-protect a disk to preserve the data or programs the disk stores. For example, suppose that you have written an extensive report and saved it to disk. You want to keep the report for your files, because you plan to use parts of it again later in another report. To keep someone else from inadvertently overwriting the report you have stored on the disk, you can write-protect the disk. This procedure allows you to read data from the disk but protects the disk from receiving any more information. You can remove write-protection at any time.
When you first purchase data disks, they are not write-protected. If you are using 5.25-inch disks, you write-protect the disk by placing a small stickerlike tab over the write-protect notch. (The tabs are included in the box of disks.) If you are using 3.5-inch disks, hold the disk so that the shutter is pointing up and the spindle hole is facing you; then slide the write-protect switch down. The tab or switch protects the disk so that data cannot be written to it.

Floppy Disk Facts

1. Two types of floppy disks—called microfloppy and minifloppy disks—are available. Miniflופpies are 5.25-inch disks, and microfллопpies are 3.5-inch disks.

2. Both micro- and minifloppy disks are removable disks that you place in a disk drive, which reads and writes information to and from the disk.

3. Both micro- and minifloppy disks hold a limited amount of information. This "size limit" is known as the disk's capacity and is measured in kilobytes (K) or megabytes (M).

4. Microfloppies (3.5-inch) can store either 720K or 1.44M of data (depending on the type of microfloppy you buy).

5. Minifloppies (5.25-inch) can store either 360K or 1.2M of data (depending on the type you buy).

Defining Storage Capacities

Different disks have different storage capacities. (The capacity of a disk is the amount of storage space the disk has. For example, a disk with a capacity of 360K can store approximately 360 kilobytes of data.) No visible difference alerts you as to the different capacities of different disks, so be sure to keep all similar disks together or use some sort of labeling system to indicate which disk type you are using.

Minifl opinies are the older of the two disk types, offering either 360K (known as low density) or 1.2M (known as high density) capacities. (Note: The term density refers to the way the disk is capable of storing data; in the same amount of space, high-density disks can store more information than the low-density disks.)
Microfloppies are available in either 720K or 1.44M. Of course, you need to be sure that you purchase disks that are compatible with your disk drives. A disk drive with a higher capacity can read from and write to a lower capacity disk, but a low-capacity drive cannot read a high-capacity disk. For example, if you have in your system a 1.44M microfloppy disk drive and you want to read a 720K microfloppy disk in that drive, you won't have any problem. If, on the other hand, you try to read a 1.44M disk in a 720K drive, the computer will be unable to read the information.

The increase in the amount of data stored by a hard disk is significant when you compare it to its micro- and minifloppy teammates. Although one microfloppy can store, say, 1.44M of data, a hard disk can store anywhere from 10 to 144M of information (depending on the capacity of the individual hard disk).

**Writing Information to a Disk**

As you learned in the last section, the disk drive actually writes the information to and retrieves information from the disk through the read/write hole.

The recording heads read from and write the information to the disk in rings—not exactly like a phonograph record, however, because each ring is separate from another. Each ring is known as a *track*, and tracks are numbered from the outside of the disk inward. The track on the outer edge of the disk is track 0, and the innermost track (on a 360K floppy disk) is usually track 40. Each track is further divided into *sectors*—allowing the computer to identify easily where information is stored on the disk (see fig. 3.14).

**Fig. 3.14.** Division of a disk into tracks and sectors.
Different computers divide disks into different numbers of sectors, which is why you occasionally may have trouble reading disks from one machine in a different, albeit similar, computer. For example, you may have some trouble using a disk you use in your IBM PC AT with a Tandy 1000, even though the Tandy is IBM-compatible. You can get around this problem by formatting the disk on the computer with which you plan to use the disk. (Formatting is a special procedure you use to prepare the disk to store data; see Chapter 12.)

The Keyboard

The keyboard is perhaps your most vital link to the workings of your computer. You perform a variety of operations with the keyboard, from simple typing tasks to selecting menu options, entering commands, and carrying out a wealth of actions with one or two keypresses.

Again, different computers have different keyboards, but basically all keyboards have the same general keys:

- QWERTY keys. The regular alphabetic keys similar to those on a typewriter keyboard
- Arrow keys. The directional (cursor-movement keys (↑, ↓, →, ←), which may or may not have their own keypad.
  - The Home, End, PgUp, and PgDn keys also move the cursor.
- Numeric keypad. The keypad of numbers, usually located at the rightmost side of the keyboard. On some keyboards, this keypad can be toggled between numeric and cursor-movement mode. When the keypad functions as a numeric keypad, you press a key and type a number; when the cursor-movement function is toggled on, you press a key and move the cursor in the direction of the arrow shown on the key (see fig. 3.15).
- Function keys. Extra keys on the keyboard, labeled F1 through F10 (or F12, depending on the number of function keys available). Most programs assign specific features to function keys, which are usually located along the top or along the left side of the keyboard.
Fig. 3.15. A numeric and cursor-control keypad.

Figure 3.16 shows the IBM Enhanced Keyboard. Each key area is clearly defined; each group of keys is positioned in its own area of the keyboard. On other computer keyboards, however, this division is not the case.

Fig. 3.16. The IBM Enhanced Keyboard.

Not all keyboards have function keys, which are special-purpose keys you can program to carry out specific tasks you perform over and over. For example, suppose that you often underline text in the letters you type. Depending on the software you use, you can assign the underline to a function key so that each time you want to start underlining, you simply press that key. Function keys can be used for a variety of other tasks, as well. All IBM and IBM-compatible computers have function keys, although the location and number of available function keys vary from machine to machine. The function keys are labeled F1, F2, F3, and so on, and are usually placed across the top or along the left edge of the keyboard. Apple computers, as a rule, do not have function keys,
although later-model Macintoshes do have full-featured keyboards with function keys. (You purchase these keyboards separately.)

Table 3.4 highlights the important keys on IBM-style keyboards. Table 3.5 explains some of the extras available on Apple and Macintosh keyboards.

**Table 3.4**

**Special Keys on IBM-Style Keyboards**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter or Return</td>
<td>Serves as a “go” key; press to have the computer carry out an action or read and respond to command-line input</td>
</tr>
<tr>
<td>Esc</td>
<td>Backs out of a menu or cancels an operation (dependent on software)</td>
</tr>
<tr>
<td>Ctrl</td>
<td>Used in combination with other keys for selecting commands and performing actions</td>
</tr>
<tr>
<td>Shift</td>
<td>Raises typed letters to uppercase</td>
</tr>
<tr>
<td>Alt</td>
<td>Used in combination with other keys for selecting commands and performing actions</td>
</tr>
<tr>
<td>Tab</td>
<td>In word processing, works similarly to typewriter tab; in other applications, moves cursor forward or backward</td>
</tr>
<tr>
<td>Backspace</td>
<td>Moves cursor back one space</td>
</tr>
<tr>
<td>Caps Lock</td>
<td>Produces all letters as capitals; affects only the letter keys</td>
</tr>
<tr>
<td>PgUp</td>
<td>Scrolls page display up one page</td>
</tr>
<tr>
<td>PgDn</td>
<td>Scrolls page display down one page</td>
</tr>
<tr>
<td>Home</td>
<td>Dependent on software, may move cursor to the upper left corner of the screen or, in some programs, to the start of a line</td>
</tr>
<tr>
<td>End</td>
<td>Dependent on software, may move cursor to lower right corner of the screen or, in some programs, to the end of a line</td>
</tr>
</tbody>
</table>
In most applications, changes computer into insert mode, allowing you to insert information without overtyping existing characters. In some programs, Ins inserts characters from a Clipboard on which data has been stored.

Deletes character at cursor position (dependent on software)

Table 3.5
Special Keys on Apple and Macintosh Keyboards

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ins</td>
<td>In most applications, changes computer into insert mode, allowing you to insert information without overtyping existing characters. In some programs, Ins inserts characters from a Clipboard on which data has been stored.</td>
</tr>
<tr>
<td>Del</td>
<td>Deletes character at cursor position (dependent on software)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>Serves as a “go” key; press to have the computer carry out an action</td>
</tr>
<tr>
<td>Arrow keys</td>
<td>Similar to arrow keys on the IBM-style keyboards, the arrow keys (↑, ↓, →, ←) move the cursor on the screen. These keys usually do not have a separate keypad.</td>
</tr>
<tr>
<td>Clear</td>
<td>Clears the number most recently typed; located by the numeric keypad</td>
</tr>
<tr>
<td>Command key</td>
<td>Used in combination with other keys for selecting commands and performing actions. The Command key shows the open apple symbol and the cloverleaf symbol. (On older Apple IIs, the open apple symbol appears as a closed apple.)</td>
</tr>
<tr>
<td>Enter</td>
<td>Functions the same way as the Return key for most applications; positioned in the lower right corner of the numeric keypad</td>
</tr>
<tr>
<td>Option</td>
<td>Used in combination with other keys for selecting commands</td>
</tr>
</tbody>
</table>
The Mouse

The mouse has scurried into the business world at a rate surprising to many people. First viewed as something akin to a joy-stick, which is used mainly for games, the mouse has grown in popularity until it has become an important part of many applications.

Originally, the mouse was designed to supplement the keyboard—you could use this small hand-held device to do things not easily done with keys (see fig. 3.17). The mouse is used most often for moving things on the screen; that is, moving the cursor, moving a graphics object, dragging a block of text. You simply move the mouse in the direction you want the object to move, and the object moves correspondingly on-screen.

![Fig. 3.17. A typical mouse.](image)

The first mice were introduced with the Macintosh (which, in fact, could not be used without a mouse). Gradually, they made their way into other applications and eventually into the PC environment. Virtually every application that deals with graphics, layout, or any kind of design is enhanced greatly by the addition of a mouse. Further, even working with applications like spreadsheets, word processors, and databases can be streamlined by the use of a mouse for selecting menu options and moving items on the screen.

All applications designed for the Macintosh were created to use the mouse, but using a mouse with any member of the Apple II or IBM families is optional. When you prepare to buy software for your machine, check to see whether the software requires the use of a mouse.
The Monitor

The monitor is your window to the workings inside your computer (see fig. 3.18). You will spend a great deal of time looking into the glassy face of your monitor screen, so when you are considering the purchase of the display for your system, be sure to get one you are comfortable with. (More about purchasing considerations in Chapter 5.)

Like anything else related to computers, a myriad of monitors are out there in the market. Green screen, amber screen, paper-white, LCD, ELD, analog, digital. Take a few minutes a catch up on these monitor types:

- Analog and digital. The terms *analog* and *digital* describe the way in which the monitor receives video signals from the computer. These terms are described in more detail in Chapter 5.

- Amber, green, or paper-white screen. Some one-color monitors (called *monochrome* monitors) are available in amber, green, or paper-white (which produces gray tones) as well as black and white.

- CGA, EGA, and VGA. These names are acronyms for graphics display cards, which are placed inside your computer so that, when the card is used with a compatible monitor type (CGA, EGA, VGA, or multi-sync), the graphics on your monitor display correctly (more in Chapter 5).
- ELD (Electro-Luminescent Display). This type of screen is available in many popular laptop and portable computers (such as the COMPAQ 386).

- Color monitor. A monitor capable of displaying text and graphics in color. Color monitors range in capabilities from displaying eight colors to displaying millions, depending on the monitor and card type and the capabilities of the software.

To make your choices even more complicated, a variety of monitor sizes and features also are available. Similar to television sets, monitors come in numerous widths and sizes, various signal intensities (resulting in better or poorer quality on the screen), and even different shapes. Full-page monitors are taller than ordinary monitors, making it easy for desktop publishing enthusiasts to display an entire publication page while working on layout. Two-page monitors, which are wider than the average monitor, allow for the display of two pages side by side. Figure 3.19 shows an example of a two-page monitor. (In Chapter 5, you learn more about monitor features.)

Fig. 3.19. A two-page monitor.
The Printer

Depending on how you look at it, a printer is an optional necessity. If you ever need to print anything, you will need something to print it with. Invoices, bills, research papers, newsletters, correspondence . . . , anything you could do on your typewriter, you now can do on your computer—in a fraction of the time.

But you need some way to get the text out of the computer once the text is in there. Similar to monitors and system units, the list of available printers and printer options goes on almost ad infinitum. Figure 3.20 shows a typical low-cost dot-matrix printer. For now, because printers are explored in Chapter 6 and because here you need only a surface knowledge of printer technology, just the basic differences in printers are defined.

As you begin pondering a printer purchase, you immediately will see that several types of printers are available. These types can be broken down loosely into the following categories:

- Dot-matrix printers
- Inkjet printers
- Laser printers
- PostScript printers

If you scale these printer types from 1 to 10 in terms of both output quality and cost, dot-matrix will be a 1, and PostScript will be a 10. On the output produced on a dot-matrix printer, you can see that the letters are formed by individual pins pressed against a printer ribbon. Although some dot-matrix printers offer good quality at a low cost, you can still see those dots when you look
closely. For that reason, if you need high-quality output, you need to choose a printer type farther up the scale.

At the top of the scale is the PostScript printer, a machine capable of producing almost typeset-looking copy at a fraction of the cost of "real" typesetters. In return for the high quality, however, you also get to deal with a high price tag. Figure 3.21 shows output produced on a dot-matrix printer and a PostScript printer.

The other two printer types (inkjet and laser printers) are in the middle in terms of quality and cost. Inkjet printers smooth out the dottiness produced by dot-matrix printers but still lack the quality of a laser printer. A laser printer hits the quality mark, but without PostScript, a laser printer is limited in the number of different fonts it can produce. Again, these printers are explained here only in terms of generalities; Chapter 6 explores printer technologies in more detail.

The Modem

A modem is another optional piece of equipment that many computer users skip—at first. The word *modem* is short for modulator/demodulator and refers to the process of changing (modulating) data into electronic pulses, sending it through a phone line, and then demodulating the pulses back into usable data.
at the other end of the line. That's what a modem does—transmits data from your computer to another computer in a far part of the office or the world.

When you are first starting out with computers, modems may seem a little beyond you. Unless your application requires specifically that you hook up to another computer via a modem, you may choose not to attempt this area of expertise until you have to use it. However, a world awaits just beyond your phone jack—waiting for you to tap into its endless computerbank of information.

Numerous electronic services can instantly provide you with almost everything you wanted to know about any given subject. These services are known as bulletin board services or information services, and many major services are available throughout the world—no matter what type of computer you are using. Additionally, your modem can link you to any number of small local bulletin boards that may advertise hardware specials, display user group information, or trade new computer games and routines. With a modem, you can also perform a wide variety of financial functions, such as electronic check writing, stock trading, and so on.

Most computers do not come equipped with a modem; that is something you probably will have to add separately as the need arises. For more information on selecting a modem for your system, see Chapter 7, “Selecting Computer Add-Ons.”

Understanding Operating Systems

The last stop in your tour of hardware involves something that is not hardware. But without an operating system, your computer would be nothing more than one expensive paperweight. Put simply, an operating system is the liaison between you or your application program and your computer. When you want to do something, you tell the operating system by entering or selecting certain commands. The operating system then translates your wishes into electronic code the computer can understand, and your request gets carried out.
Again, depending on which type of computer you use, different operating systems are available. Here's an overview of some of the most popular operating systems available:

- **MS-DOS or PC DOS**
- **OS/2**
- **Apple DOS**
- **Finder**
- **UNIX or XENIX**

The first two operating systems, MS-DOS and PC DOS (which was developed specifically for the PC), are the most popular operating systems for PC computers. In the last two years, OS/2, a new operating system for IBM computers, has been growing in popularity; but although its capabilities are still being explored, OS/2 does not yet rival MS-DOS or PC DOS in terms of actual use. Apple DOS is the operating system developed for the Apple II family of computers—making Apple DOS by default one of the most widely used operating systems in personal computerdom. The Macintosh and the Apple IIcs use the Finder operating system, with one of its primary advantages being the option of having several applications open on-screen at one time. UNIX and XENIX are two high-level operating systems used primarily on large computers, programmed and run by experts. (For more detailed information on the various types of operating systems, see Chapter 10.)

In the following section, you can see how all the elements discussed in the preceding parts of this chapter come together into a computer system—IBM, Apple, or Macintosh.

**Reviewing Basic Computer Types**

As you know, there are *many* different types of personal computers. The most popular and easily identifiable groups are the Apple, IBM (or IBM-compatible), and Macintosh computers. In this section, you learn—from a hardware standpoint—what makes these systems different. Although the Apple and the Macintosh are both made by Apple Computer, Inc., they are treated here and throughout this book as two separate families.
Apple Computers

As mentioned in Chapter 2, the Apple computer was the first to burst on the market as a true "personal" computer (see fig. 3.22). The early Apple consisted of a 40-column monitor, meaning that the monitor could display only 40 characters across the width of the screen rather than 80—today's standard. This width, combined with the fact that the early Apple could display only uppercase letters, resulted in BIG characters on the screen.

![The early Apple II.](image)

The keyboard was attached to the system unit and had no up- or down-arrow keys; only left- and right-arrows were available. Additionally, no delete key existed (hopefully no one ever made any mistakes).

Apple IIe and IIc

The Apple IIe and the IIc made significant improvements on the capabilities of the early Apple (see fig. 3.23). Now expanded to 80 columns, the display could show both upper- and lowercase letters, resulting in text that was much easier to read. The Apple IIe comes equipped with 64K and is expandable to 128K; the Apple IIc comes with 128K and can be increased to 1M.
On the Apple IIe and the IIc, the keyboard is attached to the system unit (a trait inherited from their early Apple ancestors), but the newer models of the Apple IIe offer a numeric keypad separate from the standard QWERTY keys.

One highlight of the Apple IIc is the addition of an accelerator chip that permits the Apple IIc to run programs up to four times
faster than other Apples. This feature, combined with the Apple IIc's memory expansion capabilities, makes this computer popular for home, school, and business use.

**Apple IIgs**

The Apple IIgs is a new fruit in the Apple line. The gs offers superior graphics and sound capabilities (hence the G and S), which you won't find in any of the other Apples. The gs screen's quality rivals the Macintosh's, and the expandable memory option (up to 8M total) makes the gs a terrific choice for a variety of applications—fun or otherwise (see fig. 3.24).

![The Apple IIgs](image)

**Fig. 3.24. The Apple IIgs.**

Additional features of the gs include the Control Panel desk accessory, which allows you to choose screen colors, resolution settings, and keyboard layout (you can select up to eight international keyboards).
PCs

As you learned in Chapter 2, the IBM PC was brought into the market as the first major personal computer after the shock wave of the Apple I. The IBM is a different animal from any of the Apple computers—it uses different software, includes different internal parts, and processes data differently.

This section introduces a few popular IBM models, but many more are available. Remember also that in addition to regular desktop models, there are also laptop and portable computers (see Chapter 4 for a discussion of laptops and portables).

The IBM PC

The original IBM Personal Computer was introduced in 1981. With a monochrome monitor, two full-height 5.25-inch disk drives, and an 8088 microprocessor, the IBM was quickly adopted as the standard personal computer used in business applications.

The keyboard on the original PC was cluttered by today's standards. The function keys formed two rows along the left edge of the keyboard, and the numeric keypad (which also served as a cursor-control keypad) was scrunched up next to the standard QWERTY keys (see fig. 3.25).

Fig. 3.25. The original IBM PC keyboard.
The IBM PC XT

The next generation of the PC brought the XT—a PC with more power and a hard disk drive. The XT was equipped with 256K of memory, a floppy disk drive, and a 20M hard disk drive. The hard disk was a major feature for PC users, giving them a substantial jump in storage capacity (from 360K floppies to 20M hard disk). The IBM PC XT used the same keyboard as the original PC.

In advertising, the terms PC-compatible, XT-compatible, and AT-compatible mean that you can run the software or use the hardware device with any machine of that type.

The IBM PC AT

The IBM PC AT was introduced next, made available with 256K or 512K memory. The biggest differences from the original PC were the 80286 microprocessor and the addition of a half-height floppy disk drive capable of working with 1.2M disks. This system also included a 20M hard disk, a floppy disk drive, and a slightly different “look.” The PC AT also introduced a new keyboard, which separated the cursor-control/numeric keypad from the standard QWERTY keyboard and added three indicator lights in the top right corner of the keyboard to show you when the Num Lock, Caps Lock, and Scroll Lock keys have been pressed.

The IBM XT/286

Next, IBM introduced a new machine based on its two preceding models. The IBM XT/286 was a big machine that made a little splash—even though it offered the new 80286 microprocessor, making the XT/286 the new standard beyond 8088 power. The XT/286 was basically a redesigned AT motherboard in an XT case. This system had 512K memory and a 20M hard disk.
The IBM PS/2

The IBM Personal System/2 was formally announced in April of 1987. Rather than announcing one new machine, IBM once again blazed into the market by introducing an entire family of computers—in addition to several monitors, printers, and a desktop publishing package.

The PS/2 is different for a variety of reasons. Each model has a "small footprint" design, allowing users maximum desk space with desktop models (Models 25, 30, 50, and 55) and even more freedom with the floor-standing models (Models 60, 70, and 80). Figure 3.26 shows a PS/2 Model 30, and figure 3.27 shows a floor-standing Model 60.

![PS/2 Model 30](image)

**Fig. 3.26. The PS/2 Model 30.**

The PS/2 family brings a new range of capabilities to personal computing. The low-end systems, such as Models 25 and 30, use the early 8086 microprocessor and the basic internal design (slot architecture) of IBM PCs. The Model 50 introduces MicroChannel Architecture (MCA), a new technology that allows the high-end PS/2s to move data faster than is possible with the slot architecture of PCs. All models higher than the 30 (which includes Models 50, 55, 60, 70, and 80) use the MCA. A new but different relative to the PS/2 family is currently being test-marketed; this computer, known as the PS/1, is AT-compatible and uses the slot architecture from IBM PC ATs. The high-end machine, the Model 80, includes...
an 80386 microprocessor; can be expanded to 16M of RAM; and, depending on the Model 80 you choose, can have from a 44M to a 314M hard disk.

Fig. 3.27. The PS/2 Model 60.

Macintosh Computers
Since the Macintosh first appeared in 1984, seven new models have been introduced. The first Mac had 128K of memory, one 400K disk drive, and a built-in 9-inch monitor (see fig. 3.28).

Today, the original Mac (and two of the succeeding Macs) have been discontinued, replaced by more powerful machines. In this section, you are introduced to three Macs for varying computer needs.

Mac Plus
The Mac Plus, an enormously popular machine, can do everything a beginning computer user needs. The computer has a few limitations, such as the absence of a hard disk and the limited 1M
of RAM. (You can expand memory to 4M, however.) The Mac Plus comes with one 800K floppy disk drive, a built-in monitor, a keyboard, and a mouse (see fig. 3.29).

Fig. 3.28. The original Mac.

Fig. 3.29. The Mac Plus.
Mac SE/30

The Mac SE/30 is a newer version of Mac, taking some of the best features of the Mac Plus and the SE (which added an expansion slot and room for an internal disk drive) and putting them together with additional power in the form of a Motorola 68030 CPU for a high-speed, flexible machine (see fig. 3.30). The addition of the SuperDrive (a 1.44M internal disk drive) makes possible working with a larger variety of files and applications.

![Fig. 3.30. The Mac SE/30.](image)

The SE is one step below the SE/30. The SE uses the same CPU as earlier Macs (68000, 7.8 Mkz) and offers an expansion slot for accessory cards. The standard SE comes with two 1.44M floppy disks, and an optional hard drive is available.

The Mac IIcx

The newest member of the Mac family is the Mac IIcx. This powerful machine is smaller than the other Macs and includes 1M of RAM (expandable to 8M), a hard disk drive, and a 1.44M floppy disk drive. The Mac IIcx accepts a variety of disks formatted in Pro DOS, MS-DOS, and OS/2 (see fig. 3.31).
Conclusion

In this chapter, you have covered a great deal of ground. From a basic step-by-step journey through all the hardware components in your system to more generalized discussions of the various popular personal computers in today's market, you have explored the different facets of computer hardware. In the next chapter, the beginning of Part II, you analyze your own computer needs.
II
Prepurchase Considerations

If you are planning to purchase a computer (or are thinking about adding to the system you already have), Part II will help you make an educated decision. The chapters in this part cover basic considerations about hardware and software. Specifically, the chapters in Part II include the following:

- Purchasing Considerations
  - Purchasing a Computer System
  - Purchasing a Printer
  - Purchasing Computer Add-Ons
  - Purchasing Software
Purchasing Considerations

If you have been computer shopping for any length of time, chances are that you have been overwhelmed with the mass of computer equipment available. With such an incredible range of features to choose from, how do you know which system to buy? All the dealers say that they have the best system. How do you decide which computer is best for you? How will you choose one software product from the thousands out there?

This chapter will help you identify what you need from the computer you purchase. Starting from a basic “How will I use it?” approach, this chapter walks you through an analysis of your computer needs. This chapter serves as a general guide for evaluating your computer needs, and the other chapters in Part II help you focus on purchasing considerations for computer components.

Determining Your Needs

This section is basically a list of questions you may mull over as you begin your computer hunt. Perhaps you have already answered
these things for yourself. If so, read only what’s appropriate and move on.

This section helps you find answers to the following questions:

- Do I buy the system or software first?
- What will I use my computer for?
- How much do I have to spend?
- Where will I use my computer?
- What size system will I need?
- Who else will use my computer?
- Does my computer need to be compatible with others at work or home?
- Will my computer meet my future needs?
- Do I want a PC, Apple, Mac, or PC clone?
- What components come with my computer?
- What extra components do I need?
- Where should I purchase any extra components?
- Should I buy a new or used computer?

**Do I Buy the System or the Software First?**

You need to decide whether to purchase a system first and then choose your software, or vice versa. The way you answer this question depends greatly on your previous experience; generally, however, the best plan is first to consider the types of software you need and then to choose the machine your software runs on.

Another consideration comes into play, however. You want to make sure that the computer system you purchase is not outdated or so limited that you can run only that single software program you purchase. You probably will want to get a system that provides you with the means of expanding your software repertoire and building on your computerized applications. For example, suppose that you are enamored with a particular
spreadsheet, which enables you to punch out your taxes quickly without headaches or perspiration, so you purchase the software and the computer that runs it.

You need to make sure, however, that your system has a variety of software available. You may want only to work with your taxes now, but eventually you may want to write letters, play games, balance your checkbook: you need to make sure that your system gives you room to grow. Generally, unless you have to conform to a certain hardware standard (that is, all systems in your office are a particular type, such as Apples or IBMs), you should find the software you like first and then choose the system that runs that software.

What Will I Use My Computer For?

For you, the answer to this question may be one word or several paragraphs. From the practical side, you may be purchasing your computer basically to automate one task. You may want only to keep track of monthly expenses, to be able to write and reuse correspondence to clients, to organize student names and addresses, or to publish simple newsletters.

If you use your imagination, however, you will come up with a variety of other uses. In addition to the bookkeeping in your business, you soon will realize that your computer allows you to put out routine correspondence in a quarter of the time typing required. You will see that the graphs you can produce really make the spreadsheets hit home; you will recognize that printing mailing labels from a computerized database saves hours of time you previously thought lost to a necessary—but boring—task.

The best thing you can do before you start some serious shopping is a little dreaming. In the best possible world, if the computer is within your budget, what types of things would you like it to do? For many of us, of course, the first answer to that question would be "Do my job, answer my phone, and take care of my life while I go to Hawaii." Once the fantasy clears, however, you realize that computers can perform some incredible real-life tasks. The following lists give you an idea of the variety of business tasks a personal computer can help you carry out:
Part II: Prepurchase Considerations

☐ Writing and publishing
  Writing and editing business and personal letters
  Producing reports, proposals, and contracts
  Publishing training materials
  Creating advertising copy
  Laying out and typesetting ads
  Printing fliers and brochures
  Creating company logos, letterhead, and business cards
  Writing and publishing invitations

☐ Managing financial tasks
  Performing general ledger accounting
  Tracking accounts payable
  Tracking accounts receivable
  Preparing tax worksheets
  Preparing payroll worksheets
  Performing cost analysis
  Preparing profit and loss statements
  Preparing balance sheets
  Preparing year-end reports
  Balancing your checkbook
  Planning a major purchase

☐ Managing data
  Creating and maintaining client lists
  Recording personnel information
  Maintaining inventory
  Creating an ordering system
  Organizing your CD collection
  Keeping track of names and addresses of friends and relatives

This list covers only a few of the applications personal computers can perform. In addition to writing, number-crunching, and data managing, businesses need computers to create sophisticated graphics, connect to other computers, create presentation materials, and handle a variety of other tasks.
Remember, not all programs run on all computers. Once you find a program you are happy with, make sure that you find a computer that runs the software.

How Much Do I Have To Spend?

No matter what you're purchasing, cost is always a consideration. How much money you have—or don't have—will have a significant effect on the type of system you purchase. No matter what terrific tasks you want your computer to perform, if you don't have the funding to back up your wishes, you may have to settle for something less.

As you make your wish list, keep an eye on your budget. Remember that the faster and newer the technology, the more expensive the price tag. Yet if you consider your options before purchasing, you may be able to be in the right place at the right time to pick up a powerful system for a relatively low cost.

The first step is to rid yourself of any purchasing myths you may have picked up along the way. Here are a few points to remember as you begin this planning stage:

- Bigger isn't necessarily better.

  Once upon a time, people believed that the bigger the system, the more capabilities it had. This adage was applied to computers (mainframes compared to personal computers) as well as peripheral devices such as printers, hard disks, and monitors. Based on that perspective, in order to get a top-of-the-line system, you would have to fill your office—or at the very least, your desk—with computer equipment. Fortunately, as technology has evolved, computer equipment was developed with a "smaller footprint." That is, a computer with a smaller footprint takes up less space on your desk (or under your desk).

- Smaller does not mean less expensive.

  Along with this movement toward smaller equipment came an increase in the technology (and therefore the cost) of computers and peripheral equipment. If you have ever
perused the pages of the *Computer Shopper* hoping to find a laptop computer for next to nothing, you may have been unpleasantly surprised. Laptops—particularly the more well-endowed models—can cost as much or more than a comparable full-sized personal computer. No matter which type of computer you purchase, you pay more for the smaller, more streamlined models than you will for an older, albeit clunkier, machine, because the technology in the scaled-down components costs more to produce.

- Brand name computers aren't the only computers worth buying.

When personal computers were first introduced, the major competitors in the market were IBM and Apple, with Tandy, Commodore, and Texas Instruments not too far behind. Because these computers were the only ones available (besides the totally home-grown variety assembled by technoids using bits and pieces of hardware), the manufacturers could expect a pretty hefty price for their machines. Not long after the IBM PC took off, other computer companies began developing computers that emulated the technology—at a lower price. These computers were known as *clones*, because they essentially cloned the technology without the expensive label. IBM clones are available in abundance for the IBM personal computers, but because of the *closed technology* of Apple and Macintosh computers (meaning that other manufacturers cannot copy the design), few computer manufacturers have been able to develop a machine that can be called an Apple or Macintosh clone. For more information about clones versus the "real thing," see the section "Do I want a PC, an Apple, a Mac, or PC Clone?" later in this chapter.

Table 4.1 highlights some costs you should consider as you think about budgeting in your personal computer.
Table 4.1.
Computer Setup Costs

Before Purchase

Cost (in hours) of researching which equipment to buy

Cost (in dollars) of hiring a consultant to evaluate your computer needs and to recommend hardware and software purchases

At Purchase

Initial outlay for hardware, including system unit, monitor, printer, and any "extras" (called peripherals) such as a modem, scanner, or mouse

Initial outlay for software, including the operating system, applications software (such as a word processing, spreadsheet, database, or graphics program)

The optional purchase of an extended warranty plan (Virtually all new computers include some sort of warranty, but many companies offer an extended warranty for an additional cost.)

After Purchase

Cost (in hours) of down time while the computer is being set up and checked out (Of course, down time is more important in business and school environments than in home use.)

Cost (in dollars and time) invested in hardware and software training (whether you hire a consultant to do the training, or you explore the system and programs yourself)

Productivity cost while you and your employees get up to speed using the new equipment and software

The minimal costs of supplies such as electricity, printer paper, print ribbons, and toner cartridges (used with laser printers)
Where Will I Use My Computer?

Another question you should ask yourself is where you will be using your computer. If you will be using your computer at the office, you have one set of considerations to deliberate; at home, there's a different set.

☐ At the office

If you will be using your computer at the office (and you are allowed to choose your own system), think about where in the office you will be working. Will you use the computer at your desk? If so, depending on the size of your desk (and how much you use your desk), you may want to get a “small footprint” machine so that you can position the PC on the desktop and still have the maximum amount of desk space available for the usual desk clutter. If you are extremely protective of desk space, you may want to consider purchasing a tower computer system, in which the system unit stands vertically on one end (see fig. 4.1). In your office, you may have a separate desk or workstation at which you will do your computing. If this is the case, the size of the system isn't a big consideration.

Note: You can place the system unit of almost any PC-style computer vertically if you want to. For extended periods of time, however, this position can cause wear and tear on the hard disk. You can buy stands designed specifically to hold the system unit.

☐ At home

If you plan to use your computer at home, flexibility may be more of an issue for you. Do you need a computer you can move around easily, or will you be setting up a workstation in your home and working there consistently? Will you be taking your computer back and forth to work?

Once again, if you are setting up a workstation, you can basically buy any size system that suits you. If you need to be able to move the computer from room to room, or if you plan to take your computer back and forth to work, you need something small enough to travel. A portable
computer, like the COMPAQ 386, or a laptop, like one of the NEC laptops, is small and light enough to allow you to tote the system around without too much effort. The next section, "What Size System Do I Need?" explains more about portable and laptop computers.

What Size System Do I Need?

As you have probably gathered from other questions in this chapter, computers come in a variety of shapes and sizes. Small and smaller, large and humongous, portable and immovable. From the largest mainframe computer to the smallest personal computer (that may be the Wrist Mac, a wrist-attachable Macintosh with a one-inch monitor), you can find a system with the "footprint" and the capabilities you need.

The three basic computer types explained in this section are

- Personal computers
Personal Computer

Chapter 1 introduces you to the basics of the personal computer. As you know, the personal computer is available in many sizes—from a large desk-hogging model to the newer small-footprint models that require less space on your desk. Figure 4.2 shows a typical personal computer.

![A personal computer.](image)

A new trend seems to be moving toward “tower technology,” where the system unit is designed to stand on end, giving you more elbow room and freeing up your desktop (although you still need somewhere to put your other equipment, such as the monitor, printer, and mouse). The IBM PS/2 Model 60 was one of the first “big” systems to use this tower technology (see fig. 4.3). Many users put the system unit under their desks, where the unit is really out of the way.

Portable Computer

A portable computer, like the one shown in figure 4.4, allows you to take your work with you—for a small cost in time and effort.
Most portable computers are, in fact, *portable*—although they aren't as easy to tote as their smaller counterpart, the laptop. Several good portables are available, the forerunner of which is made by COMPAQ, a leading IBM-compatible computer manufacturer.
Technically speaking, every personal computer is "portable." Most computers, however, are not easily portable. One of the first popular portable computers (the now defunct Osborne) was designed as an all-in-one unit: the system unit, mini-monitor, and keyboard all fit together in one nice portable (but heavy) unit, complete with handle. This design allowed the dedicated computerist to take the office along—on the airplane, to the races, anywhere. All you needed at your destination was a hefty power outlet and a rather large desktop. In those days, the "small footprint" standard was still a gleam in a manufacturer's eye.

Today several popular portable computers are on the market. COMPAQ Computer Corporation has been a leader in making portable, desktop, and laptop computers for years. Generally, portable computers have become increasingly powerful, lighter, and easier to manipulate. For real bite-sized power, however, you need to look at laptops.

**Laptop Computer**

The laptop computer has escalated into superstardom within the last year. Why? Portability at its best. At 9 to 12 pounds, with capabilities ranging from a bare-bones system (one disk drive, LCD display) to a beefed-up system powerful enough to rival an expensive 386 system, the laptop computer allows you to take the office with you.

Laptops were created for people who find it hard to leave their computers behind. Going in the car? Plug the system into the cigarette lighter. Heading out to the beach? Take the laptop along and use the battery pack. Your laptop computer can travel virtually anywhere you can—whether you are cramped on the subway or relaxing in the sun on the Queen Mary.

Whether your journey takes you on a train, boat, plane, or automobile; whether you wind up in Franklin, Indiana, or Fiji, your laptop computer can go with you with a minimum of fuss and bother. The laptop computer can be operated from batteries, so even electricity is not mandatory. (You will need a considerable supply of batteries, however; most batteries can stand up to only eight hours or fewer of consistent computer use without recharging.) Figure 4.5 shows a popular laptop computer.
If you need real portability in your machine, a laptop may be your answer. With a modem, access to a printer, and the software you need (on 3.5-inch disks), you can have in your laptop a workstation as powerful as any in an office environment. Additionally, you can hook most laptops to standard monitors, so you don't lose any display quality for the sake of portability.

With laptop computers, looks are deceiving. To the untrained eye, they look simple and inexpensive. They don't have as much hardware, so a laptop computer shouldn't cost as much. Unfortunately, the technology doesn't work that way. In reality, you can pay as much for a powerful laptop as you can for an equally powerful desktop computer—and perhaps even a little more.

Who Else Will Use My Computer?

One major consideration you need to look into before you buy relates to who—if anyone—will be using your computer besides you. For example, if you are responsible for purchasing a computer system (or systems) for a large company, you need to think about which system will best fit the needs and learning curves of all users. Even though you may prefer an IBM system and are comfortable with DOS, you may be in a position to purchase systems for many people who have never used computers before.
Think about the other people who will be using the computer or computers you purchase. Consider also the applications they will be working on. Look at the following example.

Jeff is responsible for purchasing computers for his small advertising agency. Although initially he wanted a computer for desktop publishing in order to reduce the cost of laying out and producing advertising copy, he soon realized that other people in the office would benefit from computers as well. He decided to purchase one computer for his bookkeeper, one for the layout person, one for the graphic artist, and one for his administrative assistant (who is in charge of all scheduling and maintaining data files on clients).

Each person will perform a different task with the new computer. Here's a list of their applications:

- The bookkeeper will use a spreadsheet program to keep track of all accounts receivables and payables, create balance sheets, publish weekly and monthly reports, supply tax information, and compute and print payroll checks.
- The graphic artist will use a sophisticated graphics program to create artwork for the ads.
- The layout person will combine the art generated by the graphic artist with text written by the copywriter. These elements will form an effective layout.
- The administrative assistant will use a database program to keep track of all client information, a scheduling program to record and display information related to project tracking and client meetings, and a word processor to generate letters to clients.

Of all these people, only the graphic artist has any previous computer experience. Jeff has worked with computers for years and is comfortable finding his way around using DOS commands and working with a variety of programs. Which computer will he buy? Should he purchase systems (and software) built around the "easy for anyone to use" philosophy or the "just simple enough so I can decipher it" philosophy? Because he is running a small business that relies heavily on the productivity of his employees (and he cannot spend an incredible amount of time and money in training), going for "easy to use" is a good move. The best way to solve his dilemma is to consider the software he needs and purchase "easy to use" systems that support the software he
requires. For his purposes, Jeff decides on Macintoshes for everyone—with Microsoft Works for the bookkeeper and the administrative assistant, Aldus PageMaker 4.0 for the layout person, and Aldus Freehand for the artist.

**Does My System Need To Be Compatible with Others at Work or Home?**

You also need to consider the compatibility issue. In other words, does your company already use a specific brand of personal computers? If so, you may want to stick with the type already in use (IBM, Apple, Mac) in order to be compatible with the programs and data already on the existing machines. (However, particularly with IBM and Mac, several popular programs exchange data—and the newer Macintoshes can read files created under any one of several leading operating systems.)

In early PC days, if you created a file on an IBM, you had to use the file on an IBM. If you worked with a Macintosh, you had better stick with it, unless you wanted to go through all kinds of hoops in order to convert your data into a format usable by another type of computer. Today, that usability gap is slowly closing. With the advent of the new Macintoshes and the sprouting of operating systems other than those “chosen” previously by IBM and Apple, applications are becoming more generous concerning who can use which file on what machine.

For a moment, suppose that you are a major software developer. Your company produces a popular product—so popular, in fact, that both IBM and Mac users want it on their machines. What do you benefit by keeping your product in only one arena? The answer is that you don’t benefit. You lose an incredible marketing opportunity and miss the chance of appeasing thousands of people fighting the compatibility issue. So you develop your software so that different—but compatible—versions of the program can run in either Macintosh or IBM environments—and the files created in those programs can be used on either machine. This compatibility makes things much easier for end users and jumps right over the compatibility barrier. Certainly this trend is the wave of the future.
Aldus Corporation's PageMaker does just that. This product, a successful desktop publishing program, can be run on either a Macintosh or an IBM (or a clone). Although different versions of the program exist for the different machines (in order to make use of the different operating systems), the files are usable in either machine.

For many applications, however, the program is available for only one genre of machines. A program that runs under DOS on an IBM, for example, will not be understood by an Apple IIgs. Likewise, a file you created on an Apple cannot be read by an IBM. For more information about operating systems and software, see Chapter 10, "Getting Familiar with the Operating System," and Part IV, "A Software Review."

Will My Computer Meet My Future Needs?

The advice here is simple: Don't buy a dinosaur. The deal that says, "Buy this computer for $99 bucks and get a free car wash," sounds good for the pocketbook, but chances are that the system is on its way out and will not be around in a year—with no replacement parts in sight. To luck in on a clearance sale is great now, but when you are talking about a product as complicated as a personal computer, having no technical support down the road can be devastating. Be sure that you purchase a system from a company you can depend on to be around for a long time (particularly if you have no technical savvy). Don't purchase a system from a computer company that wasn't here yesterday—because it may not be around tomorrow.

Another computer expansion question involves the individual capabilities of the system you are considering. Perhaps now you think that your computer use will be limited to one or two applications—maybe spreadsheets, maybe word processing—but down the road a bit you may wish that you could do a little desktop publishing. Will you be able to add memory to your system? Will adding a board to the computer present a problem? Be sure that you dream a little about what you might want your computer to do eventually—and purchase a system that gives you at least the option of expanding your computer repertoire.
Do I want a PC, Apple, Mac, or PC Clone?

Here's a hard decision. People tend to gather under the banner of one computer type or another. The three different types have very large and passionate fan clubs. Because of the lessening of the compatibility gap, however, this decision is less ominous than it used to be.

Getting Around the Incompatibility Issue

In the past, when you chose one of these systems over another, you were stuck with your decision. With your choice of computer came the limitation of being able to use only software for that computer type. For example, if you decided on a Macintosh, you got all the great qualities of the Mac, but you couldn't use IBM programs. What if a company introduces a knock-out program that runs under DOS and would take care of every software need you ever had... but here you are sitting with your Macintosh. Now what do you do? In the past, you had to grin and bear it. Today, other options allow you to get from there to here.

You have several methods of getting around the incompatibility problem with today's computers. The first is a file transfer program, which allows you to read a DOS file on a Macintosh (and vice versa). The second is a hardware fix—that is, installing a board inside your computer that can allow your computer to run and work with data from both PC and Mac applications. The third method is to rely on the progressive thinking of the software manufacturers and hope that the makers of your favorite software develop versions for your machine. Another option is to purchase a system capable of using data produced under a variety of operating systems, like the Mac SE/30.

Choosing IBM, Apple, or Mac

So much at the apex of the decision comes down to your personal preference. Have you ever used DOS? Would you be more
comfortable with a graphical interface that allows you to select programs and files by simply clicking them (Macintosh and Apple)? Do you find the graphics interface restrictive, preferring to get "into" your computer by using various DOS commands (PC)? Is the software you want to use available for both types of systems? If not, is a comparable program available for the system you prefer?

Some people prefer the IBM for writing tasks and the Macintosh for graphics work. Other true-blue die-hards feel that the IBM is great for everything; and on the flip side, some Mac enthusiasts claim their fingers would wither and fall off if they ever touched an IBM keyboard. The Apple family is a great line of computers—from the Apple II to the IIGs—but they are not used widely for sophisticated business uses. Generally, education, home, and small-business applications work best for the Apples. You usually see power users gravitating toward IBMs (or IBM-compatibles) or Macintoshes.

**Considering a PC Clone**

IBM clones were first on the market, emulating the limited power of the original PC and offering the technology at a lower cost. Because of the way the Macintoshes are designed replicating the design of the Mac hardware and user interface is difficult, if not impossible. Fewer clones are available for the Mac, but a few are available.

What do you lose when you purchase a PC clone as opposed to a name brand? Hopefully, nothing. You will probably lose some of the cost (not an unpleasant thought), but if you shop wisely, you should still be able to get all the capabilities, the support, and the expansion possibilities that are available with a name brand computer.

**What Components Come with My Computer?**

Sometimes, the "pieces" that are included in a computer system are not obvious. When you buy a computer, what are you actually buying? Is the computer the system unit? Does that include the monitor? Disk drives?
The answers to these questions depend on where you are purchasing the system. If you are buying a system piece-by-piece from a mail-order outfit or choosing elements from the *Computer Shopper*, you should expect to get the components the way you ordered them—piece-by-piece. If you are purchasing the equipment from a retail computer store, you may be purchasing a "complete" system; that is, one with a monitor, a system unit, disk drives, and a mouse. Perhaps even a printer may be thrown in. As with anything else, be sure that you know exactly what you are getting and how much you are paying for each component.

Generally, you will buy the elements in your computer system separately. You certainly have the option of doing so, even if the system you are considering is being advertised as a "complete deal." Check around and make sure that you are getting exactly what you want for each component. If you buy everything separately, you will be purchasing most of the following items:

- The system unit (that may or may not include a floppy disk and a hard disk or two floppy disks)
- Disk drives (if necessary)
- A hard disk (if not included with the system unit)
- The keyboard
- The monitor
- Any extra memory
- A modem
- A mouse
- A printer
- Extra devices such as a scanner, plotter, or graphics tablet
- The operating system
- The applications software

If you plan to purchase all these items separately, be sure that you get the cables necessary for assembling the system. Make sure that each item which attaches to the system unit includes the cable it needs; if any cables are missing, be sure to contact the dealer right away. For more information about assembling your system, see Part III.
What Extra Components Do I Need To Add?

You can buy just the basic system: system unit, monitor, disk drives, operating system, and software. But you also need to ask yourself whether you will need printed output (almost everyone needs some means of printing the information entered into the computer). Additionally, you may decide to get a modem, which allows you to connect to other computers and to information services like CompuServe and Dialog.

A scanner is great for getting logos and other forms of artwork into your computer, where you can work with them and include them in brochures, newsletters, and advertising fliers. You may or may not need these kinds of capabilities in the basic system you purchase.

Your need for a mouse is really determined by the type of software you choose. Not having a mouse with a Macintosh is unthinkable; and mice are rapidly finding their way into the majority of popular PC applications as well. For all kinds of applications—from spreadsheets and word processors to games—the mouse is becoming a faster and more efficient means of selecting commands and making menu selections.

Where Should I Purchase Any Extra Components?

The best way to answer this question is to look at your options. Can you get these “extra” components somewhere else for a lower price? If so, will you be able to get support on these items if you need support? You don’t want to buy some obsolete printer from a company that has one foot out the door—you will not be able to get parts if something goes wrong if you cannot find the company.

Generally, look at these three issues when you are considering where to purchase extras:

- Cost
- Support
- Quality
There's nothing surprising in the statement that you get what you pay for. If you want a quality product, you have to pay for a quality product. And if you want support for the product you buy (in other words, you want to have someone to scream "Help!" to when something goes wrong), you also pay for that benefit. Both quality and support are essential issues when you are considering a computer purchase.

Before you buy, check product reviews in popular computer magazines, such as PC, Byte, MacWorld, InfoWorld, and Computer Shopper. As you think about where you will buy your system and whether you will buy it all in one place or purchase pieces from the places with the best prices, ask yourself whether the cost is worth the support and quality you will be getting. If the answer is yes, and you can afford the cost, you will wind up with a great product and a support team to back you up. If the answer is no, you had better keep shopping.

Should I Buy a New or Used Computer?

Most people ignore the option of buying a used computer. Even if you plan to use your computer only for home, school, or for occasional business tasks, buying a used computer may be a bit of a risk. Although at the outset, buying a used computer may seem the cheaper way to go, you may wind up paying more in replacement parts if things start going bad with your recycled machine. If you are really starting on a shoestring and you can get some kind of a warranty from the place selling the used equipment, you may be able to solve your computer problem with a used computer. You can find used computers listed in trade papers, on school bulletin boards, or at local user groups. Be careful, however, and be sure to have an expert check the system out. Many retail computer outlets offer technical support; you can have a licensed technician check the system for you.
Using Your Resources

As you start your computer education, the best advice you can get is to use all the resources available to you and find out everything you can before you buy. You will quickly discover that the amount of information—and the range of choices—is overwhelming. However, knowing is better than not knowing, even if “knowing” makes your choice more complex. Generally, count on these resources as you gather data for your choice.

- Personal experience

  The personal experience of other people can be invaluable for you. You can learn from their mistakes without making the same ones yourself. Ask friends and co-workers which systems they prefer and why. Find a business similar to yours and take a look at the systems. Why did the company select the system? How much did the equipment cost? How much does the system benefit the business? What software does the business use?

  Learning by example has always been the best way to learn. Look around and talk to other computer users. They will be glad to tell you what works—or doesn’t work—for them. Don’t make your decision based wholly on what others tell you, however. The final test is how comfortable you are with your new machine and what applications work best in your particular situation.

- Computer magazines

  As you may know, there are many publications—weekly, monthly, bimonthly, and quarterly—that can inform you about which system you should buy. Several magazines focus entirely on PC, Apple, or Macintosh systems, and other magazines are centered around general applications, such as Home Computing, Games, and Personal Publishing. Other excellent magazines are PC, PC World, Byte, MacUser, MacWorld, PC Computing, InfoWorld, and Publish! Many of the leading computer magazine publishers do an excellent job of reviewing and summarizing the features of various computer products. These magazines are probably your single best source of information as you compare the capabilities of the hardware and software you buy.
User groups

A computer user group consists of die-hard fans who come together to meet about one particular computer type. For example, there are PC, Apple, Macintosh, Atari, and Commodore user groups (and, undoubtedly, many more than these). When you attend one of these groups, you can get many answers about the products you are investigating. To find out about user groups in your area, consult the phone book, ask your local dealer, contact a local bulletin board service, or talk to other users.

Retail outlets

When you approach a retail computer outlet, go in with a list of questions about the products you are exploring. Ask to see demonstrations of the machines; find out about the features that interest you and ask which features will be best for the type of application you need. Although you will pay more if you purchase your computer from a retail outlet, you probably can be assured of technical support for your equipment and a reasonable amount of software support, as well. In your investigation stage, however, you don't have to commit your loyalty to any one store or resource.

Before You Buy...

The best advice at this point is to exhaust your resources before you invest in your computer system. Before you commit to a specific computer brand or to a particular application program, tap into these resources:

- Read computer magazines that cover a variety of computer types and applications—especially pick up on the reviews of current hardware and software.

  Some of the better magazines are PC, PC World, Byte, MacUser, MacWorld, PC Computing, InfoWorld, Publish!, Home Computing, Games, and Personal Publishing.

- Talk to friends and business associates about the types of computers they use and how satisfied (or dissatisfied) they are with those systems.
Find a computer user group in your area and attend. Groups are available—everywhere—for all the most popular computer types. Remember, however, that although you will certainly hear about the strong points of each group's computer of choice, you may not get the most objective viewpoint at a user group.

Go to a local computer store and have a salesperson demonstrate each type of computer for you. Ask to see how the different operating systems work, and don't be afraid to ask questions.

And when you have found out everything you need in order to make your decision for IBM, Apple, Mac, or PC clone, the final decision comes down to one factor: personal preference. Just find the software you need to get the job done, the computer you are most comfortable with (that runs the software you want), and write the check.

Conclusion

In this chapter, you have seen a variety of elements to think about as you get ready to purchase your computer system. From a basic section on how to determine what you want from your computer to more specialized discussions of budgeting, finding the system type you want, and using your resources, this chapter has taken you a few steps closer to purchasing your system. In the next chapter, you learn more about the similarities and differences of the basic system and explore the various monitor types available.
By now, you have probably made some preliminary decisions about the basic type of system you want (Apple, Mac, or PC). You have probably also thought about the types of programs you will need for the computer (word processing, spreadsheet, or database programs) and the general price range your budget allows.

Now that you have mulled over those various purchasing considerations, you are ready to ease into some serious investigation of specific computer systems. This chapter helps you narrow your field of possibilities by helping you focus on the qualities you need most in a system. Is speed a major factor? Do you need a particular type of system in order to be compatible with others in your office?

As you think about putting your system together, you need to think about what this system is going to do. Think also about what it will do for you or your business in the future. Consider what types of software you may be partial to and—more important—what types of programs you need most for your business or personal use. Be sure, also, that you find out which machines run the software you plan on purchasing.
This chapter helps you make better-informed decisions about the type of computer you need for your specific applications by helping you answer the following questions:

- What model do I want?
- Should I mix and match components?
- How fast should my computer be?
- How much memory do I need?
- How many disk drives do I need?
- What type of monitor do I want for my computer?
- What programs can I run on my computer?
- Do I need to connect my system with other computers?
- What support is offered?

Deciding Whether To Choose Software First

When you buy a computer, should you choose the software first, and then pick the right computer to run the software? Some people say yes, some say no.

Generally, the best policy is to consider all your options and make the choices that best meet your needs. Choosing software first can help you reach a decision, however. Suppose, for example, that you need an accounting program to help you organize the bookkeeping system in your small office. If your office is a stand-alone business that does not need to share files or data with another office, you can make your software choice simply by deciding which program you like best. If you are part of a large chain of offices that must share information and programs, your choice is limited to what other office managers are using. In that case, compatibility between programs becomes an important point: you must purchase a program—and a computer—that will enable you to swap files with the other offices. You must either buy the same software and hardware or be sure to get programs and computers that allow you the compatibility you need.
Some people prefer to choose software first. Finding a Macintosh program that does everything you need (except dishes) is a good argument for investing in a Macintosh. Discovering that you are a born-to-publish Ventura Publisher natural may prompt you to spend your computer budget on a PC system.

When making computer choices, many people are simply “born” into one camp or the other. “I like the way IBM does things—always on the leading edge,” or “The Macintosh makes learning and using the computer nonthreatening and friendly. That’s the best choice for this office.”

Other people haven’t formed decisions, and the process of eliminating systems can be long and complicated. If you are having trouble deciding which basic computer type is for you, your preference for software can serve as a tie-breaker. For example, suppose that you have been assigned the position of New Products Publications Specialist, and as part of your job, you must produce desktop published materials on each new product your company introduces. You have been given the responsibility of finding and choosing a relatively inexpensive computer on which to publish the materials. The company wants to spend only a small amount of money to produce these simple one-page fliers.

You are torn between purchasing an IBM AT clone or an Apple. You have weighed every factor, and although the Apple is a little more expensive, you are leaning in that direction. In the midst of your confusion, a friend tells you about an easy-to-use desktop publishing product called PFS:First Publisher, which does everything you need to do in publishing the new-product fliers. However, the program runs only on IBM (DOS) computers. Your options are (1) purchase the IBM system and First Publisher, (2) choose the Apple system and purchase a different desktop publishing product with similar features, and (3) wait and shop around for additional hardware and software to further complicate your decision.

If you aren’t required to purchase a particular software program, and you haven’t found one that meets all your needs, you may want to decide on hardware first and then find software that runs on the computer you choose.
Deciding on a Basic Computer System

Most small-business and home applications can be handled by a single desktop (or floor-standing) computer that is used by one person (see fig. 5.1). The basic structure of the system is a box (called the system unit) that houses the memory, disk drive (or drives), and other special devices. Attached to the box are a keyboard and perhaps a mouse. The display screen, called the monitor, allows you to see what's going on. (Both the system unit and monitors are discussed in this chapter.) Because you need printed output (for example, printed reports, mailing labels, newsletters, balance sheets, and so on), you also need a printer.

Fig. 5.1. A basic computer system.

All desktop computers are a combination of these same basic ingredients. However, the speed at which computers process information, the amount of memory they include, and the design of the components make each computer type distinctly individual. In the PC, Apple, and Macintosh worlds, an evolution toward greater speed and storage has taken place since each machine was first introduced.
If all this information sounds like a rather overwhelming smorgasbord of computer bits and pieces, don't be alarmed: buying a computer can be as easy as you want it to be. Buying a computer takes one of two approaches. For new users, the "package deal" is best—you can purchase a specific model of computer that comes with the system unit, monitor, disk drives, and sometimes even the printer (see the next section, "What Model Do I Need"). On the other hand, many experienced users prefer to mix and match components by purchasing a monitor from one manufacturer, a system unit, drives, and memory from another, and so on. For the technologically intimidated, this mix-and-match approach is, at best, frightening.

If you are a new user, consider searching out a manufacturer or retailer who sells and services complete systems. Then, after exploring that route, if you can't find a system with the capabilities you want and can afford, you can do a little more research and buy different components from different manufacturers. (For more information about putting systems together, see "Should I Mix and Match Components?" later in this chapter.)

**What Model Do I Need?**

Fortunately, putting a computer system together is no longer a process only for the electronically sophisticated user. Before the first "real" personal computers, the only way you could assemble a desktop computer was to build it from a variety of electronic parts. Today, you can walk into a computer store and walk out with a complete system. If you prefer, you can purchase your computer by mail order, or you can telephone your order directly to a manufacturer and have the computer delivered to your home or office.

When you walk into your neighborhood retail computer store, you see a variety of systems on display. Depending on the types of computers the store carries, you may see Apples, Macs, IBMs, and a variety of IBM-compatible computers including COMPAQs, Epsons, and Toshibas. With each major brand-name computer,
however, you still have a few choices to make. Suppose that you decide that you want an IBM computer...but which IBM? As you look around, you will see that IBM offers many different computer models from which you can choose.

Most major computer manufacturers create several different computer models. This variety eliminates the need for shopping for various components and piecing computers together bit by bit (or chip by chip). You simply purchase the model that has the components you want. For example, in the IBM PS/2 line, many different models are available, each with different components. Consider this comparison of two IBM PS/2 models:

<table>
<thead>
<tr>
<th>IBM PS/2 Model 25</th>
<th>IBM PS/2 Model 80-041</th>
</tr>
</thead>
<tbody>
<tr>
<td>System unit (with 12-inch built-in analog monitor)</td>
<td>System (tower) unit</td>
</tr>
<tr>
<td>MCGA adapter on motherboard</td>
<td>VGA adapter¹</td>
</tr>
<tr>
<td>512K memory</td>
<td>1M memory (expandable to 16M)</td>
</tr>
<tr>
<td>One 720K 3.5-inch disk drive</td>
<td>One 1.44M 3.5-inch drive</td>
</tr>
<tr>
<td>84-key “space saving” keyboard</td>
<td>101-key keyboard</td>
</tr>
</tbody>
</table>

The Macintosh is available in several different models as well. The following list compares two of the more popular Macintosh models:

<table>
<thead>
<tr>
<th>Macintosh SE/30</th>
<th>Macintosh IIcx</th>
</tr>
</thead>
<tbody>
<tr>
<td>System unit</td>
<td>System unit</td>
</tr>
<tr>
<td>1M memory</td>
<td>1M memory</td>
</tr>
<tr>
<td>One 1.44 floppy disk drive</td>
<td>One 1.44 floppy disk drive</td>
</tr>
<tr>
<td>One hard disk drive</td>
<td>One hard disk drive</td>
</tr>
<tr>
<td>Built-in 9-inch monitor</td>
<td>External color monitor</td>
</tr>
<tr>
<td>Mouse</td>
<td>Mouse</td>
</tr>
<tr>
<td>Keyboard</td>
<td>Keyboard</td>
</tr>
</tbody>
</table>

¹ The monitor is sold separately.
Chapter 5: Purchasing a Computer System

The next list introduces the components of two popular Apple models:

<table>
<thead>
<tr>
<th>Apple IIgs</th>
<th>Apple IIe</th>
</tr>
</thead>
<tbody>
<tr>
<td>System unit</td>
<td>System unit/keyboard</td>
</tr>
<tr>
<td>512K memory</td>
<td>64K memory</td>
</tr>
<tr>
<td>Keyboard</td>
<td>80-column card</td>
</tr>
<tr>
<td>Disk drive</td>
<td>Monochrome monitor</td>
</tr>
<tr>
<td>Mouse</td>
<td>Disk controller card one disk drive</td>
</tr>
</tbody>
</table>

Should I Mix and Match Components?

As mentioned earlier in this chapter, some experienced computer users prefer to assemble or add to their computers by purchasing components from a variety of sources. Most people who mix and match get the parts by mail order—ordering a system unit, keyboard, and perhaps memory chips from one manufacturer; choosing a monitor from another; and perhaps buying disk drives from yet another. And some people build the system unit itself from components—a motherboard, box, power supply, and so on. Other people purchase entire systems (either by mail order or from a retail outlet) and then later add other items, such as a hard disk drive, a printer, or a mouse.

Two major caveats apply when you are considering the mix-and-match approach to purchasing a computer system:

- If you are inexperienced, have an experienced user or technical support person check your list before you order. Make sure that all the items you order will work together and that you are ordering everything you need.

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1 In the Apple IIe and Apple IIc, the keyboard is built into the system unit.

2 The basic Apple IIgs offered in your area may not include a disk drive; you may need to purchase one or two disk drives (either 5.25-inch or 3.5-inch) separately. Additionally, you need to purchase a compatible monitor to go with the IIgs.
Check out the manufacturer before you buy, especially if you are purchasing sight-unseen. Has the seller been in business long? Where does the company get equipment? Do the sellers offer a warranty? If so, how long? Several years ago, retail computer stores were a “can't lose” choice; you could see and work with the system before you bought it; and once you got the system home, you could call the store for help if something didn't work the way it should. Today, most retail stores continue that same service, but a great number of users prefer to cut out the retail costs and buy their systems through wholesale catalogs or order by mail from ads in popular computer magazines. Whether you are buying a complete system from one manufacturer or putting a system together by purchasing parts from different manufacturers, be sure to find out about the suppliers before you order.

Whether you decide to purchase an entire system or you want to assemble one from various components, you still have several questions to answer. Which model do you need? Which components make up your ideal system? The following sections help you decide which features are important. For instance, before you can decide between a particular model with 512K of RAM or one with 1M of RAM, you need to know how memory affects your computer use. The next sections address other purchasing concerns.

**How Fast Should My Computer Be?**

As you may recall from Chapter 3, inside the system unit is the “brain” of the computer system, known as the CPU (central processing unit), or the microprocessor.

At the most basic level, the speed capabilities of the microprocessor control the speed of the system, although other factors also affect the speed. (These other considerations, such as the data path, are explained later in this chapter.) The speed of the microprocessor is measured in megahertz (Mhz), or millions of cycles per second.
To you, the speed issue means how quickly your computer can start a program, save a file, or perform a variety of other tasks. The faster the speed of the microprocessor, the quicker your machine will be.

The three computer types discussed throughout this book—PC, Apple, and Macintosh—have different types of CPUs. Each has a different way a processing information, a different speed, and different capabilities. This section looks closely at each of these CPU considerations.

How Does the CPU Work?

As stressed many times in the course of this book, the CPU, or central processing unit, is the “brain” of your computer. The CPU is the single chip that makes your computer work; without this chip, the system would be nothing more than an expensive paperweight. The CPU controls all the calculating and processing that happens within your computer; the CPU also regulates and communicates information internally (running memory cards, communicating with RAM, and so on) and externally (controlling external devices such as the printer, mouse, modem, plotter, and so on).

Basically, the CPU sends the information along a data path to the various components—internal or external. The instructions on the chip that tell the computer how to send the data are known as the data bus. Different CPUs have different kinds of data buses—some process information faster than others. Generally, like everything else related to computers (and racing cars), we started with what we thought was a speed demon (the 8086 CPU in the first PC) and progressively bettered each standard.

How quickly the CPU processes information is related basically to two factors: the speed at which the CPU is capable of operating (in megahertz) and the width of the path along which the data is sent. Data paths can be 8 bits (meaning that the computer can send 8 bits of data at once), 16 bits, or 32 bits wide (see fig. 5.2).

Perhaps an analogy will help: Think of the speed of the computer in terms of the amount of water (gallons per minute) that can go through a garden hose. An 8-bit data path can simultaneously use 8 garden hoses for filling a pool; a 16-bit data path uses 16 hoses, and a 32-bit data path uses 32 hoses. If all the hoses operate at the
same speed, which data path works faster? Obviously, the 32-bit (or 32-hose) data path gets the job done more quickly.

If you are new to computers, the term CPU may sound too much like computerese for comfort. You should know some things about the CPU, however, before you purchase your computer. The capabilities of the CPU in your system will have a great effect on the speed of the computer and will also affect the type of software you can use with your computer.

**PCs and CPUs**

The first PCs were equipped with 8088 microprocessors—which by today's standards are slow. The IBM PC and the XT were capable of transmitting data at between 4 and 10 Mhz (megahertz), and the 80286, introduced with the PC AT, was capable of speeds of 8 to 16 Mhz. The difference between the data transmission times in these two processors involved many elements, but at its most basic level, the processing was faster in the 286 machine because of the speed of the chip itself and the width of the data path. Table 5.1 shows the CPUs used in popular PC models.
Chapter 5: Purchasing a Computer System

Table 5.1
PC CPUs

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU</th>
<th>Speed (Mhz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC/XT</td>
<td>8088(8086)</td>
<td>4.7-10</td>
</tr>
<tr>
<td>AT</td>
<td>80286</td>
<td>8-16</td>
</tr>
<tr>
<td>386</td>
<td>80386</td>
<td>16-33</td>
</tr>
<tr>
<td>486</td>
<td>80486</td>
<td>16-33</td>
</tr>
</tbody>
</table>

The 80386—and now the 80486—microprocessors further increased the speed of the chip and the size of the data path. With the 386, the data path was expanded to 32 bits; the 386 machines can process information up to four times as fast as the original PCs.

Computers with 80486 microprocessors are appearing—setting new standards in speed and data transfer. Although 80486 computers are just now beginning to be seen in the market—and although IBM doesn't have a 486 offering of its own yet—you can find a 486 system for under $6,000. In fact, in a recent issue of Computer Shopper, one popular mail order company, Gateway 2000, offered a 486 system for $5,294. This system has the following components:

25 Mhz 486 (the CPU—a 486—operates at 25Mhz)
4M RAM
1 1.2M 5.25-inch drive
1 1.44M 3.5-inch drive
150M hard disk drive
VGA adapter with 512K
14-inch VGA color monitor with 1,024-by-768 resolution
101-key keyboard
MS-DOS 3.3 or 4.0

PS/2 CPUs

The "official" IBM 80386 was introduced in the PS/2 line, in the PS/2 Model 80. (Some PC-clones actually beat the IBM version to the marketplace.) The PS/2 also introduced a new kind of data path, which allows the data to be transmitted independently of the CPU operation. This technique lightens the load on the processor and allows the data to flow faster.

This new technology, known as Micro Channel Architecture, is a revolutionary new concept from IBM and sets a new standard independent of the PC data bus. Only PS/2 Models 50 and above
Part II: Prepurchase Considerations

(55, 70, and 80) include Micro Channel Architecture; so if you are looking into the purchase of one of those systems, be sure that you investigate what MCA may mean for you in terms of add-on boards and other devices. Because MCA is a new technology, traditional PC expansion boards do not work in MCA machines. Just be sure to talk to your dealer or to the board's manufacturer before you buy in order to make sure that you are purchasing compatible components. Table 5.2 lists the CPUs in each PS/2 model.

Table 5.2
PS/2 CPUs

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS/2 Model 25</td>
<td>8086</td>
</tr>
<tr>
<td>PS/2 Model 30</td>
<td>8086</td>
</tr>
<tr>
<td>PS/2 Model 50</td>
<td>80286</td>
</tr>
<tr>
<td>PS/2 Model 55</td>
<td>80386</td>
</tr>
<tr>
<td>PS/2 Model 60</td>
<td>80286</td>
</tr>
<tr>
<td>PS/2 Model 70</td>
<td>80386</td>
</tr>
<tr>
<td>PS/2 Model 80</td>
<td>80386</td>
</tr>
</tbody>
</table>

One problem with the PS/2 Micro Channel Architecture is that all the higher-level machines—the ones with 80286 or 80386 CPUs—have the new data bus design. As a result, although these machines are software compatible with the older PCs, you cannot use the same hardware inside a PS/2 Model 50, for example, that you use in a PC AT. Additionally, this design affects the way data is transferred. For that reason, a new AT-compatible PS/2 (known as the PS/1) is now in design stages. The PS/1 has the standard PC AT-style data bus and uses the 80286 microprocessor.

Macs and CPUs

Similar to the PC generation, different Macintoshes use different CPUs. The CPU in the Macintosh is housed on the motherboard inside the system unit of the computer. Table 5.3 shows the different Macintosh CPUs and their speeds.

Table 5.3
Macintosh CPUs

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU</th>
<th>Speed (Mhz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>68000</td>
<td>10</td>
</tr>
<tr>
<td>Mac II</td>
<td>68020</td>
<td>16</td>
</tr>
<tr>
<td>Mac IIcx</td>
<td>68030</td>
<td>25</td>
</tr>
</tbody>
</table>
Chapter 5: Purchasing a Computer System

Understanding the Ads

You will see the following terms when you are computer shopping:

- PC-compatible
- AT-compatible
- 286
- 386
- 486

The term *PC-compatible* means that the computer uses the 8088 CPU and is compatible with hardware and software sold for the IBM PC. The term *AT-compatible* means that the computer uses the 80286 CPU and is compatible with hardware and software for 286 machines. Finally, when you see a machine referred to as a 286, 386, or 486, you know that the computer runs on the 80286, 80386, or 80486 microprocessor, respectively.

The Macs use a chip designed by Motorola, Inc. Some users argue that the chips themselves are better designed and more powerful than their Intel cousins, used in PCs and PS/2s. Be that as it may, the end result is that the Macintosh is a powerful computer available in different models which can fit into a variety of applications—from home and school use to high-end business operations.

Although a 68040 microprocessor has been developed, this CPU has not yet been used in a Macintosh. The grapevine hints that Apple may wait and make the next standard machine based on the RISC (Reduced Instruction Set Chip) 88000 CPU series. These chips give faster data transfer because the instructions contained on the CPU are less complicated and therefore easier for the computer to process.

Apples and CPUs

Typically, Apples haven't been known as speed demons in the business world. Although the data transfer rates may seem slow, nevertheless, the Apple has a strongly dedicated following in many
areas for home, school, and business use. Table 5.4 shows the CPU
speeds of the various Apples.

Table 5.4
Apple CPUs

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU</th>
<th>Speed (Mhz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple IIe</td>
<td>6502</td>
<td>1.0</td>
</tr>
<tr>
<td>Apple IIc Plus</td>
<td>65C02</td>
<td>4.0</td>
</tr>
<tr>
<td>Apple IIgs</td>
<td>65C815</td>
<td>2.8</td>
</tr>
</tbody>
</table>

In comparison to the Mac and PC data transfer times, Apple's
speed looks more like the tortoise's than the hare's. An add-on
product is available for the Apple IIgs, however, called the
transwarp board, from Allied Electronics. This product enables
you to more than triple the speed of the GS. The transwarp board
also gives you additional memory and takes some of the strain off
the CPU, accelerating the way the machine handles data and letting
you load a larger portion of a program into RAM. (This capability,
in turn, reduces the time your computer spends loading programs
from the disk.)

You don't have a great number of CPUs from which to choose
when you are looking at Apple models, so chances are, if you are
strongly leaning toward the Apple camp, you will let other
considerations overshadow the importance of the CPU in your final
decision.

What Do Differences in CPUs
Mean to Users?

To a new—or prospective—computer user, all this technical talk
about CPUs may seem a bit overwhelming. Basically, when you are
computer shopping, you should be aware of the CPU type for the
following reasons:

- If you are buying a PC, you need to be sure that the
  machine will run the software you want to use. For
  example, if you have decided to work with a program that
  is available only for 286 machines, you will be out of luck
  if you buy a PC-compatible computer with an 8088 CPU.
The faster the CPU you can purchase for the money, the better. In other words, if you can find a 386 system for the same amount of money as a 286, purchase the 386. The newer technology offers you more power and speed and is compatible with the software for earlier machines. If you can purchase a Macintosh with a 68020 CPU for the same amount of money you would spend on a 68000 Mac SE, you are better off with the more powerful computer.

How Much Memory Do I Need?

For new users, memory can be a perplexing term. Many people confuse computer memory with storage. Remember that memory is what the computer uses to hold programs and calculations while it runs the application. Storage is the area where the programs and data files are kept when the computer is turned off.

Throughout this book, and throughout any hardware or software manual, you will see two letters used to tell you how much memory or storage is being discussed. These letters are K (for kilobytes) and M (for megabytes). As you may recall, the most basic measurement of data is a bit. A bit is one electronic pulse, eight of which make up a byte of information. (One byte is roughly equivalent to one text character of information.)

One K, or kilobyte, is equal to about one thousand bytes (or characters) of information. (You can think of a 1K file as being about as long as a double-spaced, one-page letter.) One M, or megabyte, is equal to about one million bytes of information.

Your computer’s memory is measured in either kilobytes or megabytes. You may see your system’s memory shown as 640K or 1M, 2M, 4M, and so on. You may also see the terms expanded and extended memory. The next section introduces you to the memory issue. The sidebar “Understanding Expanded and Extended Memory” elaborates on the subject.

Understanding Memory Basics

As you learned in the last section, the application (software) you use is affected by the speed at which your computer processes information. Similarly, the application influences the amount of memory you need in your system.
If you have already purchased your computer and you are trying to figure out how much memory your system has, you have a few options:

- If you are using a DOS machine, you can use the DOS command CHKDSK to find out how much available RAM your computer has.
- Some utility programs can display the amount of memory available in your system.
- If you are using an Apple computer, you can use the desk accessories to find out how much memory your system has.
- In a Macintosh, you can display the amount of available memory by using the Finder.

For more information about performing these procedures on your computer, see Chapter 10, "Getting Familiar with the Operating System."

The first generation of PCs were equipped with only 64K. The original PCs could be expanded to 576K, but many users started with and stayed with 64K—at least until newer models began appearing. Programmers, therefore, had to write applications that didn't need more than 64K to run. These first software products didn't do much by today's standards: usually they just filled a specific need, like keeping track of employee information or creating an electronic spreadsheet. At the time, however, even limited software programs were regarded as revolutionary.

Today's software market offers an almost unlimited choice of applications, complete with all the bells and whistles you could ever want—including pop-up schedulers, grammar checkers, MIDI music capabilities, desktop video, and a variety of features that mix capabilities previously available only in one small, limited program.

Some programs are too large to run on older model computers—these programs use too much memory. Today's applications have been written to use memory more frugally—but because the capabilities of the programs have grown, the programs themselves require more and more memory. Basically, the more capabilities
the program has, the more memory the program requires. Brilliant programs are bigger than their less-enlightened counterparts.

As you may recall, in Chapter 3, memory was compared to the top of a library table. You placed on the table at that particular time only the files you needed to accomplish a specific task. When you were through with that task, you put the files away and got out different files for the next task. Memory handles data and programs in much the same way; only the programs you need at that one time use the RAM you have available in memory.

For instance, suppose that in your work you use two different DOS-based programs: one spreadsheet program and one word processing program. The manufacturers of both programs recommend that your system have at least 640K of RAM in order to run the programs. Do these requirements mean that you must have 1280K in order to run both programs—640K for each program? Thankfully, the answer is no. Because you will be running only one program at a time, your computer needs that available RAM for only one program at a time. 640K is all you need.

You can find out how much memory a program requires by reading the information on the software's package (the requirement should be shown on the back or the side, or in the first few pages of the program's documentation) or by calling the manufacturer.

The amount of memory in your system also affects the speed of the computer. If your program uses the computer's entire memory allotment, the processing is slower than if a smaller percentage of the computer's memory is used. If you have a 128K program running slowly in a 128K machine, for example, the program may run faster in a 256K or 640K machine.

The original Macintosh had 128K of user memory. The next generation of Macs upgraded memory to 512K and then to 1M. Now you can get a Macintosh with anywhere from 4M to 8M of available memory.

The Apple has also been on a similar path toward more memory. The Apple IIgs, for example, was first shipped with 256K of memory. Today's GS comes with 1M and can be upgraded to 1.2M.
Understanding Extended and Expanded Memory

As you investigate the different types of systems available, if you are looking at IBM or IBM-compatible computers, you will undoubtedly run into the terms extended and expanded memory.

Put simply, extended memory is a kind of memory similar to RAM. Introduced with the IBM PC AT, extended memory allows you to set aside an extra amount of RAM space in the form of a disk cache (a separate segment of RAM, which you can use for programs and data in the current work session). Extended memory is memory above 1M in address; this memory can be accessed only by 286 and higher machines running in a special mode called protected mode. DOS does not run in protected mode. Therefore, the only use of extended memory under DOS is as a special storage area for printer data or as a RAM disk or disk cache. DOS is then fooled into thinking of the extra memory as another disk drive.

Expanded memory, on the other hand, uses a different memory-addressing technology to give users more available RAM. Expanded memory is a paging scheme whereby a window of, say, 16K is opened up in memory below 1M (which DOS can see as memory). DOS uses that window to point to successive 16K pages in memory. In order for you to use expanded memory, you must have a program that supports EMS (Expanded Memory Specifications). To find out whether your software supports EMS, consult the program’s documentation or contact your dealer.

If you have already decided on the software you want, find out how much memory your system will need in order to run the program. If the system you are considering does not have that much memory, you can have the computer dealer add more memory before you take the system home. (This procedure is known as upgrading the memory.) Or you can add memory to the system at a later time.
Upgrading Memory

The way you add memory to your system depends on the type of system you buy. You can add memory to some systems by simply plugging in additional memory chips on the motherboard (although you shouldn't add memory chips yourself unless you really know your way around inside a system unit). Or you may need to add a memory expansion board on which additional memory chips are installed (as is the case with the Apple IIgs).

The best information resource for upgrading memory in your system will probably be the manual that was packaged with your system. If you are unsure whether your computer requires additional memory chips or boards, call the manufacturer of the computer and find out. Or if you prefer, you can take the system to a local technical support department and have the technicians investigate upgrade options and install the extra memory.

Generally, the cost of upgrading the memory in your computer varies. Older, slower computers can use older, slower memory chips, which cost less than faster chips. Conversely, the newer, faster machines use newer, faster memory chips, which are more expensive.

How Many Disk Drives Do I Need?

You need some means of storing all the information you enter into your computer; otherwise, it would be nothing more than an expensive typewriter. The most common form of storage is the disk drive. The two types of disk drives are the flexible disk drive (or floppy disk drive) and the fixed disk drive (or hard disk drive). The following sections explain these components in detail.

Floppy Disk Drives

You probably already know that the hard disk drive can store more data and work faster than a floppy disk drive. So when you have the option of using a hard disk drive almost exclusively, is a floppy disk drive really necessary to the computer? Although it would be nice, at some point, to reduce the number of floppy
disks that seem to accumulate in a computer work area, the answer definitely is yes.

All software comes on disks. When you buy a program, you need some way of getting it into the machine, so every machine must have at least one floppy disk drive. With most computers, you have the option of adding a second disk drive if you choose. (For many applications, you will find that with only one disk drive you spend quite a bit of time inserting and removing disks; with two drives, the computer can access data on both disks and you do less floppy swapping.) For either drive (primary or secondary), the size of the drive—5.25 or 3.5—is up to you, the makers of the computer you choose (the IBM PS/2 uses the 3.5-inch disk drive exclusively), and the developers of the software you purchase.

Until recently, most programs were packaged on standard 5.25-inch floppy disks (see fig. 5.3). This practice meant that having a 5.25-disk drive was an absolute requirement for your machine. But there are other considerations. The older disk drive formats by using a scheme of 40 tracks of data organized in 9 sector groups, making a total capacity of 360K bytes of storage. The older disk is labeled 2S/2D, meaning 2-Sided Double Density. However, AT class machines use a disk drive that fits 80 tracks with 15 sector formats into the same 5.25-inch space. This disk is the 2S/HD disk, meaning 2-Sided High Density, and can hold 1.2M (megabytes) of data.

Fig. 5.3. A 5.25-inch floppy disk.
One of the major uses of the floppy disk drive is for backing up the hard disk drive—making copies of your programs and data in case something goes wrong with the computer. The bigger disk drive means fewer floppy disks to purchase and keep track of. Floppy disk drives that store 1.2M of data can read the lower density 360K disks, but the 360K disk drives cannot read 1.2M disks. Generally, you should buy the disk drive with the highest density within your budget. Remember, however, when you are sharing files with other computers, that you will need to format your high-density disks at a lower capacity so that systems with low-density drives can read the data on the disk. (This formatting procedure is explained in Part III.)

The next "standard" drive invented was the 3.5-inch disk (see fig. 5.4). This new disk is a small hard-shell floppy disk, which is harder to destroy, making the disk easier to take care of and use. These drives also have two rated capacities: 720K and 1.4M. Again, remember both capacity and compatibility. Having a disk drive that can read and write to high-density disks can save you some time and trouble, but if you need to share data with other computers in your office, make sure that you get a drive that will read and write to disks from the other machines as well.

Fig. 5.4. A 3.5-inch disk.

With many popular programs today, you have the option of purchasing the program on either 5.25-inch or 3.5-inch disks. If you think that you will need both sizes of disks (for example, if you will be using files created on an older computer that uses only 5.25-inch disks), you may want to get two disk drives for your
computer, one drive of each size. Otherwise, you may be forced to hunt for a friend’s machine that will allow you to copy the information from the disk size you have to the disk size you need.

For many simple applications, you can get by with a system with two floppy disk drives, but for most applications that process any substantial amount of data, a hard disk is becoming the standard data storage unit. The cost of a small hard disk drive is only around $200. The cost of a single floppy disk drive is $59 to $99. But here’s the clincher: The smallest hard disk drive is at least 20M, which is equal to 20 HD (1.2M) floppy disks. And if you are using a system with only two floppy disk drives, you must insert and remove disks many times just to work with one program.

**Hard Disk Drives**

A hard disk drive has higher speed and greater capacity than its floppy counterpart. A hard disk drive is usually fixed inside the computer in a manner that does not allow the drive to be removed. (For this reason, you may occasionally run across a reference to a hard disk as a *fixed disk*.) Figure 5.5 shows a hard disk inside an IBM computer.

![Hard disk drive](image)

**Fig. 5.5.** A hard disk inside the system unit.

Defined at its most basic level, a hard disk is a storage device—similar to a floppy disk—that stores substantially more data than a floppy disk and is inside a “housing” of some sort. That housing can be the system unit of your computer, or in the case of an external hard disk drive, the housing can be the hard disk
drive's case. Unlike a floppy disk, a hard disk cannot be removed from its housing.

Several different types of hard disks are available. Most people use an internal hard disk, meaning that the hard disk is housed within the system unit of the computer. External hard disk drives are also available, allowing you to add hard disk storage to your computer without buying an entirely new system (see fig. 5.6). Removable hard disk drives are also available, but they are used primarily by "power users" and are generally more expensive than either internal or external hard disks. Generally, internal hard disks are the best buy for the money, although many users go on to add external hard disk drives when their storage capacity needs exceed that allowed by their existing hard disk.

![External hard disk attached to an Apple IIgs.](image)

**Fig. 5.6.** An external hard disk attached to an Apple IIgs.

Hard disks are popular for several reasons:

- You can store more information (from 20M to more than 160M) on a hard disk than you can on a floppy disk.
- You can store and retrieve information from a hard disk much faster than you can work with floppy disks.
Because the hard disk is enclosed, you are less apt to damage the disk (or the data). Enclosed within its housing, the hard disk is safe from coffee, smoke, and other environmental dangers that can harm floppy disks.

Although most programs do not require the use of a hard disk, some programs are extremely slow and limited without access to a hard disk. Additionally, if you are dealing with large amounts of data (such as organizing data in an extensive database or working with large spreadsheets), accessing the data from a floppy disk can be painfully slow.

Hard disks are available with different amounts of storage space. The smallest hard disk drive you can buy now is 20M (megabytes). As you may recall, a megabyte is equal to one million characters. That's a great deal of storage space. As programs get bigger and require more storage space for the program and data files, however, hard disks with more storage space are becoming the standard. You may see hard disks advertised with 40M, 60M, or even 160M.

So how much hard disk space is enough? Within reason, if your applications are fairly limited, if you get rid of those one-time letters from your word processing files, if you don't try to keep 10 years of customer information in the computer, and so on, you can manage with almost any size hard disk drive. The key word is manage. Some application data files can be stored on floppy disks until needed. Other files can be “compressed” with special programs so that the files take up less space when they are not being used. Different programs take up different amounts of space. The files you create with various programs also produce files of different sizes. For example, a short letter you compose in a word processing program may take up only a small amount of storage space, say, 6K. A one-page newsletter created in a desktop publishing program, however, may take up many times that amount of disk storage space.

When you purchase software, the manufacturers tell you the minimum space requirements for the program; but remember that the requirements are for just the program. You will need additional space for storing the files you create. You may find it helpful to ask someone who has used the program for a while to find out how much memory you need for working intensively with that particular program.
When you buy a hard disk, apply the same rule of thumb that you use for the other components: Get a hard disk with as much storage space as you can afford.

The amount of storage space is not the only consideration. Speed is also a major factor. Disk drives are rated by how long they take to find data (called the average seek time) and the time required to send the information to the microprocessor (called the transfer rate). The average seek time is measured in milliseconds, and the transfer rate is measured in bytes per second. These two specifications mean more than any other when you are comparing the speeds of hard disk drives. The following list shows you the basic ratings of hard disk speeds:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Seek time (in milliseconds)</th>
<th>Transfer rate (bytes per second)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>40ms</td>
<td>250K/second</td>
</tr>
<tr>
<td>Fast</td>
<td>28ms</td>
<td>500K/second</td>
</tr>
<tr>
<td>Ultra fast</td>
<td>15–20ms</td>
<td>700–900K/second</td>
</tr>
</tbody>
</table>

Disk controllers are the other half of a hard disk drive system. The controller is a board mounted inside the computer; the controller actually communicates information from the hard disk drive to the CPU, and vice versa. The controller is the single biggest contributor to the overall speed of the drive. A bad controller on a good drive makes a bad drive. An excellent controller can overcome some of the shortcomings of a slower drive. Make sure that the controller works with your machine and your drive the way you want. If you are unsure about the controller, ask your local dealer or consult the manufacturer for more information.

When you purchase a hard disk drive independently of your system, you have the option of purchasing a hard disk drive kit or a bare drive. A hard disk drive kit contains the controller, cables, mounting hardware, and the drive itself. A bare drive is only the drive, and you must purchase all the additional items separately.

As with all other components of the system, the faster the drive, the more it costs. And the larger the storage capacity of the drive, the more it costs as well. If you can't afford all the size you need, opt for speed. Paying a little more for a faster controller will also improve the overall performance of the system.

Before you make a decision, look around. Find whatever information you can about the drives you are considering, and ask the opinions of other computer users to find out what drives they recommend and why.
Choosing a Monitor

Your choice of monitor is important—especially if you will be staring into its amber, green, or RGB face day after day. Like everything else related to computers, incredible ranges of features and capabilities are available with monitors. In this section, you learn about the various monitor types, decide what features are most important in the monitor you purchase, and find out about graphics adapters.

Evaluating Your Display Needs

Figuring out exactly what monitor features are important to you is a good way of focusing on a particular type of monitor. As you think about the features you want in a monitor, consider these questions:

- Will you be working primarily with text?
  
  If the program or programs you plan to use deal primarily with text, you need to be sure to get a monitor with good resolution. (*Resolution,* when you are talking about monitors, is the number of dots per inch used to display characters and graphics on the screen.) Particularly when you are working with small characters hour after hour, the capability of your monitor to display text in well-formed, crisp characters is important. Poor screen resolution results in blood-shot and tired eyes. For text-intensive applications, purchase a monitor that gives you the best resolution you can afford.

- Do you use graphics often in your work?
  
  Some monitors and graphics adapters are better suited for displaying graphics than others. As you learn later in this chapter, different types of monitors and graphics adapters give you various levels of display clarity.

- Do you prefer a color or a monochrome monitor?
  
  You can let the software mandate whether you purchase a color monitor, but even if the program you plan to use displays screens in color, you may still have the option of disabling the color feature and showing the screens in
black and white. Most programs that have color capability also display in monochrome—so you won’t lose anything from a software standpoint by choosing monochrome.

Monochrome monitors generally offer a good display, with clearly formed characters and good screen resolution. Color can be both fun and functional, allowing you to add personality to your on-screen work, set screen displays most pleasing for your eyes, and customize applications.

Is the size of the screen display important for you?

Monitors are available in different sizes. From a small 19-inch to a 21-inch, 23-inch, or whopping 2-page display to a rather strange-looking vertical monitor, you have a variety of sizes and shapes. Generally, the “special” monitors (such as extra large sizes, 2-page, or vertical monitors) are most expensive, so if you are working within a budget, you may want to see whether a conventional monitor offers you the features you most need.

Is speed a critical issue?

Similar to hard disks, monitors and graphics cards work at different speeds. Some monitors and graphics cards update the screen faster than others; if this feature is important for you, be sure to shop around to find a monitor with a quick screen-update speed.

Understanding Different Monitor Types for PCs

The most obvious difference in monitors is whether the monitor is a color or monochrome (single color) monitor. Other differences include the size and shape of the monitor, the type of graphics adapter used, and the type of the monitor itself. Like hard disk drives, a display is a combination of a controller—called a display adapter—and the monitor itself.

With every monitor, you must have a display adapter to communicate information from the system unit to the monitor. Each type of display adapter has a built-in character set for displaying normal printable characters (A through Z, 0 through 9, *, %, $, and so on). Every display adapter also has the capability to
switch to a graphics mode, in which patterns (or graphics) can be
drawn based solely on the placement of individual dots on the
screen. For more information about your particular display adapter,
consult the manual that came with the adapter or consult your
dealer.

All monitors, like printers, are rated by their capability to use dots
(also called pixels) to create patterns. The more pixels on the
screen, the better-looking the picture. Curves appear more
rounded, and lines can be displayed as very thin, or very bold.
Some screen displays are better than others. Some screens provide
clear, accurate representations of the images and characters, but
others show characters and graphics that are jagged-looking and
sometimes hard to read. This difference in display quality is due to
differences in the resolution of the display. Good, or high,
resolution uses a greater number of pixels to display the image.
Low resolution uses a lower number of pixels, resulting in an
image that may look slightly distorted or choppy. Figure 5.7 shows
the difference between screen resolutions.

![A low-resolution image](image1.png)

![A higher-resolution image](image2.png)

*(with four times as many pixels)*

**Fig. 5.7. The difference between screen resolutions.**

For some people, choosing a monitor is the easiest part of this
whole task. Many people simply choose the software they want,
see what kind of monitor the software manufacturer recommends,
and go shopping for that particular type of monitor. That's fine—if
it fits in your budget and works with all the software you purchase
or have purchased.

Let's explore some of the basic monitor types.
Monochrome Monitors

The world of monochrome monitors is really not too complicated. The first computers used only one-color displays, usually green on the early PCs. When you use this type of monitor for an application, such as word processing, the monitor displays green characters on a black background.

IBM released a monochrome text monitor with the original PC. The character cell (the matrix of dots in which a character is displayed) was 9 by 14 dots; this matrix made the text easier to read than text on the CGA (IBM's first color adapter), which had an 8-by-8 character cell. This difference in the character cells—9-by-14 compared to 8-by-8—is the real distinction between text mode and graphics mode for all PC monitors. Text mode sees cells in which characters are being displayed; graphics mode sees dots.

Then Lotus released 1-2-3. IBM monochrome monitors could not display its graphs, and its text was hard to read on CGA color monitors. Hercules had introduced its own standard—a high-resolution text monitor that could display graphics. Hercules monitors require Hercules cards, and sales took off after Lotus 1-2-3 supported Hercules.

The original IBM monochrome display had a resolution of 720 by 350 pixels (or dots); this designation means that the monitor can display 720 pixels across the screen (horizontal) and 350 pixels down (vertical). This resolution is not a bad number of pixels for one screen. The characters on the IBM monochrome display were crisp and clear, making that display popular in business use that required basic text operations. At that time, the monitor's only drawback—that it didn't display graphics—could be overlooked because many applications didn't require graphics capabilities. Today, however, so many programs have graphical menu systems that the original IBM monochrome display is limited in the software it can display.

You can find monochrome monitors in three varieties: green, amber, and white (which is sometimes referred to as paper white). The green-screen monochrome monitor was the first in the bunch. Then came the amber monitor for people who found it easier to look at on a long-term basis. The paper-white monitor is currently a popular monochrome, offering high resolution and a sense that you are seeing your document or file as it will appear in print.
Color Monitors

The color monitor opens up even more possibilities. On a simple word processing display, for instance, an underlined word can be displayed in red, a boldfaced word in green, and a boldfaced underlined word in cyan. Quickly glancing at the screen can give you a significant amount of information, just by the colors used to display the words. Color costs more, however, and if you are purchasing a color monitor from the low end of the price spectrum, you may wind up with poorer resolution than a comparable monochrome monitor offers.

The following section explains the various display adapters that work with the different types of color monitors. As you will see, the monitor and adapter greatly affect the quality of the resolution you see on the screen.

Display Adapters

The major types of color display are CGA (Color Graphics Adapter), EGA (Enhanced Color Graphics Adapter), VGA (Video Graphics Array), and variations of multi-sync monitors. The differences are in how many colors can be displayed at a time and how many pixels are displayed by the monitor. Some monitors are specific to only one kind of display adapter, only CGA, for example. Other monitors have been designed to take advantage of any kind of color output, including boards that haven't even been designed yet. These monitors are called multi-sync monitors—yet another class of monitor to make the choice even more confusing. Multi-sync monitors may be VGA monitors (meaning that they work with VGA adapters), but they can emulate—or act like—EGA monitors and they have the capability to work with any graphics adapter you may have. (Note: This emulation means that you can use the monitor to display software whether or not the makers of the software claim that it can be used on CGA, EGA, or VGA displays.)

CGA was the first design to offer color. This adapter displays characters in an 8-by-8 character cell; as a result, text characters are a little rough around the edges. In graphics mode, the CGA is capable of displaying text and graphics in two resolutions: a medium-resolution color mode (320 by 200), which can display 4 different colors, and high-resolution mode, which displays 2 colors.
In text mode, the CGA can display in 40- or 80-column character widths (the larger the number, the smaller the character) and in 16 different colors. The capability of CGA adds color to the display of your programs, but the quality doesn’t get anywhere close to what you see in a color photograph, for instance. But some color is better than none at all, and depending how the program uses these colors, the result can be quite good.

EGA, or Enhanced Graphics Adapter, adds more dots per inch and has more colors available at a time. The character cell for the EGA adapter is 8 by 14. Resolution for EGA goes up to 640 by 360 with 16 colors displayed at once from a palette of 64 colors. The bottom line is a better picture with wider variety of sharper colors.

The introduction of VGA not only advanced color technology but changed it as well. The way the VGA adapter interacts with the monitor is different from the technology of the VGA’s EGA or CGA forefathers. With a VGA card and monitor, the video signals come in as analog signals—each signal is a separate color (red, blue, or green). The signals are then mixed and changed in intensity to give you an incredible spectrum of colors. The idea was to allow even more colors on the screen with sharper images. With VGA, the screen is composed of 800 by 600 pixels, with up to 256 separate colors displayed at the same time. The choice of colors (also called the palette) is 262,144. That’s enough to make even Crayola shudder.

With the PS/2 Models 25 and 30 came another display technology: MCGA. The Multi-Color Graphics Array is a display adapter that is built into the motherboards of Models 25 and 30. Although similar to the CGA, the MCGA can display several colors and provide text and graphics resolution better than CGA standards.

When you are considering purchasing a color monitor, expect to pay two prices. The first price, as you might expect, is dollars: the better the monitor and adapter, the higher the price tag. If you watch for special offers from manufacturers (by keeping an eye on the industry magazines), however, you may be able to pick up a VGA card and monitor as cheaply as you can buy EGA equipment.

The other price you pay is speed—of the lack thereof. In order for the screen to display so many dots with so many colors, the adapter must have a better video processor and even its own memory to keep track of each pixel and the color the pixel represents at the moment. Some of the cheaper display cards can
offer the highest resolution available within the adapter's type of
display, but they may offer this resolution with a lack of speed or
even a little flicker when a screen clears and redisplays. Because
adapters change, the best way to keep up is either to see the
display card/monitor combination in action at a local store or to
look in magazines for reviews of each type of combination before
you make your purchase.

One other trick when choosing a monitor: Look at how many
different mail-order houses are selling a particular model. These
companies do not want these boards or monitors sent back and
are not going to sell only the cheap stuff. If only one company is
selling a display or card, wait until a review comes out.

Multi-sync monitors offer a nice compromise in display technology.
Because the monitor is designed to handle a large variation in the
type of signal the monitor processes, the display can continue to
service your machine even if your monitor needs change. The
price of a multi-sync is higher, but if you see your color needs
changing or evolving over time, the investment is worthwhile.
Multi-sync monitors also have very small pixels. Because this
monitor creates a nice sharp on-screen image, even in a lower
resolution, the overall quality is better.

One final note on PC displays. The price differences among the
classes of monitors continue to shrink. Most good adapters can be
switched to display even monochrome images. Buying a flexible
display card and an expensive monitor leaves room for an easy
upgrade in the future.

Understanding Apple and
Mac Monitors

As you learned in the last section, with PC technology, the
monitor and display adapter you choose determine the quality you
see on the screen. The basic category break also holds true here:
color and monochrome. Beyond that decision, however, lie the
complications.

With Apples and Macs, the technology is different. Although the
basic technique is the same—that is, each element on the screen is
a composition of pixels—the ways in which the video signals are
sent to the monitor are different, and different types of monitors are used for Apple and Mac computers.

The basic difference between PC and Apple monitors is in the way the signals are sent to the display. With PCs, the quality of the display is mandated by the monitor type and display adapter. With Apple monitors, the quality of the characters is governed by a chip on the system board, known as the character generator ROM, and by the capabilities of the monitor. On the Macintosh, the quality of the display is controlled by both the software and the monitor's features.

With the Apple, you have a choice of a composite or analog monitor. When you use a composite monitor, all video signals are grouped as one signal and sent to the monitor at one time. Although a composite monochrome monitor may provide clear, easy-to-read characters, a composite color monitor is out of the question for text-based operations. Because of the mix of so many signals in a composite color monitor, you may see a rainbow effect around characters. If you simply want to play Space Invaders, a color composite monitor will do the trick. But for serious text work, you need another type of monitor.

Analog monitors receive video signals from the computer as separate signals. For example, the red comes in as one signal, the blue as another, and the green as yet another. (These monitors are often referred to as RGB monitors—Red, Green, Blue.) You can produce an almost unlimited number of hues by varying the strengths of the three signals.

In terms of display quality, the monitor doesn't control the formation of characters as much as the computer's internal character generator ROM does. Because of the separate signals in the analog color monitors (you can also purchase analog monochrome monitors), however, the distortion often present in the color composite monitors does not occur. Additionally, because of the variety of hues available with analog monitors, users can achieve greater contrast and better blending and shading, creating effects that appear to offer better screen resolution.

As mentioned previously, the way text and graphics are displayed on Apple systems is determined in large part by the capabilities of the system and the monitor's mode of resolution: low, high, double-high, or super-high. (You set the resolution by selecting options from the Control Panel.)
As table 5.6 shows, the monitor displays in different resolutions (number of dots on the screen) depending on the number of colors you are using. Low resolution allows you to use up to 16 colors, but the number of dots used to create each item on-screen will be few so that the text and graphics may look rough around the edges. Medium resolution increases the number of dots used to form text and graphics, but you can’t display as many colors.

Table 5.6
Understanding Apple Displays

<table>
<thead>
<tr>
<th>Computer System</th>
<th>Number of Colors</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple II Plus</td>
<td>16 colors</td>
<td>40 by 48 (low)</td>
</tr>
<tr>
<td>Apple IIe</td>
<td>16 colors</td>
<td>40 by 48 (low)</td>
</tr>
<tr>
<td>Apple IIc</td>
<td>16 colors</td>
<td>40 by 48 (low)</td>
</tr>
<tr>
<td>Apple IIcs</td>
<td>16 colors</td>
<td>40 by 48 (low)</td>
</tr>
</tbody>
</table>

Primarily, Apple monitors lead the pack in supplying displays for their systems. As mentioned earlier, Apple standards have little competition. Some of the popular monitors used with Apple systems include the AppleColor RGB Monitor, the Apple Color Monitor, the Laser 14-inch RGB Monitor, and the Magnavox RGB monitor.

The first Mac monitor was built into the system unit (see fig. 5.8). The monitor was small, 4.5 by 7 inches, giving you only a 9-inch diagonal viewing area, yet the resolution was superior to most standards available at that time. Since that time, Mac monitors have been introduced in a variety of shapes and sizes—from 12- to 19-inch screens (measured diagonally) to elongated full-page monitors that can display an entire page. Only analog monitors can be used with Macintosh computers.
Figure 5.8. The original Mac monitor.

Figure 5.9 shows a newer Mac system. As you can see, the basic shape of this system resembles a PC more than the original Mac. The monitor, system unit, and keyboard are individual pieces connected with cables.

Figure 5.9. A Mac IIcx.
Many people are really attached to their standard Mac screens, and unless you are working with an application that requires that you see the entire screen (such as a desktop publishing or CAD application), you will probably be so happy with the resolution of the display that the small size won't bother you. The Macs above the 512K model—which include the Mac SE, the Mac SE/30, the Mac II, and the Mac IIcx—have the option of adding or selecting a stand-alone monitor. (With the Mac SE and SE/30, the monitor is included as part of the standard Mac; but with the Mac II and the Mac IIcx, the monitor is purchased separately.

If you are really fond of your Mac screen but find that you're leaning up and squinting more than you used to, you can get a *screen extender* program, which magnifies the display shown on the traditional Macintosh screen. More than one product currently available gives you good resolution as well as a larger picture; one popular screen extender is Stepping Out II, from Berkeley System Design, available for only $95.

Many monitors are available for the Macintosh. Beyond the color or monochrome decision, you have other options. Do you want a 2-page monitor? A full-page monitor? One with a 19-inch diagonal width? 24-inch width? As with the monitors available for PCs, you have choices about the basic style and size of the monitor. A screen that is wider than it is tall (the "typical" monitor type) is known as a *landscape* monitor; and a screen that is taller than it is wide (like a full-page monitor) is known as a *portrait* monitor. You will see these terms, which coincide with the same terms used to describe printing orientation, used in Macintosh forums, although the same phrases can refer to any monitor type.

Table 5.7 lists several popular monitors that are currently available for Macintoshes.

When you add a monitor to your Macintosh, you also need to add a separate video card, which enables the system to communicate with the monitor. The video card is included with the purchase of the monitor. Usually, a different video card is required to connect each member of the Mac family—Plus, SE, and II; if you are considering adding a monitor to your Mac, be sure to tell the dealer or manufacturer which type of system you are using.
Table 5.7

Popular Macintosh Monitors

<table>
<thead>
<tr>
<th>Monitor</th>
<th>Size</th>
<th>Works with</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple High Resolution</td>
<td>12 inch</td>
<td>Mac II</td>
<td>840 by 480</td>
</tr>
<tr>
<td>E·Machines Big Picture</td>
<td>17 inch</td>
<td>Mac Plus, Mac 512K, Mac SE, Mac II</td>
<td>1024 by 808</td>
</tr>
<tr>
<td>Moniterm Viking 1</td>
<td>19 inch</td>
<td>Mac SE, Mac II</td>
<td>1280 by 960</td>
</tr>
<tr>
<td>Radius Two Page Display</td>
<td>19 inch</td>
<td>Mac SE</td>
<td>1152 by 864</td>
</tr>
<tr>
<td>Radius Full Page Display(^1)</td>
<td>14 inch</td>
<td>Mac SE</td>
<td>640 by 864</td>
</tr>
</tbody>
</table>

\(^1\) A full-page monitor that is elongated vertically, giving you the capability to display an entire page on the screen at one time.

If you are purchasing a Macintosh or an Apple computer, be sure that you find out everything you need to know about available monitors before you make your decision. Read articles, talk to sales people, and sit down and try out a few monitors before making your final choice.

Some Final Considerations

So far, this chapter has introduced purchasing considerations you need to think about as you shop for your system and monitor. You have looked at computer speed, storage capacity, hard disk features, and display considerations. This section brings up a few final questions you should address before making your final decision.
Your Personal Comfort Zone

One major issue not really addressed thus far is probably the decision that will affect you most in day-to-day use. Are you comfortable using the monitor? Many factors can affect your comfort level, including the following:

- A monitor with a nonglare screen can make your life easier and reduce headaches and eyestrain.
- A monitor with a tilt base gives you the option of turning and angling the monitor the way you want it.
- A monitor that provides contrast and brightness controls gives you more choices about the way your text and graphics are displayed.
- A monitor that updates the screen slowly can be agonizing for graphics applications. (The screen update speed is known as the scan rate.)
- A monitor with a long cable enables you to place the monitor wherever you like—beside the system unit, on the desktop, or—in the traditional place—on top of the system unit.

Available Software

An important consideration—and one that some people insist is the foremost consideration when you are purchasing a computer—is the type of software available for your specific brand. If you want to purchase a computer to perform a specific task, finding the computer that works with the software you want makes sense. Some software is written only for the PC, some only for the Apple, other programs only for the Mac. Additionally, you will find programs that run only on the Commodore or the Atari. Be sure to choose the computer that will run the programs you want to use in your home, business, or school applications. Also look for a computer that will allow you to expand your number and kinds of applications. In other words, you should purchase a computer for which many programs are available; then when your needs change or expand, you won't be limited by the number of programs written to run on your computer.
As mentioned earlier in this book, many programs are available for the different types of computers. Part IV of this book contains a software library, which introduces you to the popular applications software types and provides examples for each of the major computers. Additionally, icons in Part IV help you identify the software that runs on your computer.

Remember that different programs require different features in a monitor. For example, if you work primarily with Lotus 1-2-3, you don’t really need a two-page monitor. If you work intensively with desktop publishing, you may find that a two-page or a full-page monitor makes your work easier. When you find a monitor you like, ask the dealer to demonstrate using the type of program you will be using so that you can see how the monitor displays text and graphics with your particular application.

If you are purchasing the monitor by mail order, be sure to ask the manufacturer how the monitor works with your software type. For example, if you use Aldus PageMaker in your work, ask the maker of the monitor how that particular monitor works with PageMaker, whether there are any “bugs” or special considerations you need to know about.

As you investigate your options, also look over the reviews and the ads in popular industry magazines like *PC World*, *Byte*, *MacWorld*, and *Apple IIgs*.

**Networks to Other Computers**

Will your computer be part of a network? That is, will your computer be linked to other computers that share common resources, such as printers or hard disk drives? If the computer you are purchasing is to be one of a team, you need to talk to others on the network before you invest your time and money. Is the hardware you are planning to purchase compatible with the other systems?

**Available Technical Support**

Technical support is a major issue for most new computer users. Technical support also is a novice’s nightmare. You get your
Part II: Prepurchase Considerations

computer home, set up the system, turn on the monitor, see a flash of light and then... nothing. Whom do you call? If you bought your computer from a reputable dealer who offers a technical support service, you can return the defective monitor and get a new one. Or if you are unsure what caused the zap-out, you can call one of the support technicians and have them walk you through the setup procedure to see whether you connected something incorrectly or forgot something important.

Most computer outlets also offer an extended technical support plan that gives you months of support for an additional fee. For most people, this additional support is worth the money—if for nothing more than the peace of mind from knowing that if something goes wrong, someone will be around to fix the problem.

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**Reviewing Purchasing Decisions**

Use this checklist to put on paper the purchasing considerations you have been tossing around.

I want ______________ computer (IBM, Mac, Apple, PC clone).
I want _______ in the computer (8086, 80286, 80386, 80486).
I want ________________________________ of RAM.
I want ________________________________ storage space:
   b. Floppy disk drive? __________ Number? __________
   c. Other? ________________________________
I want ______________ monitor (CGA, EGA VGA, multi-sync, Apple, Mac).

These special features are important:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Conclusion

This chapter has introduced you to many of the points you should consider as you get ready to purchase your system. Whether you are already leaning toward the PC, Apple, or Mac camp or you are still unsure which computer is best for your needs, be sure that you identify how important speed, storage capacity, display quality, and compatibility are to you. In the next chapter, you explore some printer purchasing considerations.
Part II: Prepurchase Considerations
Up to this point in the book, you have learned the basics about computers in general and have considered many important points. You have

- Analyzed your computer needs
- Determined which type of computer is best for you
- Learned about the differences in computers and considered which features (such as speed and storage capacity) are most important for your uses
- Considered which type of monitor you need

The time has arrived to decide on a printer for your new computer. You can use a computer without a printer, but most people find that they need some way to get a printed copy of the information they enter and work with on their computers. If your work involves producing letters, reports, financial statements, graphs, or any kind of printed output, you need some sort of printer.

In this chapter, you are introduced to the various kinds of printers available. As you will see, the span of printer capabilities is almost as wide as the range of needs; that is, you can find a simple inexpensive printer simply to “get the information on paper,” or you can pay a substantial amount of money to purchase a printer that is capable of producing typeset-quality text and graphics. And there are many printers in between.
Analyzing Your Printer Needs

As usual, you need to start with an analysis of your needs. Use the following questions to help zero in on the kind of printer that will be best for your particular application:

- **What kind of quality do you need from your printouts?**
  
  This question is probably the most important factor in determining which type of printer you need. Who will be reading your printouts? Will your work be circulated only among people in your department, or will you need a high-quality printout you can send to clients?

- **Is speed an issue?**
  
  If you need to print documents quickly or if you will be spending a great deal of your time printing a large volume of information, you will need a printer that is capable of printing with some speed.

- **Will you be printing high-resolution graphics?**
  
  With the advent of desktop publishing and computerized graphics arts, you can design and create highly sophisticated art work. To get acceptable final output, however, you need a printer that can give you the quality you need.

- **Do you need to print in color?**
  
  Many applications do not require the use of color in printouts, but if you do need color, you have several options.

- **Will you use a variety of fonts and type styles?**
  
  If you are happy with your simple printouts in one basic typeface with a few enhancements like a boldfaced headline or an italicized word or two, you can get by with a relatively low-cost printer. If you need a variety of typefaces and fonts in a spectrum of sizes and styles, you may need to consider purchasing a PostScript printer.
Introducing Different Printer Types

This section introduces you to the basic printer types currently available. Like everything else involved with computers, you will undoubtedly find some printers that fall outside the categories you see listed here. One area of confusion that ripples through all computer-related materials is the number of different terms used to describe different items. The following list defines some of the most frequently used printer terms and explains the basic functions of the printers and parts.

*Daisywheel printer.* A type of impact printer on which the characters are cast on a wheel-shaped disk, which presses against the printer ribbon and then against the page.

*Desktop typesetter.* A printer producing the highest print quality currently available in a desktop printer; uses laser technology to print characters and graphics on a page at the highest possible resolution.

*Dot-matrix printer.* A type of impact printer that forms letters by creating characters from a cluster of dots. Rather than having each letter preformed (as on a daisywheel printer), the print head of the dot-matrix printer is a cluster (matrix) of pins that are pushed against the ribbon and onto the page in the formation of the character desired. When you look closely at output produced on a dot-matrix printer, you can see the actual matrix of dots used to create each character.

*Impact printers.* The type of printer that places characters on the page by pressing the print head against a ribbon onto the paper.

*Inkjet printer.* A type of printer that forms characters by squirting dots of ink onto the page (using the same matrix technology the dot-matrix printer uses, but without the impact).

*Laser printer.* A type of printer that uses a technology similar to that of an office copier to place text and images on the page.

*Letter quality.* A term used loosely to describe the quality you can achieve from typewritten text. Letter quality is not
the highest quality available, but for many office uses, letter quality is a sufficient standard.

*Plotter.* A type of specialized printer that produces high-quality output by moving ink pens over the surface of the paper. Plotters are used for computer-aided design and presentation graphics.

*PostScript printer.* A type of laser printer that uses a special page description language called PostScript to communicate with the printer. PostScript gives you a wide range of fonts that can be scaled to any size possible within the amount of RAM available in your printer and enables you to print high-resolution graphics.

*Print head.* The printer mechanism that forms characters by pressing characters against the printer ribbon and onto the page.

*Print modes.* Most dot-matrix printers are capable of printing in more than one quality, or mode. For example, draft mode gives you a quick printout, but the quality is fairly poor. Near-letter quality mode produces text with more clearly formed characters but takes longer to print. Compressed mode prints twice as many characters within the same amount of space used for draft or NLQ mode. (Not all printers support all modes.)

*Printer memory.* The amount of memory in your printer; stores any external fonts and, in laser printers, stores fonts that are downloaded during a work session.

*Printer ribbon.* The ribbon used in impact printers.

*Resolution.* The number of dots per inch. The greater the number of dots, the higher the resolution and the clearer and crisper the characters or graphics.

*Toner cartridge.* The cartridge that stores the toner used in laser printers. The toner is a powderlike substance used to place text and graphics on the paper.

In the following sections, you explore the different printer types.
Impact Printers

By far, the most prolific category of printers is the impact printer. The major players in the impact category are dot-matrix printers. Daisywheel, or formed-letter, printers are the other type of impact printer. Daisywheel printers hold a small share of the impact printer category. In both cases, the mechanism is a simple print head and ribbon, which the print head strikes, or impacts, against the paper. The impression left is affected by the quality of the paper, the amount of ink left in the ribbon, and the overall design of the printing mechanism itself. Both types of impact printers have advantages, but clearly, the dot-matrix printer offers the greatest flexibility within the category.

In this section, you learn about the differences in impact printers and find out how the technology works. Figure 6.1 shows the inside of an impact printer. Notice the location of the print head. (The appearance of the print head depends on whether you are using a daisywheel, ball or thimble, or standard dot-matrix impact printer.) This illustration was created based on a dot-matrix printer. The roller bar allows you to insert and position the paper; the tension arm holds the page in place; the ribbon receives the impression from the print head and transfers the characters to the page.

![Fig. 6.1. Inside an impact printer.](image)

The next section introduces you to daisywheel and other formed-letter impact printers.
Daisywheel and Other Formed-Letter Printers

The idea of a formed-letter printer dates back to the first typewriters (see fig. 6.2). An individual letter is molded onto an arm. The arm is moved against the ribbon, and the impact makes that letter on the paper. Instead of using a series of long, spindly arms attached to a keyboard, the daisywheel printer has the letters spread out around the edge of a flexible wheel-shaped disk (see fig. 6.3). The disk spins, and when the proper letter is in place, the "hammer," or print head, pushes the letter onto the ribbon. The wheel itself looks like a mechanical, many-petaled daisy.

This striking motion creates a distinctive "click" each time a letter is printed. Depending on the shape and kind of materials used in the enclosure, a daisywheel printer can be quite loud. Just think about hearing a typewriter going at constant speed for several minutes to get an idea of the kind of noise these printers make.

Fig. 6.2. Typewriter technology.
Chapter 6: Purchasing a Printer

Popular Daisywheel Printers

- Apple Daisywheel Printer
- NEC Spinwriter
- IBM QuietWriter

One buzz word in the printer world is letter quality. This term comes from the notion that the final output should look as though it has been typed with a typewriter. Because the daisywheel printer essentially is a typewriter—without a keyboard—it cannot produce anything but letter quality. That same feature, however, is also the downfall of the daisywheel printer. Because the wheel spins to line up the proper character for printing, the time required for each letter to be printed is relatively long (in computer terms). Although a daisywheel printer can certainly print faster than most typists, the printer still performs far more slowly than other kinds of printers. So even though the quality of the type may be acceptable within the application, the speed may be lacking.

To measure speed, printers use a rating called characters per second (cps). A typical daisywheel printer can print 15 to 55 characters per second. The price of the printer determines the
speed (in almost all cases), so to get a “fast” daisywheel printer, you pay a premium price.

Translating cps into usable time results in what is called throughput. How long will the printer take to print the letter or report? For a one-page letter with 350 words and an average of 6 characters per word, a 15 cps daisywheel takes 140 seconds (or 2 1/3 minutes) to print the entire page. A 55 cps daisywheel takes 38 seconds (or half a minute) to print the same page. Compare those times to the speed of a laser printer rated at 8 pages per minute (or roughly 8 to 9 seconds) for the same letter. Daisywheel printers’ results may be “letter” perfect, but the time may be too costly. To put this comparison in perspective, considering your specific needs is helpful. Will you print several pages per hour or only a couple a day? If you print only sporadically and you are happy with the quality of the daisywheel printer, this printer may work for you. If you are printing large amounts of information, you may find that the lack of speed is too great a handicap.

The most limiting factor for daisywheel printers is the fact that the size of the letters is fixed. You have no way to change the size of a capital A on the daisywheel. The letter is molded in plastic or metal on the end of the spindle. This fact means that changing spacing, or the pitch of the type, is not possible without changing the wheel. So if the final draft needs both small print and normal size letters, you have to stop in the middle of the print job, change the wheel, start again, stop again, and so on. Because the shape of the letter cannot be changed on demand, changing style or fonts also requires that you change wheels.

Many people still use the daisywheel printer because they are happy with the quality of the output and they don't have a problem with the lack of speed. Brother makes good low-cost daisywheel printers and also offers some typewriters that have built-in computer adapters so that you can use the machines as either typewriters or printers.

The Spinwriter is another kind of formed-letter printer. A product of NEC (Nippon Electric Company, Japan), the print head in the Spinwriter looks more like a thimble than a wheel. Take the daisywheel disk and fold the arms upward away from the center, and you have a spinning thimble. Spinwriter thimbles take up less vertical space inside the printer and can therefore be used in the desktop printers that have lower profiles.
The ball-type print head is used in another formed-letter printer, this one manufactured by IBM. Similar to the technology used in IBM's line of typewriters, the IBM ball print head is a metal globe that is moved in various directions by the ball holder. Unlike the other two types, instead of a head pressing against a letter to make an impact, the entire ball is moved against the ribbon (see fig. 6.4). With the entire mass of the ball behind the strike, an even impression can be made every time. (This type of head is found only on typewriters with special adapters that allow the typewriter to be used as a printer.)

![Fig. 6.4. The ball-type print head.](image)

**Dot-Matrix Printers**

The dot-matrix printer is inarguably the category of printer with the widest variety of models and manufacturers. Dot-matrix printers differ from the older style impact printers in the fundamental design of the print head itself. Instead of each character being a formed letter (on a stick), the print head is a cluster of wires or pins that are pushed against the ribbon to form the character. The number of pins in the head determines the speed and quality of the final product. Typically, there are only two types of dot-matrix print heads: 9-pin and 24-pin (also referred to as 9-wire and 24-wire).

With both types of print heads, the pins line up in columns. As the print head moves across the page, the printer fires the pins necessary to form the letter or image. With the 9-pin character, the "matrix" which defines the letter is a grid made up of individual dots: 9 high and at least 9 wide. A 24-pin head can produce the same character with a grid which is 24 dots high and 9 to 24 dots wide. Notice that in the same space, the 9-pin head
Part II: Prepurchase Considerations

creates a character that is made up of 81 dots, and the 24-pin uses 216 dots. The more dots per inch (dpi), the higher the resolution and therefore the more clearly formed the letters.

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**Popular Dot-Matrix Printers**

- Apple ImageWriter
- Apple ImageWriter LQ
- EPSON FX-286e
- IBM ProPrinter
- NEC LC-090
- Okidata 390
- Toshiba P1351

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Most 9-pin printers overcome their dpi deficiency by using a multiple-pass technique to add more dots to their letters. Instead of going from left to right and printing the character in only a 9-by-9 dot matrix, the printer moves the paper ever so slightly and on the way back adds a second set of dots between the already printed dots, forming an 18-by-18 dot matrix. This technique is where the term *near-letter quality* (NLQ) comes in. Printers advertised as NLQ can print with so many dots in their characters that the final product is hardly discernible from the perfect letter-quality output of the formed-letter printers. Dot-matrix printers are useful in their capability to print normal or draft-quality characters and to print NLQ letters.

Which brings us back to speed. The 24-pin printer does not need to make a second pass to fill in the gaps. In one pass, the printer can produce a better overall product than the 9-pin can produce in two passes. Assuming that the two printers can move the print head across the page at the same speed, the 24-pin printer is automatically twice as fast. Typical cps (characters per second) ratings on dot-matrix printers range from 150 cps to 300 cps. But the 9-pin printer usually carries a slower NLQ (near-letter quality) rating along with its typical draft rating.

Because the grid, or matrix, of dots can change as needed, dot-matrix printers can print more than one type size or pitch. (*Pitch* is defined as characters per inch.) By changing the width of
the character, the printer accomplishes different pitches. All dot-matrix printers can print 10 cpi (characters per inch). This pitch is the same as the typewriter standard—pica. Ten-pitch type prints 80 columns of characters in a standard 8-inch wide format.

Most dot-matrix printers can also print in compressed mode. This mode prints up to 132 characters in an 8-inch wide format. Usually, compressed mode can print 16 to 17 characters per inch, and on some printers even 20 cpi is available.

Another mode available on most dot-matrix printers is condensed mode. In condensed mode, a dot-matrix printer can produce 12 cpi. This pitch is the same as the elite typewriter font and results in printing 96 characters within the 8-inch wide format. Figure 6.5 shows a sample printout from a dot-matrix printer in normal, compressed, and condensed modes.

Some dot-matrix printers are also capable of printing a variety of different fonts. A font is one size and style of type within a particular typeface (for more information, see the sidebar "Understanding Typefaces"). When you purchase your dot-matrix printer, you usually have two different type styles available in the printer, and with the appropriate software from other vendors, you may be able to get additional fonts for your printouts. If having a variety of fonts is important to you, before you buy a printer, be sure to ask your dealer about adding fonts.

The range of possible fonts in a dot-matrix printer grows every week. Some printers even have a special area of memory for storing fonts that are not part of the standard package. These added fonts are called downloadable fonts and are available through third parties. Downloadable fonts are used mostly by companies that have a need for greater variety in printing styles for newsletters or varied publishing requirements.
Understanding Typefaces

Not long ago, you had little choice about the actual typeface used in printing your characters. Of course, in the early days of computers, getting *any* kind of printout seemed like a miracle. As users become more accustomed to controlling the look and feel of the documents they produce, they become more selective about the typefaces they use in their documents. The early standards of pica and elite typefaces (which you usually see on typewriters) are no longer enough. Users want "artsy" typefaces, typefaces that help convey the meaning of their message, whether that message is loud, light, or languid.

A typeface is a type *family*: letters and characters that are all created using a specific type. The following is a sample of text in the Helvetica typeface:

```
This is an example of Helvetica type.
```

Within each typeface family, you have different sizes and styles of type. The size of the type in the preceding example is 10 points (a *point* is a standard measurement equivalent to 1/72 of an inch). The style of the example is normal, meaning that no special style such as boldface or italic has been added. As you work with typefaces, you will see the word *font* used every which way. A *font* is one particular size and style within a typeface family.

Following are some examples of different fonts:

**This is an example of the Times Roman 12-point bold font.**

This is an example of the Avant Garde 8-point font.

***This is an example of the New Century Schoolbook 14-point italic font.***

This is an example of the Helvetica 10-point font.
Graphics are the other strong suit of a dot-matrix printer. Daisywheel printers have no (or very limited) graphical capabilities. Because dots can form lines, curves, and almost anything imaginable, as well as letters and numbers, dot-matrix printers are great for printing graphs and charts. The limiting factor again is dpi (dots per inch). If the printer can print only a few dots both vertically and horizontally, the smoothness of a curved line is jeopardized. The result is a series of straight lines trying to turn a corner—a condition known as the jaggies. The only known cure for jaggies is higher resolution—more dpi. Because 9-pin printers are limited by the print head, 24-pin printers are certainly better for printing graphics (plus 24-pin printers are faster because they don't have to make as many passes to fill in the gaps between dots). Don't expect graphical printouts to be fast in either case. Dot-matrix printers have to slow down to keep the dots as close together as possible. If you need a great many graphs and pictures, you will be much happier and get better quality from a laser printer.

**Inkjet Printers**

The concept of an inkjet printer lies somewhere between impact printers and laser printers. Your choice of inkjet printers is much more limited than any other kind of printer. As the cost of laser printers keeps coming down, inkjets will probably disappear altogether (unless an extremely economical version of the inkjet printer can be created). Many people swear by their trusty inkjets, however, and the printers do have merit.

Unlike a standard impact printer, the inkjet printer has no mechanism that physically strikes a ribbon and then the paper. The image of the letter, however, is formed by the same kind of dot pattern that dot-matrix printers use. The print head of an inkjet printer moves across the page, spraying the dots of ink onto the paper. Instead of changing ribbons, you change ink cartridges. Because the "spray gun" head does not use hammers or pins, the inkjet printers make far less noise than their dot-matrix cousins. Like a laser printer, an inkjet printer cannot create multiple copies using carbon or carbonless paper.

The inkjet printer seemed like a good idea when it was first introduced. The printer's major advantage—silence—helped promote the idea of a printer on every desk in an office.
However, the quality of the type was the printer's first downfall. Early versions just didn't look good enough to attract the mass audience. And specially treated paper was "suggested" for the best quality.

The newest generation of inkjets by IBM and Hewlett-Packard are a far cry from the early versions. Almost any kind of plain paper can be used, ink cartridges are easier to find, and the print quality has improved by quantum leaps. The latest HP ThinkJet Plus printers use plain paper and can print graphics that rival even laser printers. The cost of inkjet printers lies between the costs of high-quality 24-pin printers and slower low-end laser printers.

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**Popular Inkjet Printers**

- Hewlett-Packard DeskJet
- Panasonic InkJet
- Okidata Inkjet
- Hewlett-Packard ThinkJet

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**Thermal-Transfer Printers**

The thermal-transfer printer uses a different kind of technology, which is similar to the inkjet printer's technology. The thermal-transfer printer creates characters and images by melting a kind of wax-based ink off the printer ribbon and onto the paper.

This type of printing technology produces a higher quality of text than is obtainable with dot-matrix printers. Known as *resistive ribbon thermal transfer*, this type of printing is used in both color and black-and-white printers in business applications when good-quality text is needed and the amount of noise in the office environment is a consideration. Like its inkjet cousin, the thermal-transfer printer is quiet, making thermal-transfer printers a good choice for large offices.

The speed of the thermal printer is surprisingly good; in some cases, the thermal printer rivals the low-end laser printers. Cost, however, is a factor, and to get a good thermal-transfer printer like
the IBM QuietWriter III, you will pay for the extra speed, high quality, and silence. Figure 6.6 shows the IBM QuietWriter III.

Fig. 6.6. The IBM QuietWriter III.

Popular Thermal-Transfer Printers

IBM QuietWriter III
Apple Silentype

Laser Printers

The laser printer is a specialized version of the office copier machine that has been around for years. So what's so great about laser printers? Simply stated: speed, quality, and quiet. Laser printers can print with great speed, with higher quality, and with less noise than normal impact printers. Laser printers are also the newest technology and carry the highest price tag of all the printers available. Now, look at the differences between lasers and impact and between old lasers and new lasers.

The formation of characters with the laser still relies on a pattern of dots. But instead of the dots being limited to a head moving across the page, the dots are created by electrically charging particles of toner and the paper so that the toner sticks to the page in the pattern chosen. With an office copier, the pattern is
determined by reflected light: from a lamp to the original and back onto a drum that is charged. Laser printers use a charged drum, but instead of bouncing light off an original, the information is digitized onto the drum by the signal coming from the computer to the printer through a standard printer cable.

Where impact printers have only 9 or 24 pins to create the pattern, laser printers can create a pattern limited only by the amount of memory in the printer and by the physical size of the toner cartridge. The resolution of a standard laser printer is rated in dots per inch (dpi). The potential "pattern" of dots created by a laser can be 300 dots in one vertical inch by 300 dots horizontally, making possible a one-inch square containing 90,000 individual dots. I will relate this to quality just a bit later.

Results with the laser are more consistent, because the printer has no ribbon to wear out in the middle, or dry up. Only when the toner gets low is there any real difference between the first copy and the last (4000th!). The drawback to the laser is in paper handling. Only one sheet at a time can pass through the printer. This limitation means that reports of several pages come out as several individual pages instead of a chain of pages, as with impact printers.

If you need more than one copy of a report or check, you must print the information more than once. This method is fine for reports—at least the second and third copies are just as good as the original. And because the speed of the printer is exceptional, two reports can be printed as quickly as only one report on an impact printer.

In spite of the minimal drawbacks of these wonderful single-sheet printers, the paper and forms companies are always coming up with more ways to make the laser printer more adaptable to day-to-day business use.

Possibly the biggest use for laser printers is in the field of desktop publishing. Because of the higher resolution and speed of these printers, mixing text and graphics for newsletters and brochures becomes more economical. In fact, you can make several versions of your publication for comparison before sending the final copy to a print shop for duplication. And if your needs are strictly in-house, you can eliminate using a print shop altogether.
Differences in Laser Quality

How does all this information relate to the question of quality? At the 300 dpi resolution offered by most laser printers, most graphical images look fairly good—on a quality scale of 1 to 10, they would rate a 6. The biggest problem with laser printers is in forming curves; in many cases, you can see the rough edges of graphics or large type. You cannot produce halftone images because the dots are all the same size. Gray scaling (the capability to change colors into printed shades of gray) doesn't look terrific at 300 dpi, although both functions are clearly better on a laser printer than on impact printers because of the small dots of the laser and the consistent blackness of the output.

Today, you can buy laser printers rated at 400 by 400 dpi, 600 by 600 dpi, 1000 by 400 dpi, and even 1000 by 1000 dpi. At 600 dpi, images really look professional, but at 1000 dpi, the final output rivals typeset quality. (These 1000 dpi laser printers are known as desktop typesetters and are covered later in this chapter.) In fact, one person who is a professional printer related the fact that his shop could satisfy 95 percent of all the printing needs at 1000 dpi instead of farming out the work to a typesetter. The final application will really determine how good the laser must be. For writing letters, creating in-house reports, quick newsletters, and a variety of other products that don't require the highest quality typeset text, the older 300 dpi printers do just fine. When pictures and scanned images call for higher quality, the newer 600 or 1000 dpi printers may be more appropriate.

Differences in Laser Printer Types

Maybe you have noticed a significant price range in laser printers. Suppose that you're looking through the Computer Shopper and you find one laser printer for around $1,000; but then, you turn the page and...what? $4,900?

The reason for this double price scale in laser printers is because two different technologies (or languages) are at work in laser printerdom. One type of printer, known as a PCL laser printer, can be purchased for around $1,000; the other type, known as a PostScript laser printer, is more expensive, usually upwards of $3,000 in cost.
PCL (short for *printer control language*) and PostScript are names of printer languages, which communicate the information from the computer to the printer. These languages control the way data is sent and received and affect the types of capabilities found in each printer.

Although early versions of PCL were nothing more than simple languages containing only basic instructions necessary for printing, PostScript was—and is—an elaborate page description language, which communicates detailed descriptions of each page to the printer. The complexity and power of the PostScript language gives you substantially more control over the way your page is printed and enhances the quality of the printouts.

Generally, a PCL printer gives you the capability to print good quality text (at 300 dpi); in fact, PCL and PostScript produce printouts of the same quality. The two laser printers have several major differences, however. Obviously, cost is a major difference. PostScript printers give you greater flexibility in the way you use fonts and in the number of fonts you can print. Additionally, you can print high-quality PostScript graphics with a PostScript printer, but your graphics output is more limited with PCL printers.

The most current version of PCL appears in the newly released Hewlett-Packard LaserJet III. This popular new laser printer uses PCL5, which for the first time in any PCL revision gives users the benefit of scaling fonts. Having the capability to scale fonts means that from a specific font—such as Times Roman Bold—the printer language can create type in a variety of different sizes within that specific font. Before the advent of scalable fonts, you had to have a specific font cartridge or software to get each size you wanted: one for Times Roman 10 point, one for Times 12 point, 14 point, and so on.

The new HP LaserJet III and PCL5 close some of the gap that previously existed between PostScript and PCL printers. If scalable fonts are your main concern, the new HP could do the trick for you at less than half the cost of a new PostScript printer. (The new HP is only $2,395 retail, and a new PostScript printer will run over $4,000.) The other qualities that separate PostScript and PCL still hold true. If you need top-of-the-line graphics, you cannot get the quality you need from a PCL printer; if you want eventually to print your work on a high-end typesetter like a Linotronic 500, you will not find support for PCL files beyond your LaserJet III. (One major typesetter manufacturer, Agfa Compugraphic, is
PCL Laser Printers and Fixed Fonts

The low-end laser printers (which are high-end everything else) are the PCL laser printers. The Hewlett-Packard, long a standard in this type of laser printer technology and the first widely used laser printer, has evolved through many generations. The first HP laser was capable of producing only a few built-in fonts at the 300 dpi quality. The fonts available were fixed fonts, however; that is, only the specific font in the printer (or later, in the cartridge) could be used. If the font was Times Roman 10-point italic, that's what you got. You couldn't change the font to 12-point italic or 12-point boldface.

With a fixed font, the definition of the shape and size of the characters printed is defined by a table inside the printer itself. The printer prints characters only the size and shape found in its tables. For a bigger version of the same font, a different font table is required. Additions to the character tables can be accomplished by plugging in a font cartridge. But you are stuck with the shape and size of the characters as they are defined by the cartridge or internal table.

The next generation of HPs allowed plug-in font cartridges. These cartridges contained a small amount of memory and the files that contained the font information. With these cartridges, users could add to their font repertoire, but each cartridge contained only a few fonts, and getting together a significant font library was costly and cumbersome.

All printers include some sort of internal memory that stores the basic information for the workings of the system. In laser printers—particularly HP and PostScript printers, where you work with a variety of fonts and graphic elements—having an adequate amount of printer memory is important. The QMS PS 810+, for example, is a PostScript printer that has 2M of memory.

Not long after the cartridge solution came the advent of soft fonts. Soft fonts are fonts that are stored on disks (or on your computer's hard disk) and then sent—or downloaded—to your printer's memory at print time.

A soft font is not "burned" or "hard-wired" into the printer or cartridge. Instead, the font definitions can be loaded into the
printer's memory so that the printer can be reprogrammed to make a new character set. The limitation with this method is the fact that fonts are still fixed at certain sizes and shapes. By loading and unloading soft fonts, you have virtually endless possibilities, but you waste time waiting for the next soft font to load. Additionally, soft fonts can use a considerable amount of memory, so you must make sure that your printer has enough memory of its own to support the fonts you want to use.

Whether you use a PCL or a PostScript printer, you more than likely will want to add fonts to your system. The way you add fonts depends on the type of printer you use. All printers have some built-in fonts—whether you're talking about dot-matrix or laser printers. The typical PCL printer, such as the HP LaserJet or the Brother HL8e Laser Printer, comes with eight or ten built-in fonts.

Adding fonts to your system brings in two considerations: the printer must have enough memory to support the fonts, and the software you want to use the fonts with must also support the fonts. Sound simple? It is, really.

Fonts can be purchased from a variety of sources:

- Independent companies specializing in font technology (such as Adobe or Bitstream)
- Font packages available as add-on products to particular software packages (such as PFS:First Publisher special fonts)
- Shareware or public domain fonts that you can download from a bulletin board and use with some popular applications

Depending on the type of PCL printer you use, you may need to purchase font cartridges to plug into your machine. These cartridges contain the instructions your printer needs to make and print the fonts and also have the memory required to generate the fonts. If your printer has enough internal memory, you may be able to use soft fonts, fonts that are actually software instructions sent to your printer and stored in your printer's memory. (The procedure for sending the soft fonts to the printer is known as downloading the fonts.)
The newest member of the HP LaserJet family, the HP LaserJet III, does not use the PostScript page description language, but this printer does give you two built-in scalable fonts and the capability to produce PostScript-quality text and graphics for your publications.

The LaserJet III uses a new technology known as resolution enhancement to smooth out curves and jagged edges. With resolution enhancement, the "dot" technology—that used to create characters from a series of dots (even laser printers built their characters based on that technology)—now includes a new twist. Resolution enhancement shrinks dots to fit in curves and diagonal shapes, where they could never fit before, giving your publication a smoother, more finished look.

Other important features of the new HP include the capability to print portrait and landscape on the same page and to print reverse or angled text, spirals, and shaded text. Hewlett-Packard plans to introduce up to 300 scalable fonts for the LaserJet III. Additionally, an Adobe PostScript emulation package (S695) is due for release during the summer of 1990.

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**Popular PCL Printers**

- Brother HL8e Printer
- Hewlett-Packard LaserJet series
- Any non-PostScript laser printer
- Panasonic KX-P4450 Laser Printers
- Toshiba Pagelaser

The primary difference between PCL and PostScript printers is software related (that is, PCL and PostScript are different languages used to communicate information to the printer). The basic "insides" of the printers, however, are similar. In fact, you can change your PCL printer into a PostScript printer by adding a compatible plug-in board, additional memory (depending on how much your printer already had), and the correct software. The expense required for this alteration is much less than the cost of purchasing a new PostScript printer—you're just adding a few items to enhance the capabilities of your printer. For example, the
manufacturers of the QMS PS810+ (a popular PostScript printer) make a board called the JetPlus board, which allows you to turn your HP LaserJet into a PostScript printer. Depending on whether you need to add additional memory (which depends on which model of LaserJet you have), you can turn your HP into a PostScript printer for around $1,600.

Another relatively new addition to the "upgrade to PostScript" arena is UltraScript PC, a software program that makes almost any printer—laser or dot-matrix—into a PostScript-compatible printer for $195. Early reviews of UltraScript PC have been favorable, although the output of the program takes a long time to produce and the output quality is limited by the capabilities of your printer. (In other words, you're not going to get 300 dpi output from your Epson dot-matrix printer, but you will get other PostScript benefits, including being able to print lengthwise—that's landscape orientation—when it would otherwise not be possible).

PostScript Laser Printers

The biggest benefit of PostScript laser printers can be explained in two words: scalable fonts. Although PCL printers are able to print at the same quality as most PostScript printers (300 dpi), PCL printers offer only fixed fonts—fixed in typeface, size, and style. You can print only the font you have.

With scalable fonts, you can print any size and style of a particular type by using only one definition of the character set in the printer's memory. This definition includes mathematical formulas for changing the size and orientation of the characters as needed. One of the first scalable fonts was developed by a company named Adobe. Adobe invented a language that can manipulate the mathematics of a font to make the font scalable. Called PostScript, this definition of scalable text became the first standard for unfixed font formats. Now you can get several variations of scalable fonts, some of which claim to be (and are) PostScript compatible.

The major advantage to scalable fonts is the capability to change the size and even the orientation of the characters without loading a whole new definition of the character or plugging in a cartridge. Suppose, for example, that you are creating a newsletter, and the main text is in Bookman 10-point normal type. For the banner, you want to use Bookman 48-point. With a PCL printer, you would have to have that specific font—Bookman 48—either built into your printer (and it wouldn't be), on a cartridge (which is
unlikely), or on a soft font disk you could install in your computer. With a PostScript printer, you already have the font (Bookman), so you can just set up your document and go.

The same benefit applies to graphics. Images captured or imported in Encapsulated PostScript (the same page-description language, used to explain graphics to the printer) can be resized, rotated, and manipulated without any loss of quality. You will see no jaggies on a PostScript art file.

Popular PostScript Laser Printers

Apple LaserWriter IIINT
QMS PS810 +
IBM Personal PagePrinter

There is one more step between PostScript printers and desktop typesetters. These printers are enhanced-resolution printers, which are capable of printing at a higher resolution than 300 dpi. You will see several variations available: 600 by 400 dpi, 800 by 600, 600 by 600. Usually, these printers are high-end PostScript-compatible printers that use a special board installed inside the system unit of your computer.

Desktop Typesetters

The final quality stop in laser printer technology rests with the current top of the line: desktop typesetters. Desktop typesetters use a different technology similar to PostScript to scale fonts and graphics and provide the highest possible quality currently available: 1000 by 1000 dpi.

With the output from most desktop typesetters, you cannot tell the difference between the print and type from a conventional typesetter. Figure 6.7 shows a comparison of output from a 300 dpi PostScript printer (a QMS PS 810+) and a desktop typesetter (Raster Devices TurboSetter 1000).
Laser Maintenance Costs

The last consideration with laser printers is operating cost. With an impact printer, a single ribbon is replaced at a cost of between $3 and $20. With lasers, the disposables are mostly toner. The laser printer “engines” are made by two major manufacturers: Ricoh and Canon.

With the Canon engine, a drum and toner are contained inside one easy-to-change cartridge. This cartridge can be rated from 4,000 to 10,000 pages depending on the kind of printer used. Price: $89–$179 street price. With the Ricoh, toner is separate and is good for roughly the same number of pages. Price: $25–$35. But the “drum” must be replaced every 10,000 to 20,000 pages. By the time you add in this price and the cost of toner, both systems cost about the same amount to operate.
Paper for these printers can be any good grade copy-machine paper. You can purchase specially formulated paper for higher quality (600 to 1000 dpi) printers. Most manufacturers recommend the better paper for high-resolution output, and judging from first-hand experience, their claims are justified. Basically, the laser printer costs more to operate each time you need to purchase its disposables. And even though that cost is spread out over a much longer time, laser printers still run about 50 percent higher to maintain than desktop impact printers. (But they’re so quiet and so fast!)

Considering Other Printer Factors

Now you know too much about printers. What you don't know is which one to buy. Your budget will always limit your purchase, so here are other factors to consider along with costs and budget. Where is the printer going to sit? On the desk? If so, a short cable will do. How does the paper feed into the printer? If the paper comes in from the back, you will need enough space for the paper both before and after printing. This space may require a simple wire stand ($15 to $24). Will you feed more than one form into the printer, like checks, invoices, and plain paper? Now this simple stand just got more complicated, because the stand needs slots to hold the different forms. Keep in mind how the paper feeds into the printer and where the printer will sit. This information tells you whether you need a floor stand or a desk stand of some kind, and how long the cable should be.

How often will you change these forms? If the answer is very often, maybe you need two printers! Will your software support two printers? Maybe you need two printers, two cables, and a switch box to control which printer you use at which time (with its own cable, of course). Will more than one person need access to the printer? If the printer has a multiuser adapter built in, you're all set. If not, however, you need a controller that allows several computers to access the one printer. This controller will cost another $300 to $600, depending on the number of users and the kind of features you want. So should all users have their own printers? (You should keep this question in mind about the
number of users or future users, not only when you choose your printer, but also when you decide where to place the printer.)

Finally, consider paper, forms, and paper storage. If you will print a great many multipart forms, a laser printer probably will not work best for your needs. But the printer must also handle multipart forms easily. Look at the paper path—does the paper make a 180 degree turn from where the paper enters to where it exits the printer? This major turn can jam multipart forms more easily than singles.

Will you be switching often from continuous-feed paper or forms to single sheets or letterhead stationery? If so, look for a printer with a “paper parking” feature. This feature allows the continuous-form paper to remain attached to the mechanism that pulls or pushes the paper past the head while you insert a single sheet into the printer (no loading and unloading the printer when switching from continuous to single sheets).

Are your reports confidential? Do you need a shredder for old reports? How will you bind the reports for storage? Find a good paper supply house to help with these considerations. Are your forms special? Do they require a customized design? Or can you use off-the-shelf forms from one of the national forms supply companies?

Remember to heed the *Buyer Beware* warning. Don’t take the word of the salesman; try the printer out before you buy it. Try inserting paper, find out about the ribbon (or toner cartridge), and ask about service. Finally, don’t be afraid to shop around. Printer prices can vary by as much as 40 percent for the same model. Find the best price you can; after all, the printer is the same no matter where you buy it.

### Deciding Where To Buy Your Printer

OK, you know the printer you want. Do you buy the printer at the local computer store or shop mail order? Think about one aspect of this printer: Service is the one and only deciding factor about where you purchase the printer. Who is going to fix it?
If something small happens (like you cannot figure out how to change the ribbon or you're not getting the font you want), you can call the printer manufacturer's customer support line—all reputable manufacturers have one. A technical support specialist can answer these kinds of questions no matter where you bought the printer.

But if something major occurs (like your kids drop a bowling ball on the cover) or something mysterious goes wrong (like the printer begins printing backward for no apparent reason), you will need to take the printer to someone who knows how to fix it. If your local retail store can fix the printer, if the store is an authorized service facility that stocks parts and the technicians know what they are doing, great. You will need that printer every day in a business. Getting the printer fixed fast is important. Will the retail store give you a loaner? Does the store have to send the printer somewhere else to fix it?

Buying mail order changes the equation. You can definitely save money buying mail order. The questions to ask involve turn-around time. Does the mail order company ship a replacement printer or fix the one you send in? How fast? Overnight? Who pays shipping? What about an on-site service contract? Will the on-site company have parts, or does the company have to order them? Remember to ask all these important questions before you buy.

Any service is tricky at best. No one has the perfect solution, although same-day loaners can be the most useful policy around. A printer is a commodity. Good printers work well, right out of the box, and for a long time. But when they break, when they fail—what then? Just ask the questions. Find a backup, someone willing to give you a loaner. And make sure that you register the equipment so that the warranty is in effect.
Conclusion

Printing is an important part of working with computers, whether you publish materials for a living or simply want some sort of documentation for the spreadsheet you have been building all week, having the capability to get printed output from your computer is important. In this chapter, you have learned a great deal about your choices in printing type, quality, and speed. In the next chapter, you learn about additional devices you may want to purchase for your computer.
Now that you have made some of the major decisions about your basic computer needs, the computer system you want to purchase, and the printer you need, you are ready to investigate some additional options for your system.

This chapter introduces you to the following computer add-ons:

- Keyboard
- Mouse
- Modem
- Scanner

Depending on the type of application you will be using on your computer, you may not need all these add-ons. You will undoubtedly need a keyboard, but the mouse, modem, scanner, and joystick (a pointing device used primarily with games) may be optional for your use. If you are purchasing a Macintosh computer, the mouse is a necessity; if you are purchasing a PC, your use of the mouse will depend on the software you plan to use. For example, if you are using a PC with WordStar (a word processing program that does not require a mouse), you don't need to invest in a mouse at the outset. If you intend in the future to purchase a program that uses a mouse, you may want to invest in a mouse.
This chapter looks closely at each of these computer add-ons and provides examples of when you use each item.

Understanding Available Keyboard Options

With many computer systems, the keyboard is included as part of the package. You do have the option of purchasing the keyboard separately or of buying a different keyboard other than the one included with the system, however. With all Macintoshes later than the Macintosh Plus, you have to buy the keyboard independently.

You also can buy keyboards from places other than the manufacturer of the computer. For both PCs and Macintoshes, you will find many independent computer companies that make keyboards. Most people like the following features in their keyboards:

- A key layout design that is easy to use with the software they use most
- Function keys in the place most easily accessible. Some people prefer function keys (special keys labeled, for example, F1 to F10) along the left side of the keyboard; others prefer them across the top.
- Separate numeric and cursor-movement keypads
- Some kind of click mechanism that makes a sound when a key is pressed
- The capability to angle the keyboard at the best angle for the typist
- Enough weight so that the keyboard doesn't slide under heavy typing
- A key action that works for you. Some people like light responsive key action; others prefer keys that you must press firmly

The following sections introduce the basic keyboards for IBM, Apple, and Macintosh computers. Remember, however, that other manufacturers (called third-party vendors) make other keyboards,
so if you don't see one that appeals to you, be aware that many others are available.

**IBM Keyboards**

The original IBM PC keyboard was like one long block of keys with 10 function keys at the left (see fig. 7.1). This keyboard was one of the first ones, and IBM was criticized for the keyboard's "mushy" feel, the somewhat confusing layout of the keys, and the size of the keys. Users felt that important keys like Enter and Shift were too small, and that the dual role of the numeric keypad (as cursor-control keys and as a numeric keypad) was confusing.

![Fig. 7.1. The original IBM PC keyboard.](image)

With the IBM PC AT, IBM introduced a new keyboard (see fig. 7.2). Solving many of the problems of its predecessor, the PC AT keyboard had larger Shift and Enter keys. IBM also moved the numeric keypad away from the text keys and added indicator lights to show when the Num Lock, Caps Lock, and Scroll Lock keys had been toggled on.

Several of the keyboard's real problems still hadn't been solved, however. The double-featured numeric keypad was still confusing, and the location of the function keys limited how easily they could be used.
When the IBM Enhanced Keyboard was introduced (not long before the first PS/2s popped into the market), IBM had addressed all the issues and come up with a solid, functional keyboard that pleased many people (see fig. 7.3).

The Enhanced Keyboard located the function keys across the top of the keyboard, reducing the user's chance of pressing the wrong key erroneously. Now users had the choice of using the numeric keypad as a cursor-control keypad or as a numeric keypad. A separate set of cursor-movement keys occupy a space between the numeric keypad and the regular text keys. Insert, Delete, Home, End, Page Up, and Page Down keys, and Pause keys also were added.
The Model 25 brought another standard to the IBM keyboard series. The 84-key Space-Saving Keyboard packaged with the Model 25 was in keeping with the "small footprint" size of the Model 25 (see fig. 7.4). With the Model 25, however, you do have the choice of getting the larger Enhanced Keyboard at a nominal cost.

You also will find a wide variety of keyboards available from many third-party vendors. Many of these keyboards are slight variations of the IBM Enhanced Keyboard, perhaps offering special features, such as an increased number of function keys or special purpose keys, like a macro key.

**Apple and Macintosh Keyboards**

With the original Apple computers, the choice of keyboard was easy: You didn't have a choice. With these laptop-looking models, the keyboard was included as part of the system unit. Today's Apple IIe and Apple IIc still have the keyboard attached as part of the unit (see fig. 7.5). On the Apple IIcs, however, the keyboard is a separate component, connected by a cable to the system unit (see fig. 7.6).
The first Mac keyboards were petite—much like the Mac itself, compact and without many extras. Although the keyboard had basically everything most users needed, the small size and compact feel of the keys perpetuated the “game” or “toy” image from which the company was trying to escape.
As mentioned, with any Macintosh purchase at a higher level than a Mac Plus, you're on your own for the keyboard. You can choose to purchase the Apple Extended board directly from Apple (see fig. 7.7).
The Extended Keyboard has the standard alphabetic keys, 15 function keys, plus the usual arrow keys and a full numeric keypad.

Other Keyboards

You don't have to purchase a keyboard from the "big names" in computerdom, and you don't have to use the keyboard you receive as part of the "package" you purchase. If you are unhappy with the keyboard you have, look through popular computer magazines or catalogs like the Computer Shopper to find other keyboards compatible with your system.

For example, the LOGOS 5001 130-key PC keyboard shown in figure 7.8 offers 130 keys, 8 (rather than 4) cursor-movement keys, 2 sets of function keys, and a stand-alone macro key. Additionally, this keyboard has its own calculator so that you can perform calculations without interrupting the processing of your computer. The manufacturer of this keyboard, American Computer Technologies Corp., offers the LOGOS 5001 for $119.

Fig. 7.8. The LOGOS 5001 keyboard.

Be careful when you are considering a third-party manufacturer of keyboards, however. Before you buy, make sure that the keyboard is compatible with your system and offers an acceptable warranty.
Choosing a Mouse

Whether you use a mouse depends on two major considerations: the type of system you use and the application programs you plan to use with your computer. Before exploring applications and systems that use the mouse, I will explain what the mouse does.

Put simply, a mouse is a pointing device that you use to select menu options, open files, choose commands, move graphics, and perform a variety of other operations which might be cumbersome or slow on the keyboard. You can use the mouse to move the cursor on the screen quickly and accurately. You press the mouse button(s) to open menus and select items.

Consider the time it takes you to move the cursor from one end of the screen to the other by pressing one of the arrow keys. Then think about how quickly you can reach up and point to the place on the screen where you want the cursor. The second procedure—pointing—takes the same amount of time it takes to move the cursor by using a mouse. The faster the pace of your business or application, the more agonizing the wait as that cursor crawls across the screen in non-mouse-based programs.

Which Computers Use a Mouse?

Not all computers and programs can use the mouse. The Macintosh was shipped with a mouse from its first generation; in fact, the Mac was literally unusable without a mouse. The mouse was used for virtually all file and document management tasks, such as opening and closing files, running programs, and selecting menu options. The keyboard also was used for a variety of tasks such as entering data, renaming files, and other operations that require keyboard input. The fact that the Mac interface was so easy to use (users simply used the mouse to point to and click applications, files, and commands) was due in large part to the mouse technology.

Early Apples—like the II, Ile, and IIc—did not come equipped with a mouse, but users could add a mouse for some applications. The Apple IIGs was—and is—sold with a mouse as part of the standard package.
Generally, IBM PCs (and compatibles) were pretty slow to move into the mouse market. Since its introduction as a primarily Macintosh device, the mouse has lost out in the PC arena to keyboard selection methods. Early PC users preferred typing commands from the keyboard and pressing certain key combinations (such as Ctrl-Y) to perform operations that Macintosh users accomplished in mouse-based programs by pointing with the mouse and clicking the mouse button.

Microsoft Windows, a program designed for the IBM PC and compatibles, legitimized the use of the mouse by providing users with the capability of having several files open at one time (in *windows*) and giving users the capability to select commands, programs, and various file operations by using the mouse. (For more information about Microsoft Windows, see Chapter 10.) Figure 7.9 shows a screen from Microsoft Windows, Version 3.0.

![Microsoft Windows](image)

**Fig. 7.9.** Microsoft Windows: a mouse application for PC users.

Because the mouse was such a success, many popular IBM applications are now including the mouse interface. When the IBM PS/2 was introduced, a dedicated mouse port was built into the system. (A mouse port is a port on the back of the system designed specifically to allow users to attach a mouse. Through this port, the mouse interface communicates actions to the operating system and vice versa.)
What Can I Use a Mouse For?

Whether you use an IBM (or compatible), a Mac, or an Apple, the mouse does basically the same thing: it enables you to point to, select, and move items on-screen. For example, in a spreadsheet program like the one shown in figure 7.10, you use the mouse to do the following tasks:

- Open menus
- Select commands
- Highlight spreadsheet cells

![Figure 7.10. A spreadsheet on the Apple IIgs.](image)

In the PC graphics program shown in figure 7.11, the mouse takes on a variety of personalities: When you are using text, the mouse appears as a text tool (and, in many programs, you wind up with two versions—the mouse cursor and a separate text cursor). When you are filling an area with a certain color, the mouse appears as a paint can.
Do I Need a Mouse?

The best answer to this question is, “Will I be using a program that requires a mouse?” If you haven’t chosen the software you will be using, you may want to reserve judgment on this question.

Generally, people who are intimidated by using a mouse are surprised to find out how easy the procedures really are. And once you get used to pointing and clicking, going back to selecting menu commands, options, and operations by typing commands or pressing keys on the keyboard may be harder than you think.

If you have chosen the Macintosh, you will get a mouse—no questions asked. Additionally, if you purchase an Apple IIgs, the mouse comes as part of the system. For every other type of system, you will need to purchase the mouse as an add-on item. The next section explains the different types of mice available.

What Type of Mouse Do I Need?

As mentioned, if you buy an Apple IIgs or a Macintosh, you don’t have to worry about picking out a mouse: Apple does that for you.
And similarly, if you are purchasing a mouse for your Apple IIe or Apple IIc, you have basically one choice if you want the name brand product: an Apple mouse. Some mice, however, are created by third-party manufacturers. One such mouse, called a Turbo Mouse, is discussed later in this section.

If you are purchasing an IBM PC or a PC clone, however, you need to decide which type of mouse you want and where you want to add it. Basically, two types of mice are available for the IBM: serial mice and bus mice. A serial mouse is attached through the serial port in the back of the computer system, and a bus mouse requires the addition of a board that plugs into the motherboard of the computer system. Most users cannot see the difference in mice. Although the serial and the bus mouse work differently inside the computer (and some people argue that the bus mouse is slightly faster), the only difference is that the bus mouse frees a serial port on the computer, giving you another serial port to use for devices such as printers, digitizers, or modems.

If you are working with an Apple or a Macintosh computer, your choice of mice is limited: only a few exist for those computer types. Unlike its PC counterparts, the Apple mouse has only one button (PC mice usually have two or three buttons). Figure 7.12 shows the IBM mouse.

![Fig. 7.12. The IBM mouse.](image)

As you are mouse shopping, you will run across several terms:

Mechanical mouse. A mechanical mouse is a “traditional” mouse that operates on the rolling-ball concept. Inside the mouse is a little rubber ball that touches special pressure-sensitive electrodes when you move the mouse across the
desktop. This action communicates to the computer the location of the mouse. The computer program then “knows” where to display the cursor on the screen in relation to where you move the mouse.

Optical mouse. Instead of the mechanical rolling-ball concept, an optical mouse “sees” where it is going by keeping track of certain coordinates. You use an optical mouse with a special pad that contains a grid of wires; when you move the mouse across the pad, the optical mouse shines a beam of light onto the pad. In the spaces between the grid lines (each line is called a gradical), the light is reflected back to the mouse; when the mouse passes over a gradical, the light is not reflected back. The mouse then “knows” where it is and sends the coordinates to the system and the application software.

Hi-res mouse. A type of mouse that is highly responsive to any movement of the mouse. For example, a hi-res mouse may be capable of resolution up to 320 dots per inch, which would make it more sensitive to movement than a 200 dpi mouse.

A Look at Mouse Accessories

For some people, these are mouse necessities:

- A mouse pad is a thick, cushion-like surface (roughly 10 by 12 inches) on which you place the mouse. This pad gives the mouse an accurate tracking surface, allowing you to move the mouse smoothly. The mouse pad also keeps the mouse cleaner—bypassing the dust, dirt, and crumbs that may accumulate on your desktop.

- A mouse house is a small pocket that attaches to the side of the system unit of your computer. This “house” gives you a place to store the mouse when you’re not using it, giving you more clear desk space.

- For the winter months, you may want to invest in a small fuzzy mouse suit... (yes, we’re kidding, but they do sell these novelties).
Another type of pointing device—which is something like an upside-down mouse—is climbing into the mouse arena: the trackball (see fig. 7.13). The trackball is popular for games, and some CAD users like the feel of the trackball better than the feel of the mouse. The only real difference between a trackball and a mouse is that with the trackball, the unit stays in one place and you move the ball, which in turn moves the cursor on-screen. One popular trackball, from Logitech, costs $119.

Fig. 7.13. A trackball.

The Turbo Mouse, available from Kensington for the Macintosh, is a cross between mouse and trackball technology. The ball is on the top of the device (similar to a trackball) and the Turbo Mouse has two buttons with switches that allow you to set how you want the mouse to respond when you click the buttons. The Turbo Mouse is available for approximately $170.

How Much Does a Mouse Cost?

If you are considering adding a mouse to your system, you will see a few differences in price. First, you will find some popular mice packaged with a program, like Microsoft Windows or Logitech Paint. (Of course, a Microsoft mouse is packaged with Windows, or
a Logitech mouse is packaged with Logitech Paint.) You also may see a price difference based on whether you buy a bus or serial mouse. Generally, however, here are a few mouse prices:

<table>
<thead>
<tr>
<th>Mouse Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENIUS three-button serial mouse</td>
<td>$129</td>
</tr>
<tr>
<td>Logitech hi-res serial mouse</td>
<td>79</td>
</tr>
<tr>
<td>Logitech hi-res bus mouse</td>
<td>89</td>
</tr>
<tr>
<td>Microsoft bus mouse</td>
<td>129</td>
</tr>
</tbody>
</table>

Understanding Modems

Similar to the mouse, the modem was not used in the mainstream of computer applications in the early days. Today, modems are extremely popular, linking users all over the world through phone lines.

The term *modem* is short for *modulator/demodulator*, which is basically the process the modem uses to turn data into audio signals (modulation). These signals are sent through the phone lines and are received by another modem that changes the data from audio signals into the electronic form usable by the computer (demodulation).

The earliest modems were *acoustical* modems, requiring you to place the handset of the phone in the modem, which sent and received data through the cuplike receptacles into which the handset was placed.

Today's modems can be either external or internal modems. An *external* modem is placed outside your computer and connected to both the system unit and the telephone jack with telephone lines (see fig. 7.14). An *internal* modem is a board plugged into the motherboard of your computer system, and the telephone wire is connected to the board. Internal and external modems are available for Macintosh, Apple, and PC computers.

What Can I Use a Modem For?

Initially, you may have to use your imagination a bit to picture yourself using a modem. Once you step into the communications arena, however, going back is hard. Some uses for a modem are suggested in the following paragraphs.
Fig. 7.14. An external modem.

- Computer-to-computer communications

With the significant increase in the number of offices in homes, communications—the process of linking computers via phone lines—has become a new wave in personal computing. Imagine this: You are working on a report that is to be presented at a corporate meeting on the 14th. Two days before the meeting, you have to travel to Georgia to handle a major breakdown. With communications, you can take your laptop computer to Georgia with you (assuming that your laptop model has a modem), finish the report, and then use the modem to send the file to your administrative assistant. Your assistant can then print the report and have it duplicated in time for the boss's approval and inclusion in the report packet assembled for the meeting.

- Retrieving information from information services

A modem gives you access to a world of information previously available only in the most up-to-date libraries. Through the use of information services, or large mainframe computers that store an incredible amount of information on an exhaustive list of topics, you have at your fingertips information on almost anything you could want. From an information service, you can perform the following information-gathering activities:

  - Find out about cruises to Alaska
  - Check for up-to-date stock information
  - Talk to users of your favorite software package
  - Get advice on publishing your corporate newsletter
Retrieve a new game publicly distributed for your computer
Leave a message on a bulletin board about a system you have for sale

For information on how to subscribe to these information services, see Chapter 18.

- **Electronic Mail**

  The electronic mailbox is similar to the answering machine—but done through the use of computer technology. With an electronic mail system, you can leave messages for other users and read messages left for you.

  With electronic mail, you have the option of using either a private or public system. Public systems, such as ones run by MCI or AT&T, charge a monthly subscription fee and a per minute (or per message) rate. Private electronic mail is used within corporations to transfer messages and memos from department to department and from person to person. A variety of private electronic mail software currently is available.

### Do I Need a Modem?

When you purchase your computer system, consider whether having the capability to link to other computers is an important feature for you. A modem is easy to add later. If you are unsure whether you need one, you may want to delay that purchase.

When you are considering the purchase, ask yourself the following questions:

- Will I ever need to transmit data from a remote place?
- Would I use an information service to look up information or contact other companies?
- Would my business benefit from electronic mail?
- Will I be contacting the bulletin board services run by software manufacturers?

If the answer to any of these questions is "Yes," you should look further into finding a modem that will operate with your system.
The following section introduces you to the cost of modems. Chapter 18 explains the differences in communications software for various machines.

How Much Do Modems Cost?

Like anything else related to computers, the cost of the modem is directly related to its features. The greater the number of features, the greater the cost.

Modems have many differences besides the internal or external choice. Baud rate—or the speed at which the modem is capable of sending and receiving data—is another variable. Some modems send and receive data at 1200 baud, while others are capable of 2400 or even 9600 baud. The earliest transmission speed standard—300 baud—is seen only rarely, now that faster transmissions are available. The following list shows you how the difference in transmission speed can affect the transfer times of a 16K file. (A 16K file is comparable to a 7-page single-spaced document.)

<table>
<thead>
<tr>
<th>Baud Rate</th>
<th>Transfer Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>2 minutes</td>
</tr>
<tr>
<td>1200</td>
<td>30 seconds</td>
</tr>
<tr>
<td>2400</td>
<td>15 seconds</td>
</tr>
<tr>
<td>4800</td>
<td>7.5 seconds</td>
</tr>
<tr>
<td>9600</td>
<td>3.75 seconds</td>
</tr>
</tbody>
</table>

Generally speaking, a modem is a relatively low-cost addition to your computer system. External modems are ordinarily higher priced than internal modems. Additionally, some modems are sold with communications software. Generally, modems that transmit data faster cost more (for example, a 2400-baud modem will cost more than a 1200-baud modem). Additionally, you will pay slightly more for an external modem than you will for an internal modem because the number of additional parts of the external modem (the housing, cables, and so forth) make it more expensive to manufacture. The following list* gives you an idea of the costs of a few popular modems:

* Prices according to Computer Shopper, March, 1990; they are not meant to reflect retail prices.
<table>
<thead>
<tr>
<th>Modem</th>
<th>Baud Rate</th>
<th>Type</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hayes</td>
<td>1200</td>
<td>Internal</td>
<td>$199</td>
</tr>
<tr>
<td>Hayes</td>
<td>2400</td>
<td>Internal</td>
<td>249</td>
</tr>
<tr>
<td>Hayes</td>
<td>1200</td>
<td>External</td>
<td>289</td>
</tr>
<tr>
<td>Hayes</td>
<td>2400</td>
<td>External</td>
<td>339</td>
</tr>
<tr>
<td>Everex</td>
<td>1200</td>
<td>Internal</td>
<td>89</td>
</tr>
<tr>
<td>Everex</td>
<td>2400</td>
<td>Internal</td>
<td>129</td>
</tr>
<tr>
<td>Everex</td>
<td>2400</td>
<td>External</td>
<td>199</td>
</tr>
<tr>
<td>Supra Modem</td>
<td>2400</td>
<td>Internal</td>
<td>99</td>
</tr>
<tr>
<td>Supra Modem</td>
<td>2400</td>
<td>External</td>
<td>119</td>
</tr>
</tbody>
</table>

There are arguments for both internal and external modems. An internal modem, of course, takes up one of your system's expansion slots, eats up some of the CPU speed, and costs less (that's two minuses and one plus). An external modem stands alone on the desktop, includes indicator lights on the front to show when data is being sent and received, but costs more (two minuses and one plus). The indicator lights are a nice feature—particularly if you want to be able to send and receive data while you are working on something else; the lights can then show you when your system is working "in the background." If you don't have an external modem, however, you can generally rely on the software to let you know how the data transmission is going.

You have heard this theme before: Different types of modems offer different features. And, although the cost of modems is relatively slight, you may be able to get a few "extras" when you purchase your modem from certain manufacturers. For example, when you purchase the ATD/Zuckerboard 2400E Internal Modem, the PC Talk 3 communications software is included with the modem. Additionally the ATD/Zuckerboard 2400E offers these features:

- Fully Hayes compatible
- Pulse or tone dialing
- Auto answering and auto dialing features
- Built-in speaker with volume adjustment control
- Capability to monitor the progress of a call
- Full or half duplex operation
- Dual phone jacks
- Automatic error detection
When you are ready to purchase a modem, be sure that it

1. Transmits at a speed acceptable for your uses

2. Will be compatible with modems in computers you will be sending and receiving data from

3. Includes any additional features that you feel are important (special dialing features, error detection features, volume control)

What Is a FAX Modem?

Basically, when you use a FAX, you insert the sheet you want to send, and the FAX "reads" the sheet (like a scanner, which is explained in the next section); changes what it "sees" to transmittable signals (like a modem); sends the data to the receiving modem, which then reconverts the signals (like the receiving modem); and prints the data (like a printer).

FAX modems, or FAX plug-in boards, are now available. These modems enable you to send and receive files directly from your computer without a separate FAX machine. Additionally, some manufacturers offer a scanner and FAX board combination that allows you to scan text and graphics, and then transmit the data to another FAX machine. One of the major advantages to a FAX board is that you can FAX a file from the background (while you are working on another application) without interrupting your work. You can also keep a log of frequently used FAX numbers and perform a variety of other time-saving tasks by merging the power of your computer with FAX capabilities.

Although most stand-alone FAX systems range in price from $500 for a low-end machine to $1,000 and more, you can get a FAX board for between $250 and $400. Of course, you don't have many of the bells and whistles of a stand-alone FAX (such as a dual function as a copier, data/voice switching option, or automatic printout capabilities), but you do have the option of using the received FAX data in your computer application and printing the information, if you wish.
Buying a Scanner

As computing needs change, users are asking for better and faster ways of getting information and graphics into their computers. After you type a 40-page document, you can use it again and again, but getting it entered can be a real headache. If someone approached you with an option that would free you from hours of mindless typing, you would at least be interested.

Or suppose that you are working with a client who insists that you use his logo on all his publications. The problem? The logo is decades old and will be difficult to reproduce. How can you get it into your desktop publishing software so that you can work with it easily?

Scanners—or scanners and OCR software (which is explained in the following section)—come to the rescue. A scanner is a device that allows you to convert something on paper—text or graphics—into an electronic form usable by the computer. The way in which you use the scanner depends on the type of scanner you have. If you have a hand-held scanner, for example, you scan the image by moving the scanner across the page. If you have a flat-bed scanner, you place the page in the scanner, similar to inserting a page into an office copier.

When would you use a scanner? For example, following the example of the persnickety client in the last paragraph, suppose that you need to place this client's logo on each page of a special publication you are producing for him, and he insists that the logo be exactly the same as the one he supplies. "No fancy artwork," he says, "We've had this same logo for seventy-five years and it has suited us very well, thank you." So how can you use the logo on every page but avoid manually cutting and pasting the logo into the publication, page after page?

Your way out in this case is to use your scanner to "read" his logo into electronic form so that you can then use it in documents. That keeps you from having to get out the EXACT-O knife and the wax (or scissors and glue) and appeases your client by keeping the logo the same.

When you scan text, the scanner turns what it "reads" into graphics text; that is, you cannot edit the text, retype sections, or correct misspellings. The computer thinks that the text is a graphic, because the scanner has essentially taken a picture of the text. To turn the text into real text again—characters that you can
edit, modify, and change font styles—you need OCR (optical character recognition) software. This type of software is used with your scanned files to convert the graphics text into text that can be used in your applications. OCR software can run anywhere from $150 to $1,000. Many scanner manufacturers—like Logitech—offer OCR software as an option when you purchase your scanner.)

Again, like all computer items, a number of scanner types are available.

What Types of Scanners Are Available?

Scanners come in a variety of shapes and sizes. High-end powerful color scanners can scan color images, retaining the densities and slight color differences of up to 16 million colors. (The number of colors available is limited only by the scanning software.) Low-end hand scanners—black-and-white—scan only a portion of a page and offer a resolution of only 200 to 400 dpi (dots per inch). In the middle are the gray-scale scanners, so named because they convert the scanned image into images displayed and presented in shades of gray. Depending on the capability of the scanner, these scanners may give you up to 256 different gray tones and are adequate for many graphic scanning needs.

The resolution of the scanner determines how many dots per inch the scanner will pick up when it is converting the image into electronic form. A 300 dpi scanner will read more dots than a 200 dpi scanner. Generally, like other devices that use resolution as a standard—such as monitors and printers—the more dots, the better resolution the device is capable of producing. Most scanners have a switch that allows you to set the resolution of the scan.

Besides the color or gray-scale question is the question of the basic type of scanner: hand-held, half-page, or full-page scanner? You can guess what each of these different types offers. A hand-held scanner gives you about four inches of scanning width, a half-page is a wider version of the hand-held, and a full-page (also called a flatbed) scanner enables you to place an entire page in the scanner and capture all text and graphics shown on that page. The flatbed scanner offers the best quality scanned image because nothing moves during the scan—you don't move the scanner (as
you do with hand-held and half-page scanners). Often, when the page or the scanner is moved, the output can be somewhat wobbly. Figure 7.15 shows a hand-held scanner, and figure 7.16 shows a flatbed scanner.

Fig. 7.15. A hand-held scanner.

So how do you use a scanner? You install the device (or have it installed), load the scanning software (which comes with every scanner), and—in the case of a hand-held scanner—pull the scanner over the image you want to scan.
If the image you scan is a graphic, you will want to save the image in a file format that is usable in other applications, such as PCX or TIF (the two most common PC graphics file formats). You then can import the graphic into another program, such as PageMaker or First Publisher, to add scanned artwork to your publications.

If the image you scan is text, your computer recognizes the image as a graphic. All text and graphics digitized by a scanner are converted into a graphics format. Until you use a certain kind of software known as optical character recognition, or OCR, software with the captured text, your computer and your applications will "see" the text as a graphic element. Therefore, you cannot edit, change the style, or work with the text (as text) until you have used OCR software to convert the text from a graphic element into real text.

Some OCR packages are rather clumsy, allowing you to transform text, but limiting your output choices. For example, not all OCR software allows you to set different font types; some high-end OCR software packages can recognize the font in the original scanned image and automatically match that font for the output. OCR software can cost from $150 to over $1,000, depending on the speed, accuracy, and flexibility you want. Some of the most powerful OCR packages can even convert hand-written text into usable electronic type. The high-end OCR programs, in addition to requiring a substantial investment, eat up significant amounts of memory, often up to 4M of EMS memory.

When Would I Use a Scanner?

The question of need comes into play again with scanners. Would you use one if you had one? And if so, which type? Use the following list to give you an idea of when you might use which scanner type:

<table>
<thead>
<tr>
<th>Use</th>
<th>Scanner Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>For scanning small logos</td>
<td>Hand-held</td>
</tr>
<tr>
<td>For importing pages of text</td>
<td>Flatbed or full-page</td>
</tr>
<tr>
<td>with OCR software</td>
<td></td>
</tr>
<tr>
<td>For importing color images</td>
<td>Color scanner</td>
</tr>
<tr>
<td>that must stay color</td>
<td></td>
</tr>
<tr>
<td>For scanning columns of text</td>
<td>Half-page scanner with OCR software</td>
</tr>
</tbody>
</table>
Here are some examples of times when a scanner would come in handy:

- **Desktop publishing**

  Suppose that you are responsible for producing newsletters for the three small companies. In each case, the company has a logo it wants you to replicate as part of the design of the newsletters. You *could* use a graphics program to draw the logo on-screen, or you could do the rest of the publication in your page layout program and then manually cut and paste on the logos at the appropriate time. With a simple hand scanner, you can scan the logos, import them into an easy-to-use paint program, clean up the rough edges, and then pull the logos into your page layout program, using the same file again and again.

- **Text-intensive data entry**

  Suppose that you have inherited the job of cataloging the documentation of over 1,400 photo shoots that have taken place in your company since 1985. The work from all these years has culminated in more than 300 pages of text; each in a certain format including information like subject, photographer, date, and other important facts. Instead of spending the next several weeks typing this material, you can purchase a full-page scanner and OCR software. Then, as simple as running the pages through the scanner and running the text through the OCR program, you have your files.

- **Getting rid of half-tones**

  Year after year, you have produced your department’s annual report. The annual reports have become competitive, with each department vying for the “Best Publication” award at the annual dinner. Last year, after adding PageMaker to your software repertoire, you thought you had the title—but you took some criticism for that lousy photograph of the president you used. This year, you won’t be caught unawares—with the help of a scanner and a good paint program (like PC Paintbrush IV Plus), you can make the president’s photo look better than he does.
Cleaning Up Scanned Images

In the best of all possible worlds, scanners could scan images so that they look as good—if not better—than the originals. Unfortunately, because you are limited to 300 dpi, most images scanned on low or mid-range scanners have a pretty good case of the jaggies (meaning that the edges are jagged and you can see the individual dots that make up the image). To smooth out the graphics, you can use either a paint program or an autotrace program, like Adobe Streamline, that traces the image for you and smooths out edges.

What Does a Scanner Cost?

Again, the cost of scanners is directly related to the features of the scanner you buy. Color flatbed scanners top the chart, running from $2,695 for a Microtek scanner (for IBM or Mac) to an $8,195 Howtek Scanmaster (for IBM or Mac).

Like any computer component, you can purchase a scanner from a retail outlet, from a mail-order business, or directly from the manufacturer. Be sure to read about current models and prices in popular industry magazines, such as PC, Byte, MacWorld, and Computer Shopper.

The next step down is on the gray-scale level. Gray-scale flatbed scanners also offer a variety of features, including file output in many different popular formats (such as PICT, EPS, PCX, and TIFF); different scale controls; and variable dots per inch resolution. The HP ScanJet is an industry standard, available for both Macs and PCs at a cost of around $2,200.

The next level is adequate for many and consists of hand and half-page scanners. These smaller devices can be used to scan a variety of logos, graphics, and text, at a significantly lower cost than the more elaborate models. The Logitech Scanman Plus, for example, is packaged with Logitech Paintshow Plus and retails for $199. This scanner gives you everything you need to scan an image, touch it up (with Paintshow Plus), and export it in a file format usable in other applications.
Conclusion

In this chapter, you have looked at several of the available add-on devices that you may want to add to your PC, Mac, or Apple system. Whether you are totally fulfilled with your current keyboard, you have seen a few options and found out a little more about the types of keyboards available. Additionally, you have learned about the ins and outs of mouse ownership and have explored the more specialized functions of modems and scanners. In the next chapter, you learn more about evaluating your software needs.
Up to this point, you have considered the type of computer you want and have identified important features and add-on components that will give you the power and flexibility you need in your Apple, Mac, or PC system. In this chapter, you learn about the various types of software available.

As mentioned earlier, some people swear by their tried-and-true method of purchasing the software they want first and then purchasing the computer that runs the software. When using one particular software program is important (for example, when several computers in one office share the same spreadsheets), letting the software mandate the choice of hardware is necessary.

Suppose, for example, that your office has adopted a popular spreadsheet program, Lotus 1-2-3, as its standard. Although you will be working primarily with the publication of a series of reports, you will need to use 1-2-3 occasionally for tasks such as budgeting and planning. You also plan to use 1-2-3 spreadsheets as illustrations in your reports. In this case, because 1-2-3 runs only on PC computers, your choice is made for you. In order to be compatible with the other computers in your office and have access to the spreadsheets created in 1-2-3, you need to purchase Lotus 1-2-3 and an IBM or a PC-compatible computer.

This chapter first introduces you to each of the major software types and then walks you through a series of questions that will...
help you identify the software you need for your particular computer uses.

We need to make a distinction between operating systems software and application software, however. As you may know, your computer's operating system serves as the link between your application programs, your computer and you. In this chapter, applications software is explored. In Chapter 11, you learn about the various operating systems available.

## Defining Software Types

If you have been software shopping for any length of time, you have seen the incredible range of available programs. This section provides a brief introduction to each of the major software types; in Part IV of this book, examples of each type of software are listed in their respective chapters. The following list introduces the software categories and shows you where you can find more specific information about each type:

<table>
<thead>
<tr>
<th>Software Type</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spreadsheets</td>
<td>12</td>
</tr>
<tr>
<td>Word Processing</td>
<td>13</td>
</tr>
<tr>
<td>Data Management</td>
<td>14</td>
</tr>
<tr>
<td>Integrated Software</td>
<td>15</td>
</tr>
<tr>
<td>Desktop Publishing</td>
<td>16</td>
</tr>
<tr>
<td>Graphics</td>
<td>17</td>
</tr>
<tr>
<td>Communications</td>
<td>18</td>
</tr>
<tr>
<td>Educational and Recreational Software</td>
<td>19</td>
</tr>
</tbody>
</table>

## Spreadsheets

One of the first uses for "canned" software (that is, programs that were packaged and sold for personal computers) was the spreadsheet. The spreadsheet was a computerized version of an accountant’s pad and pencil—replacing the traditional adding machine or calculator with automated functions and formulas. This replacement saved the user a considerable amount of work and significantly reduced the error margin. Perhaps best of all was the “reusable data” aspect; users have an on-disk version of the
spreadsheet that they can modify and rework as needed. Chapter 12 explores many of the most popular spreadsheet programs.

Whether you are comfortable working with columns, rows, and pages of financial data or you break out in hives at the thought of balancing your checkbook, you will find the electronic approach of the spreadsheet reassuring. Just plug in the numbers and let the spreadsheet do the rest. Suppose, for example, that you want to do a few calculations to see whether you can afford a new car you have been yearning for.

First, you would start by figuring out how much money you had left each month:

- Monthly income: 2,100
- Monthly expenses: 1,400
- Monthly income remaining: 700

Then, you would figure out how much you would end up paying for financing the car:

- Total price of car: 8,900
- Number of months financed: 48
- Interest rate: 13.75
- Total amount financed: 13795.00
- Total monthly payment: 287.40

Then you would subtract the amount of the monthly payment from the amount of money you had left over each month (not allowing for other expenses such as license plates, taxes, and the increase in insurance premiums):

- Monthly net income: 700
- Monthly car payment: 210.91
- New net income: 489.09

Okay, we have got this all worked out. But suppose you want to try financing the car for 36 months? And what about a down payment? If you could scrape together another $2,000 toward a down payment for the car, how would that affect your monthly budget? And what if you try a different interest rate?

Now you're at a crossroads. With "conventional" bookkeeping methods, you need to redo many of the calculations you just did, plugging in different numbers to get different results. With an electronic spreadsheet, you can simply change a number or two and let the program do the rest of the work for you. For example,
compare figures 8.1 and 8.2. Figure 8.1 shows you how you would be forced to refigure the calculations based on the items that changed (number of months, down payment, interest rate). Figure 8.2 shows how a spreadsheet program can calculate the different results with a minimum of hassle.

Fig. 8.1. Calculating the conventional way.
Fig. 8.2. Letting the spreadsheet work it out for you.

As you can see, the layout of the electronic spreadsheet closely resembles the layout of a traditional accountant's pad. Columns and rows store the data, allowing you to work with columns of numbers and set up the spreadsheet in whatever way works best for your application. The intersection of each column and row is called a cell, and each cell stores a number, formula, or text that you enter as you create the spreadsheet.

The spreadsheet also contains built-in functions, which are like prewritten formulas that the program uses to perform calculations on data you choose. For example, suppose that you want to add the values in column 1, like this:

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>123.45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>234.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>345.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>456.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rather than telling the program to add all four of those values (such as typing 123.45 + 234.56 + 345.67 + 456.78), you can tell the program to TOT(C1R1..C1R4). TOT is a function that tells the program to add (total) the numbers you specified. The
(C1R1..C1R4) part of the function is known as the range of cells you want to add. You place the function in the cell in which you want the result to be displayed. For example, cell C1R6 in the preceding example would display the actual result 1,160.46, but the program would store the function. Then, if you changed the number in, say, cell C1R3, the program would automatically recalculate the total in C1R6. Figure 8.3 shows an example of using a spreadsheet function.

![Spreadsheet Image]

**Fig. 8.3. Understanding spreadsheet functions.**

**Word Processing**

Word processing was another major step in applications software. From its earliest versions, word processing took the typewriter, carbon paper, and correction fluid away from a generation of typists and replaced those tools with on-screen editing, formatting, and simple printing procedures.

What can you do with word processing? You can type letters, reports, novels—anything you routinely type on a typewriter. If you make a mistake, you can use the Backspace key to erase the error and type the word again correctly. If you decide that you don't like the opening of the report and you want to move two or three paragraphs around, you can mark the text and move it with a minimum of trouble. And the best thing about the word processing program is that after you have entered the text and saved it, it's in
Chapter 8: Purchasing Software

The Benefits of Spreadsheet Programs

- The format—columns and rows—of the spreadsheet is easy to understand and use.

- You can perform calculations on the data you enter; formulas are saved with the spreadsheet.

- Data entry can be automated and checked for errors.

- The format used to display numbers can be changed easily.

- Columns and rows can be sorted, copied, and moved with formulas intact.

- The spreadsheet can be printed in a variety of formats for financial reports.

- Most spreadsheet programs have a built-in graph generator that allows you to create simple graphs from the data in the spreadsheet.

a file, ready to be edited, used again, or printed. Once you type a 10-page document, you never have to type it again, no matter how many words you misspell, how many paragraphs you want to move, or how much of the document you end up rewriting. Chapter 13 introduces you to several of the most popular word processing programs. Figure 8.4 shows a popular word processing program, WordPerfect 5.0.

At the most basic level, word processing simply allows you to work with text. Instead of typing things over...and over...and over, you can use a word processing program to store your words until you want to use them again. And you can use them again—that’s one of the major benefits of word processing. You type the text, save it in a file, and use the text again whenever you need it. Additionally, you have a number of editing features—such as spelling checkers, a thesaurus, or a built-in grammar checker—that help you produce text not only quickly but also accurately.

The variety of word processors is staggering. Some basic word processing programs allow you to do nothing more than enter text, edit it, save it, and print it. Others, of course, do all those things and much, much more. In fact, you can think of the range
Schuyler W. Lininger, Jr., D.C.  

Fall Quarter

PRACTICAL NUTRITION OBJECTIVES

1. Provide a foundation for the practice of nutritional therapeutics.
2. Provide a rationale for the nutritional approach.
3. Provide standards against which the efficacy of a therapeutic approach can be assessed and monitored.
4. Offer a basis for the appreciation of the underlying relationship between biomechanical and biochemical functioning.

EVALUATION PROCESS

The evaluation process will be based on the investigation of an assigned nutritional problem utilizing the scientific literature and a final examination. Grading will be on a straight percentage basis: 90–100 = A; 80–90 = B; etc.

All papers must be typed on non-erasable paper. Papers are expected to be properly punctuated, to use proper grammar, and to be proofed for spelling errors.

Fig. 8.4. The WordPerfect word processing program.

of word processors like a triangle. At the bottom, you have the features that are common to all word processing programs—typing, editing, simple formatting, and printing procedures. Next, you have a more specialized but still common group of features—help menus, special function or "quick" keys, easy formatting features, customizable screen functions. At the next level, things get even more specialized, with built-in spelling checkers, thesaurus, grammar-checkers, address books, capability to export files in many formats... and so on. At each additional level, some word processing programs drop out. A select group continues building toward the apex of that triangle, however, in the race for the definitive word processor.

At the apex of the triangle are the supremely specialized features—such as the capability to integrate text and graphics, create special effects, work with special legal dictionaries, and myriad other individual features. The majority of users who purchase even the highest level word processing programs may still work with low and medium-range features.

The moral? Be aware of the features you are purchasing before you buy. If you need a mid-range word processor, don't purchase a top-of-the-triangle program. If you want something simple that everyone in your office can learn quickly, you may want to shy
away from something so powerful (and expensive) that the learning curve looks like Mt. Everest.

---

**The Benefits of Word Processing**

- You type the document only once and then store it on disk to be used again—reusable data.
- Most programs provide easy text entry and editing features.
- Most programs include on-screen formatting capabilities allowing you to control tabs, indentation, column formats, and the placement of special features.
- Most word processing programs have spelling checkers, and some also have additional features like a thesaurus or grammar checker.
- Most programs offer a variety of printing options, allowing you to customize the program for your printer.
- Some word processors allow you to change the font and style of text.

---

**Data Management**

Data management software lives up to its name by managing your data—whether that data includes cataloging your CD collection, maintaining an elaborate database of clients, or keeping up with the newest additions to the PTA list.

A database program allows you to store, sort, and retrieve information. Each database is built on the concept of records and fields; that is, each *record* stores similar information about one particular item, while each *field* is the individual information item that is part of a record.

Perhaps an example will help. Suppose that you want to create a database to organize your massive 7-rack CD collection. In this
case, each CD would be a *record* about which you store four pieces of information (*fields*) about the CD:

<table>
<thead>
<tr>
<th>Field</th>
<th>Stores this information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of music:</td>
<td>Whether the music is Popular, Classical, or Instrumental</td>
</tr>
<tr>
<td>Artist or composer:</td>
<td>Name of group, artist, or composer</td>
</tr>
<tr>
<td>Location of CD:</td>
<td>The rack where the CD is stored (or if you have allowed a friend to borrow it, which friend)</td>
</tr>
<tr>
<td>Number of CDs by that artist:</td>
<td>The number of CDs in your collection by that same artist</td>
</tr>
</tbody>
</table>

The following list gives you an idea of the types of records that could be entered in this database. Remember that each row is a record (each CD) and that each column represents a field (information item about each CD):

<table>
<thead>
<tr>
<th>Record</th>
<th>Type</th>
<th>Artist</th>
<th>Location</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classical</td>
<td>Bach</td>
<td>Rack 5</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Popular</td>
<td>Boston</td>
<td>Rack 1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Instrumental</td>
<td>David Lanz</td>
<td>Rack 3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Popular</td>
<td>Bad Company</td>
<td>Rack 1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Classical</td>
<td>Mozart</td>
<td>Rack 5</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Popular</td>
<td>Rush</td>
<td>Rack 3</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Classical</td>
<td>Vivaldi</td>
<td>Rack 5</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Classical</td>
<td>Beethoven</td>
<td>Rack 6</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Popular</td>
<td>Def Leppard</td>
<td>Rack 2</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Popular</td>
<td>Aerosmith</td>
<td>Rack 2</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Instrumental</td>
<td>George</td>
<td>Rack 7</td>
<td>2</td>
</tr>
</tbody>
</table>

Although you entered them in no specific order, you can have the database organize the data for you in any way you choose. For example, suppose that you want all the CDs in the preceding list to be arranged alphabetically by their type. The list would then look like this:

<table>
<thead>
<tr>
<th>Record</th>
<th>Type</th>
<th>Artist</th>
<th>Location</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classical</td>
<td>Bach</td>
<td>Rack 5</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Classical</td>
<td>Beethoven</td>
<td>Rack 6</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Classical</td>
<td>Mozart</td>
<td>Rack 5</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Classical</td>
<td>Vivaldi</td>
<td>Rack 5</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Instrumental</td>
<td>David Lanz</td>
<td>Rack 3</td>
<td>2</td>
</tr>
</tbody>
</table>
Notice how the records changed sequence? That's because the database sorted the records, placing them in order by their Type and then alphabetizing them within the Type field. (Additionally, the database arranged the Types—Classical, Instrumental, and Popular—alphabetically, too.)

The way in which your particular database program allows you to sort records will depend on the program you are using. Additionally, a wide range of other features is available in different database programs. From a simple enter-and-organize-your-data approach to a multi-level complex database program that allows you to link databases, perform a variety of sophisticated functions, and even program the way users enter data, you will find a database program that will help you organize all the little data fields in your life. Figure 8.5 shows a screen from dBASE Mac—one of the most popular database programs currently available.

![Figure 8.5. A popular database program, dBASE Mac.](image)
The Benefits of Data Management Programs

- You can reuse data; you can enter data once and sort, search, and arrange it to your heart's content.
- You can arrange data easily by using the database program's sort feature.
- You can find quickly the data you need by using the program's search capabilities.
- You can use printing features that allow for mailing label and report generation.

Integrated Software

*Integrated software* is a term used to describe a program that is actually several programs in one. Many popular integrated packages include the following application programs:

- Spreadsheet
- Word processor
- Data manager
- Graphics
- Communications

The integrated package is popular for users who need a variety of different programs. Figure 8.6 shows a popular integrated program for the PC called PFS: First Choice. Users can enter data in one application and then use the information in other applications as well, saving time and trouble and protecting the accuracy of the data. For example, suppose that you entered a list of employee names in the filing (data management) portion of the program. You then set up a spreadsheet, and instead of typing all the employee names a second time, you can copy and paste the names into the appropriate spreadsheet row. Then, when you are ready to send out information about a change in policy, you can have the program automatically plug the names and addresses of the
employees into a document. You can see how the feature of “reusable data” comes into play in integrated packages.

**Fig. 8.6.** The PFS: First Choice integrated program.

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**The Benefits of Integrated Software**

- Data is compatible among applications.

- The menu system is generally the same, lessening the number of menus and options the user has to learn.

- Having everything in one package means less time loading programs and opening and closing files.

- Purchasing an integrated package costs considerably less than purchasing the same number of applications individually.

Popular integrated packages are available for the Apple, the Apple IIgs, the Mac, and the PC. Chapter 15 highlights several of the most popular integrated programs.
Desktop Publishing

Desktop publishing software is a relatively new addition to the gallery of software available for Apples, Macs, and PCs. Desktop publishing allows you to produce documents such as newsletters, company reports, and other types of publications by using the capabilities of your computer and page layout software.

What's the difference between desktop publishing and word processing programs? Word processing programs process words; desktop publishing programs allow you to combine text and graphics to produce the publications you need. Some desktop publishing programs include clip art (individual art items you can use in your own publications). Chapter 16 includes specific information about desktop publishing programs.

Desktop publishing takes the publication of your documents a step further from word processing. Although some word processing programs allow you to perform some desktop publishing features (remember the top-of-the-triangle word processors?), most do not offer features that will allow you to create publications more complex than simple reports, letters, and manuals. For more complicated projects that require multiple columns, integration of graphics, a variety of fonts, and special effects, desktop publishing software gives you the power and flexibility you need to arrange the page elements the way you need to. Figure 8.7 shows an example of a document created with a popular desktop publishing program.

Like everything else, there's a high end and a low end to desktop publishing programs. You can purchase a simple program that will allow you to publish newsletters, brochures, and a variety of other publications for under $100. Similarly, you can get powerful programs that let you create massive documents, complete with index, table of contents, and automatic page numbering for around $600.

Graphics

A graphics program is handy when you need to create a logo, clean up a scanned image, or create an art element. Graphics software comes in different shapes and sizes. Like other types of software, graphics programs range from a high end to a low end. Low-end graphics programs are sometimes referred to as paint
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**Fig. 8.7.** A document created with desktop publishing software.

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**The Benefits of Desktop Publishing Programs**

- You arrange text and graphics on-screen.
- You can assemble documents quickly, make changes easily.
- You can import text from word processors or type the text directly in the program.
- You can print on a variety of printers—from dot-matrix to PostScript laser printers.

---

programs, and they are capable of providing a good range of artwork. Paint programs generally create bit-mapped graphics, meaning that each art element you create is nothing more than a pattern of dots on the screen. This type of graphic is easy to edit—you just magnify the size of the graphic and change the color of a few dots—but the printed output may look choppy, and sometimes the individual dots can be seen.
Graphics software comes in different shapes and sizes. You will generally see the terms *paint* and *draw* programs when you are investigating graphics. The following paragraphs explain these two program types.

Generally, you use *paint* programs to “paint” the screen, creating your artwork out of a pattern of dots. This type of graphics is easy to edit—you just magnify the part of the graphic you want to work on and change a few dots around (the way you do this depends on which program you use). Although paint programs are easy—and fun—to use, they don’t offer users the highest quality graphics available. Because each item is actually a picture made from dots, you can often see the individual dots that make up each graphic, resulting in a somewhat choppy or jagged printed output.

*Draw* programs, on the other hand, use a different technology to create the graphics you work with on-screen. Generally much more complicated to use than paint programs, draw programs see the items as “objects” you create and manipulate as necessary. You can select individual items and resize and work with them as necessary.

To illustrate the difference, let’s compare two popular PC graphics programs: PC Paintbrush IV (a paint program) and Micrografx Designer (a draw program). PC Paintbrush IV is an extremely popular paint program for the PC, available for around $150. Micrografx Designer, which costs around $600, is a popular draw program for the PC, offering one of the highest quality standards currently available for the PC.

When you want to create a rectangle in either of these programs, the procedure is basically the same:

- With PC Paintbrush IV, you select the rectangle tool, select a place on-screen, and draw the rectangle.
- With Micrografx Designer, you select the rectangle tool, select a place on-screen, and draw the rectangle.

The difference comes when you want to work with the rectangle you have just created.

- With PC Paintbrush IV, if you want to change the shape of the rectangle, you must either (1) erase the rectangle you just made and create another one, or (2) magnify the display and, dot-by-dot, change the shape of the rectangle (see fig. 8.8).
With Micrografx Designer, you can simply click on the rectangle and then drag one of the "handles" that appear, until the rectangle is the size and shape you want (see fig. 8.9).

Fig. 8.8. Working with a paint program.

The main difference in these two programs is the way in which the program "sees" the graphics. Because Micrografx Designer recognizes the rectangle as an object and not as a series of dots, you can work with the rectangle as an object. This capability makes the draw program more powerful, flexible, and, because the graphics are communicated to the printer in a language that understands the object-oriented descriptions, the printed quality of the graphics far surpasses that available with paint programs.

Draw programs are much more expensive than paint programs, however, and they are generally much more complicated to learn. Before you invest in any type of graphics program, be sure that you think carefully about the type of quality you need from your graphics and the type of program that will best suit your needs.

Throughout this book, you will see the terms high end and low end used to describe various graphics packages. Generally, I have
used *low end* to refer to paint programs, because they give an overall lower quality of printout and offer fewer features. There is a hierarchy of programs within each category (paint and draw), however, so you shouldn't automatically discount any particular type until you have investigated the features of the programs.

High-end graphics programs generally incorporate some CAD features and provide high quality images that can be exported in a variety of formats. These sophisticated graphics programs usually offer an incredible range of features.

Chapter 17 highlights some of the most popular low-end and high-end graphics programs available.

**Communications**

Communications software is used with a modem to connect your computer to another computer—whether that computer is a standalone computer in some remote corner of the world or a huge corporate mainframe from which you retrieve important information.
The Benefits of Graphics Programs

- With on-screen graphics, you don't have to go back to the drawing board every time. You can make small modifications to the original art until you get it just the way you want it.

- Use of the art tools in a graphics program gives you more control over the precision of your creations.

- You can use the art you create over and over again without losing any of the quality.

- With many graphics programs, you can export art directly to popular desktop publishing programs.

Without communications software, you would be unable to use your modem; but with communications software, you can send and retrieve files, ensure data accuracy, and check for transmission errors. Some modems are packaged with communications software, so check out your modem before you buy additional software. Chapter 18 explores individual communications programs.

Generally, any good communications software worth its salt will offer the following features:

- Automatic dialing features

- A "phone book" feature that allows you to store frequently called numbers

- The capability to transmit files in a variety of formats (or protocols)

- The capability to talk to many different kinds of modems

- A help system

- Simple commands in the form of buttons or easy-to-use menus

- The capability to customize your work session by setting special keys (sometimes called macros or quick keys)

- Some sort of text editor that allows you to view and work with text you receive from another computer
Although some modems are packaged with communications software, be sure to check out the software if it is included with your modem. If the software doesn’t include the items in the preceding list, you may want to shop around and find more powerful software for your communications sessions. Figure 8.10 shows a screen from a popular communications program.

**Fig. 8.10.** The opening menu of a popular communications program.

### Educational and Recreational Software

Educational software helps you learn things you need or relearn things you have forgotten; and recreational software allows you to get away from it all and spend a few stolen moments just having fun. Although a wide range of software is available in both departments, the Apple computer family seems to be the strongest in terms of packages available. Perhaps because the Apple hit strongest in the educational market, many terrific educational programs are currently available for Apple computers.

Recreational—or game—software is a big seller everywhere. Sure, we work with numbers during the day. Sure, the advances in word processing have made our lives easier. Of course, we take our
computers seriously. But sit down in front of a full-color screen of the Indianapolis 500 and take a couple of laps around the track, or ... Computers don't have to be all work and no play, do they? Chapter 19 lists important educational and recreational programs you may want to check out.

Determining What Software You Need

Now that you have been through the various software types, how do you tell which type you need? For starters, ask yourself these questions:

- **What kind of tasks do you want your computer to perform?**
  If you want to streamline the time you spend editing text, think *word processing*. If you grit your teeth each time someone asks you to do a financial statement, think *spreadsheet*. If you are tired of cutting and pasting that newsletter together with an EXACTO knife and rubber cement, think *desktop publishing*. Perhaps the tasks are not nearly so clear-cut, and you would benefit from integrated software.

- **What features do you need?**
  Do you work primarily with numbers? If you currently create schedules, reports, financial statements, or any kind of project that requires the calculation of numbers, you may benefit from having a spreadsheet program at your disposal. Do you work with words? Whether you write them, type them, edit them, or arrange them, word processing can save you countless keystrokes in typing and retyping time. Reports, letters, manuals, books, advertising copy, banners—anything you type—a word processor can help you do more efficiently and—best of all—allow you to save on disk what you have had to type only once. Do you have to organize data? If you work with data in any form—entering, sorting, organizing, searching for, or creating reports from data—you will love working with a
database program. Designed specifically to allow users to enter, find, and retrieve data easily and efficiently, database programs get you out of the filing cabinet and back to the keyboard.

Do you publish materials? Whether you create simple advertising fliers, church newsletters, or incredibly complex multi-volume reports, a desktop publishing program can make your life easier. Low-end and high-end programs exist to help you get the text and graphics together with the least amount of hassle possible.

☐ Do you need more than one application?

Suppose that you decide that you need a word processor and a spreadsheet. Is it important that these applications be capable of sharing the data you enter? For example, will you be using text in your spreadsheet or numeric values from the spreadsheet in the word processor? If so, you may want to consider purchasing an integrated program.

☐ Is it necessary that the program you buy be compatible with other programs?

Compatibility should be a major consideration when you are purchasing a new program. If you use PageMaker, for example, and you are looking for a graphics program, make sure that the files from the graphics program you are considering can be used in PageMaker.

☐ What are the experience levels of the people who will be using the software?

If the people using the software have varying skill levels, you may want to consider purchasing a program that will be easy for everyone to learn and use. Think about the learning curve involved and the various skill levels of the users before you buy.

After you have answered those questions, think about the future. Do you see your computer needs growing? Will you outgrow a limited word processing program within a few months, causing you to upgrade to a better package (which means disrupting your staff while they learn the new program)? If so, you may want to start out with the higher-end program now.

Is there a possibility that you may want to add to your software library? Suppose that you need a word processing program now—one mainly to create and print limited letters and
reports—but you plan to move into desktop publishing in the future. You could start with Microsoft Word as your word processor (a high-end word processing program that is easy to learn and use) and then purchase PageMaker or Ventura Publisher later (both work hand-in-hand with Microsoft Word).

Can I Run the Software on My System?

Different programs require different things from your computer system. Somewhere on every software package is a list of hardware and software requirements. Generally, check the following facts before you buy software:

- Type of system that runs the software
- Amount of RAM needed
- Amount of disk storage space (to hold the program and files)
- Number of disk drives recommended
- Type of operating system supported
- Type of monitor and video adapter required
- Printers supported
- The program's capability to use expanded or extended memory
- Types of files compatible with the program
- The need for any other program to run this software

Where Do I Buy Software?

You can purchase software from a variety of sources. Many people purchase software by mail-order, although you really should at least see the software demonstrated before you buy.

You can purchase software at retail software outlets (such as Software Etc. and Egghead Software), at many bookstores (like
Waldenbooks), and computer retail stores like ComputerLand and MicroAge computers.

Although there are no real disadvantages or advantages to buying software mail-order or retail (except that with retail you can usually see the product demonstrated before you buy), it's always best to find out as much as you can before you purchase a product. In addition to the hardware-related questions in the preceding section, be sure to check for these things:

- Make sure that the software is compatible with other programs you will be using, if that factor is an important consideration for your use. For example, if you use PageMaker in your work, purchasing a paint program that doesn't work with PageMaker isn't going to help you much. Be sure to mention other programs you use so that the manufacturer or salesperson can make sure that you are buying a compatible program.

- Is there a technical support line you can call if you have problems? If you are purchasing the software from a retail outlet, find out where they will support you if you have problems with the program.

- If you are unhappy with the product, will the retail outlet or the manufacturer refund your money?

What about Software Support?

You can get support for your software; in fact, all reputable software companies have a technical support line you can call when you get stuck or have questions. Remember to fill out the registration card in the software package and keep the registration number of your software somewhere handy. Most technical support people will ask for the registration number so that they can check to make sure that you are in fact a registered owner.

Additionally, you may be able to get software support from the place you purchased the program. Many retail outlets offer consulting and training on the major packages. For a fee, some computer stores allow you to purchase a technical support package that gives you access to a support professional when you have problems with either hardware or software.
Conclusion

This chapter, which is the last chapter in Part II, has helped you identify the types of software you need for your particular application. The next part, "A Computer Primer," takes you through a series of hands-on sessions that will help you get comfortable with your new system.
Now that you have investigated your computer options and have made your choice, you are ready to set up and begin working with your new system. Specially designed quick starts for each of the major computer types—Apple, Mac, and PC—help you unpack, assemble, and start your system. The quick starts also show you basic file procedures. Then more detailed chapters lead you through the beginning uses of your computer. You learn about operating systems and get full explanations of file and disk management operations. Specifically, Part III includes the following chapters:

- Quick Start: Using Your PC
- Quick Start: Using Your Macintosh
- Quick Start: Using Your Apple II GS
- Setting Up Your Computer
- Getting Familiar with the Operating System
- Using Your Computer
Quick Start 1:
Using Your PC

This quick start introduces you to life with your new PC. Now that you have learned about the various types of computers available and have made your purchasing decision, you are ready to put your hands to the keyboard and get busy.

First things first. If you haven't selected your work area and unpacked and assembled your computer, go ahead and do so now. (If you need help doing this, refer to Chapter 9 for specific instructions.) Then, when everything's put together, you are ready to fire up the system. (*Note: This quick start includes steps for starting and working with a system that uses the DOS operating system.*)

This quick start walks you through the following steps:

1. Starting your PC
2. Entering the date and time
3. Formatting a disk
4. Copying a disk
5. Displaying the contents of a disk
6. Copying a file
7. Renaming a file
8. Erasing a file
9. Shutting down your PC

Step 1: Starting Your PC

Basically, once you get all your components connected, you simply turn on the computer.

1. Make sure that all cables are attached properly, thumbscrews are tight, and power cords are plugged in.

2. Locate the on/off switch. This switch may be in the front of the system (as it is on the PS/2 Model 50 shown in figure 11.1), or the switch may be on the side or in the back of the machine.

3. If your computer system requires that you start the computer from a DOS disk, place the disk in drive A and close the drive door. (You will need to do this if your computer does not have a hard disk).

4. Flip the switch to the On position. The computer then starts and DOS is booted. You see the opening screen with DOS Version 3.3, as follows:

SA-Screen Attributes, Advanced Edition, © Copr 1987, Peter Norton
IBM Personal Computer DOS Version 3.30
[C:\]

Step 2: Entering the Date and Time

DOS prompts you to enter the correct date and time. To enter a new date, simply type the date in the format

mm-dd-yy

For example, the dates 06-12-66 and 08-17-89 are acceptable dates in DOS's date format. After you enter the date, press Enter.
When the time prompt is displayed, type a new time in the format

```
hh:mm:ss
```

For example, the times 12:29:23 and 18:02:23 are valid times. If you are using DOS V4.0, you will see the traditional 12-hour time with an a or p, indicating A.M. or P.M. After you have entered the time, press Enter. DOS displays the current date and time:

```
SA-Screen Attributes, Advanced Edition, © Copr 1987, Peter Norton
IBM Personal Computer DOS Version 3.30
[C:\] date
Current date is Sat 7-14-1990
Enter new date (mm-dd-yy):
[C:\] time
Current time is 14:52:00.00
Enter new time:
```

## Step 3: Formatting a Disk

When you want to format a disk on your PC, follow these steps:

1. Start the computer (place the DOS disk in drive A, if necessary).

2. Type

   ```
   FORMAT A:
   ```

   **Note:** If you want to format the disk in drive B instead, type `FORMAT B:`. (Do not, however, type `FORMAT C:` and press Enter, or DOS will think that you want to format the hard disk of your system.) DOS will prompt you to put a disk into drive A.

3. Insert the disk and close the drive door.

4. Press Enter. DOS then formats the disk. Some versions of DOS, such as Version 3.3, display the percentage of the disk formatted as the process is being carried out. When the
procedure is finished, DOS asks you whether you want to
assign a name (called a *volume label*) to the disk. This name
is optional. (If you want to assign the disk a name, see the
sidebar "DOS, Apple, and Mac Disk-Naming Conventions," in
Chapter 11.) For now, just press Enter.

5. DOS then asks whether you want to format another disk. If
you do, type Y and press Enter. If you don’t, type N and
press Enter.

**Step 4: Copying a Disk**

When you want to copy an entire disk, use the DOS DISKCOPY
command, as follows:

1. Type `DISKCOPY A: B:` and press Enter.
2. Insert into drive A the disk *from which* you want to copy
   (source).
3. Insert into drive B the disk *to which* you want to copy
   (target).
4. Press Enter.
5. When DISKCOPY is finished, DOS asks whether you want to
copy another disk. Press N.

**Step 5: Displaying the Contents of a Disk**

You will want to be able to display the contents of a disk often—
whether you are looking for an elusive file or you can’t remember
what you stored on a particular disk.

To display a list of files on a disk, follow these steps:

1. Place the disk you want to use in drive A.
2. Type `DIR A:`
3. Press Enter.
DOS then displays a list of the files on the disk. The listing includes the file names, the date and time the files were last updated, and the size of the files in bytes:

[C:\] dir a:

Volume in drive A has no label
Directory of A:\

KMC16    KM   18816   6-19-90   11:34a
KMC18    KM   21120   6-21-90   3:01p
KMC20    KM   15872   6-25-90   10:41a
KMCFM    4480   3-12-90   6:41p
LESLEE 4VR  66560   5-16-90   10:22p
KMC17    KM   18176   6-20-90   12:07p

6 File(s) 759808 bytes free

[C:\]

**Step 6: Copying a File**

When you want to copy a disk of files or a single file on your PC, follow these steps:

1. Insert the disk from which you want to copy (the *source* disk) into drive A.
2. Insert the disk to which you want to copy (the *destination* disk) into drive B. (Instead, you may want to copy the files to drive C.)
3. Type the COPY command in the following format:

   COPY A:filename B:

   This command copies the file you specified (*filename*) from the disk in drive A to the disk in drive B. If you want to copy the file to drive C instead, you enter the following:

   COPY A:filename C:
You can also use the COPY command to copy the entire contents of the disk. The command for this operation is

COPY A:*.* C:

4. Press Enter to begin the copy procedure. After the copy procedure is complete, DOS asks you whether you want to copy anything else. If you do, press Y. If you don't, press N.

Step 7: Renaming a File
To rename a file by using DOS, follow these steps:

1. Go to the directory that stores the file you want to rename.
2. Type the command in the following format:

   REN oldfilename newfilename

   Of course, you need to replace oldfilename with the name of the file you are renaming and newfilename with the new name for the file. For example, you might use the command

   REN letter.txt let1.txt

   This command renames the original file (letter.txt) as let1.txt.

Step 8: Erasing a File
When you want to erase files on your PC, the steps are simple:

1. Change to the directory in which the files you want to delete are stored. (Remember that the DOS command for changing directories is CD.)
2. Type the following command:

   ERASE filename

   Of course, you need to substitute the name of the file you want to delete for filename in the preceding example.
3. If the file is stored on a disk other than the current disk, enter the drive letter in front of the files named as follows:

[C:] dir a:

    Volume in drive A has no label
    Directory of A:

    KMC16   KM 18816   6-19-90   11:34a
    KMC18   KM 21120   6-21-90   3:01p
    KMC20   KM 15872   6-25-90   10:41a
    KMCFM   4480   3-12-90   6:41p
    LESLIE  4VR 66560   5-16-90   10:22p
    KMC17   KM 18176   6-20-90   12:07p

    6 File(s)  759808 bytes free

[C:] erase a:kmc17.km

As an alternative, you can use the DEL command to delete a DOS file. Use the same format, just using DEL instead of ERASE, as in

    DEL filename

Step 9: Shutting Down Your PC

When you are ready to end your work session with your PC, follow these steps:

1. If you are using an application program, first make sure that you have saved the file you were working on.

2. Next, you need to return to the operating system level. (If you are unsure how to do that, look in the program’s documentation for instructions on how to exit the program.)

3. When the operating system prompt is displayed (C> for DOS on a hard disk system), you can safely turn the system off. If you are using a power surge protector strip, turn the system off there; otherwise, turn off the monitor and then the system by flipping their power switches.
Quick Start 2: Using Your Macintosh

This quick start introduces you to various procedures you will use on your Macintosh. As you know, the way you interact with the Mac is based on a desktop-like graphical environment; much of what you do will involve icons of disks, folders, and files.

If you haven't selected your work area and unpacked and assembled your computer, go ahead and do so now. (If you need help doing this, refer to Chapter 9 for specific instructions.) Then, when everything is put together, you are ready to fire up the system.

This quick start walks you through the following steps:

1. Starting your Mac
2. Initializing a disk
3. Opening disks and folders
4. Closing disks and folders
5. Creating a new folder
6. Copying a disk
7. Copying a file
8. Renaming a file
9. Erasing a file
10. Shutting down your Mac

Step 1: Starting Your Mac

When you're ready to start your Mac, follow these steps:

1. First, make sure that all cables are attached properly, thumbscrews are tight, and power cords are plugged in.

2. Turn on the system. The on/off button is located in the back left corner of the computer (see fig. QS2.1).

3. A "Welcome to the Macintosh" screen is displayed, and then you see the Finder desktop. The Macintosh Finder is a different version than the Apple IIgs; the Mac Finder also offers a few different commands in the operating system menus at the top of the screen.
Step 2: Initializing a Disk

The procedure for initializing a Mac disk is similar to the procedure on the Apple IIgs. When you want to format (or initialize) a disk on your Macintosh, follow these steps:

1. Start the system.

2. When the Finder desktop is displayed, insert the disk to be formatted in the drive.

   The Mac tries to read the disk and finds that the disk is unreadable. The computer asks whether you want to initialize the disk.

3. Select whether the disk you want to format is one-sided or two-sided.

   The Macintosh displays a warning that the initialization process will erase all information on the disk.

4. Click the Erase button to continue the format.

5. Enter a name for the disk and click the OK button. The Macintosh then begins formatting the disk. After the format is finished, the Macintosh verifies the format and creates a directory. The disk is then displayed on the desktop with the name you specified.

Step 3: Opening Disks and Folders

When a disk or a folder is displayed on the Finder desktop, you can open it by using one of three methods:

- Click the disk (or folder) icon so that it is displayed in inverse video (black with white lettering). Then open the File menu and select the Open option.

- Click the disk (or folder) icon and then press ⌘-O (that's the Open Apple key and the letter o).

- Double-click the disk (or folder) icon.
Step 4: Closing a Folder

When you want to close a disk or folder, you have three options:

☐ Click the disk (or folder) icon, open the File menu, and select the Close option.

☐ Click the disk (or folder) icon and press `W` (that's the Open Apple key and the letter w).

☐ Click the close box in the upper left corner of the window in which the disk or folder is displayed (see fig. QS2.2).

![Fig. QS2.2. The close box in the window.](image)

Step 5: Creating a New Folder

When you add files to your Mac, you need to add a new folder to keep them in. To add a new folder, follow these steps:
1. Open the File menu.
2. Select the New Folder option. (You can bypass the menu selections by pressing ⌘-N, if you prefer.) The operating system then places a new folder on the desktop in the current window.

Step 6: Copying a Disk

To copy an entire Macintosh disk, follow these steps:

1. Make sure that the system is on and the desktop is displayed.
2. Insert the disk you want to copy into the drive.
3. Next, place the mouse cursor on the disk you want to copy.
4. Press and hold the mouse button. The file is highlighted.
5. Drag the file icon to the top of the hard disk icon.
6. Release the mouse button. When you do so, the Macintosh copies the contents of the disk to the hard disk. A screen is displayed, showing the progress of the copy procedure.

Step 7: Copying a File

When you want to copy a file (or files) on the Macintosh, follow these steps:

1. Place the disk from which you want to copy the file (the source) in the drive.
2. Double-click the disk icon to display the contents of the disk.
3. Double-click the hard disk icon to open it.
4. Click the file you want to copy from the source disk and drag the file to the hard disk window.
5. A screen is then displayed, showing the progress of the copy procedure. When the copy is complete, the icon of the file is shown in the hard disk window.
Step 8: Renaming a File

The graphical interface of the Finder makes renaming files and folders easy. To rename a folder, for example, follow these steps:

1. Open the disk containing the folder you want to rename.
2. Click the folder. The folder is then highlighted.
3. Type the new name for the folder.
4. Press Enter. The Finder then saves the new name for the file.

Step 8: Erasing a File

When you want to erase a file on the Macintosh, follow these steps:

1. Open the folder storing the file you want to delete.
2. When the mouse cursor is positioned on the file you want to delete, press and hold the mouse button.
3. Drag the file icon out of the window and over to the trash can.
4. The trash can becomes highlighted when the file is “in” the trash (see fig. QS2.3)
5. Release the mouse button. The sides of the trash can bulge, indicating that a something has been thrown away.

If you throw something away accidentally, you can retrieve it from the trash. To display the contents of the trash can, double-click the trash can. A window is then displayed, showing the last item you threw away. If you want to recover the file most recently placed in the trash can, you can select the file and drag it from the Trash window and onto the desktop.
Step 10: Shutting Down Your Mac

When you are ready to turn off your Macintosh, follow these steps:

1. If you were using an application program, exit the program now. The desktop is displayed.

2. Close any open files and folders. Click the close box in the upper left corner of any open windows to close them.

3. Point to the Special menu in the menu bar at the top of the screen.

4. Open the menu and select the Shut Down option.

5. The Finder tells that you can switch off the Macintosh safely. If you choose, you can start another session by clicking the Restart button in the bottom left corner of the window.

6. You can then turn off the Macintosh either at the surge protector strip or on the back of the computer.
Quick Start 3: Using Your Apple IIgs

The other quick starts have introduced you to basic procedures using the Macintosh and the PC. Now it's the Apple's turn. This quick start shows you some of the basic procedures you will use on an Apple IIgs. In terms of capabilities, the Apple IIgs is actually a cross between an Apple and a Macintosh—the enhanced sound and graphics capabilities of the IIgs give it power the Apple families cannot offer.

This quick start introduces you to some of the basic operating system features. Because this hands-on session includes the use of the mouse, we have included a special mini-quick start within a quick start (a special bonus!) so that you could get used to using the mouse.

Introducing the Apple IIgs Desktop

If you haven't already started your Apple IIgs, do so now. Follow these steps:

1. Make sure that all cables and components are connected securely.
2. Insert the system disk into the drive.
3. Turn on the Apple IIgs.
4. Turn on the monitor.

Your computer will make mysterious chugging noises as it loads the operating system information from the disk. After a few seconds, you will see a "Welcome to the Apple IIgs" screen with an indicator showing you how much of the operating system has been loaded into the system's memory.

The next section gives you a brief introduction to using the mouse.

Working with the Mouse

Okay, so you have the little rodent sitting on your desk. It's cute, it's functional—now you need to learn how to use it. In this mini-quick start, you will practice moving the mouse and using the mouse button.

Initially, the mouse cursor appears in the upper left corner of the screen. See it way up there? To move the cursor down into the middle of the screen, you simply move the mouse in the direction you want the cursor to move. Simple.

You will use several mouse operations over and over again in your computer use. These basic operations are

**Pointing**—moving the mouse cursor until it is positioned on (or pointing to) an item

**Clicking**—clicking the mouse button. You use this operation to select commands, choose files, select folders, among other things.

**Double-clicking**—clicking the mouse button twice quickly. You use this operation to open files, open folders, open disks, select words and phrases, and other tasks.

**Dragging**—pressing the mouse button and dragging the mouse until the items you want are selected

Now let's put this mouse knowledge into practice.
To open a menu, follow these steps:

1. Push the mouse until the cursor rests on the word Edit in the menu bar at the top of the screen.
2. Press and hold the mouse button.
3. Pull the mouse down; this action opens the Edit menu on the screen. You can then look through the menu to find the option you want (see fig. QS3.1).

![Fig. QS3.1. Opening a menu.](image)

To display the contents of the system disk, follow these steps:

1. Position the mouse cursor on the SYSTEM.DSK icon in the upper right corner of the screen.
2. Double-click the mouse button. The contents of the SYSTEM.DSK are then displayed in a window on the Apple IIgs desktop.
Understanding the Apple IIgs Desktop

The Apple IIgs desktop (also called the Finder desktop), is organized to look and “feel” like the top of a desk. Disks appear as icons (small pictures that represent files, folders, disks, and programs). Figure QS3.2 shows an example of the Apple IIgs that was started with the AppleWorks GS System disk (this disk contains important files for AppleWorks GS as well as the System files the GS needs in order to load the operating system). As you can see, two disk icons—AWGS.SYSTEM and AWGS.PROGRAM—are on the right side of the screen, the trash icon is in the lower right corner of the screen, and a window displays the contents of the AWGS.PROGRAM disk.

Fig. QS3.2. The Apple IIgs desktop.

This quick start walks you through the following procedures:

1. Starting the Apple IIgs
2. Displaying disk contents
3. Selecting files
4. Opening files
5. Closing files
6. Creating a new folder
7. Renaming files
8. Deleting files
9. Shutting down the Apple IIgs

Step 1: Starting the Apple IIgs

This section takes you through the steps involved in starting an Apple IIgs. As you may recall, the Apple IIgs uses an operating system called GS/OS (it is also referred to as the Finder, similar to the Macintosh operating system).

Basically, once you get all your components connected, you simply insert the system disk, turn on the computer, and go. Follow these steps:

1. First, make sure that all cables are attached properly, thumbscrews are tight, and power cords are plugged in.

2. Insert the system disk into the drive. (If you are using two drives and are unsure which disk drive to use, place the disk in the drive connected directly to the system unit.)

3. Turn on the monitor. The on/off button is located in the top right side of the display.

4. Turn on the Apple IIgs (see fig. QS3.3). The opening screen is displayed, and then the Finder desktop is displayed, showing the system disk in the upper right corner of the screen.
Step 2: Displaying Disk Contents

Now that you know how to use your mouse, you're ready to begin working with files and folders on the Apple IIgs desktop.

1. Position the mouse cursor on the SYSTEM.DISK icon in the upper right corner of the screen.

2. Double-click the mouse button. The disk appears to "open," and all the files on the SYSTEM.DISK are displayed as little folder or file icons in the window.

3. You can then open the contents of a folder by double-clicking one, if you like. If you double-click a file icon, the Apple IIgs tries to run the program. For example, if you double-click the ProDOS icon, the operating system restarts the computer.
Step 3: Selecting Files and Folders

As you have probably noticed, when you click a file or folder one time, the icon turns black with white outline and lettering. This change means that the icon is selected. You must select a folder or a file before you can perform any routine file maintenance operations such as duplicating, moving, deleting, or changing the icon's color.

Try it. Position the mouse cursor on any folder and click the mouse button once. The icon is then highlighted (see fig. QS3.4).

![Selected folder](image)

**Fig. QS3.4.** The selected folder icon.

Step 4: Opening a Folder

The folder is selected. You can now display the contents of the folder by using one of three methods:

- Opening the File menu and selecting the Open option.
- Pressing ⌘-O (that's the Open Apple key and the letter o).
- Double-clicking the icon.
Step 5: Closing a Folder

When you want to close the folder, you have three options:

- Opening the File menu and selecting the Close option.
- Pressing `w` (that's the Open Apple key and the letter `w`).
- Clicking the close box in the upper left corner of the window (see fig. Q83.5).

![Fig. Q83.5. The close box in the window.](image)

Step 6: Creating a New Folder

When you add files to your Apple IIgs, you need to add a new folder to keep them in. To add a new folder, follow these steps:

1. Open the File menu.
2. Select the New Folder option. (You can bypass the menu selections by pressing `N`, if you prefer.) The operating system then places a new folder on the desktop in the current window.
Step 7: Renaming a Folder
As you can see, the new folder is named Untitled. You can rename the folder by following these steps:

1. If the folder is not selected, select it by clicking the folder once.
2. Type the new name of the folder.
3. Press Enter.

Step 8: Deleting a Folder
Occasionally, you will want to remove folders you have created. To delete a folder, follow these steps:

1. Select the folder you want to delete.
2. Position the mouse cursor on the folder.
3. Press and hold the mouse button.
4. Drag the icon to the trash icon in the bottom right corner of the screen. You can tell when the folder is "in" the trash because the trash can turns black.
5. When the folder is in the trash, release the mouse button.
6. The trash can changes to show that something has been placed in the trash.

You can save an item you placed in the trash by double-clicking the trash can and dragging the folder icon back onto the desktop.
Step 9: Turning Off the Apple IIgs

Turning off an Apple IIgs is different from getting out of an Apple II because of the differences in the machines’ interfaces. When you want to end your session with your Apple IIgs, follow these steps:

1. Exit the application program you were using. You are then returned to the desktop.

2. Close the windows that are open on the desktop. (This step is not mandatory, but it’s good housekeeping practice.)

3. Point to the Special menu in the menu bar at the top of the screen.

4. Open the menu and select the Shut Down option (or press \-Q, if you want to bypass the menu selections).

5. When the Finder asks you whether you want to continue, click OK.

6. You can then turn off the Apple IIgs safely.
Now that you have your computer system, what are you going to do with it? This chapter walks you step-by-step through procedures for setting up your Macintosh, Apple, and PC computer. (If you just finished working through one of the preceding quick starts, you may want to skip this chapter and go on to working with the operating system in your machine.)

This chapter starts right after purchase and helps you determine whether you have all the pieces you need. You will also find information on preliminaries, such as filling out the warranty card and registering the equipment, as well as procedures for getting ready to use the equipment, such as selecting a good work area, unboxing the system, and connecting the components.

Setting Up

As you learned in Chapter 3, few computers are created equal. Each computer system (and the way it looks) depends on the age of the system, the type of system you purchase, and a thousand
other questions. But, as you also learned in Chapter 3, all PC computer systems contain basically the same components:

- A system unit
- A monitor
- A keyboard

A basic Apple II system includes

- A system unit-keyboard combination
- A monitor

A basic Apple IIgs system includes

- A system unit
- One or two external disk drives
- A monitor
- A keyboard

A basic Mac SE/30 system includes

- A system unit-monitor combination
- A keyboard

A basic Mac II system includes

- A system unit
- A monitor
- A keyboard

Some people purchase additional components for their systems, such as printers, a mouse, a graphics tablet, a modem, and on and on.

Whether you purchase a true-blue IBM, an Apple, a Mac, or a PC clone, you go through the same basic setup procedures. This setup involves the following steps:

1. Checking your system
2. Selecting a work area
3. Unboxing the system
4. Connecting the components

The sections that follow explain these steps. You will find diagrams, where appropriate, to help you identify key places on your machine.
Checking Your Computer

First things first. Did you get everything you paid for? Take a look at the invoice you received, whether you purchased the system through mail order or drove to the computer store and picked it up. Did anything not come in? If you had an important part back ordered—that is, it was not available to ship when your system order was filled—you may be in for trouble. Reputable computer dealers let you know if they cannot fill all your requests. If something important, like the monitor, is missing, perhaps you can get a loaner from the place where you purchased the system.

Check all the components and make sure that you have everything you need. Write down the particulars about the system and include the serial numbers of individual units.

Having the particulars of your system written down is always a good idea. That way, when you have something serviced or when a vendor calls and asks you, for example, what type of graphics adapter you use, how much RAM your machine has, and other miscellaneous facts, you can look up your “cheat sheet” and find the answers right away. Figure 9.1 shows another example of a documentation sheet designed to hold more information.

Next, look at the manuals that came with your system. Most likely, you have several different manuals for the various components in your system, such as the system itself, the monitor, the mouse (if you have one), and perhaps the graphics adapter, a plug-in memory board, a graphics tablet, printer, and so on. Chances are, you will wind up with a small library of manuals that tell you about the different components in your system.

Also make sure that you save the warranty cards, fill out the portion you are supposed to, and send the card to the manufacturer. Sending in the warranty cards ensures that the equipment is under warranty so that if anything goes wrong, you can get the problem corrected in a reasonable length of time (and—you hope—at no cost).

Bundle all this information together (the cheat sheet, the hardware manuals, and the warranty information) and put it away in a safe but accessible place. That way, when you need information about your system, you will be able to get to it quickly.
### Item Description Serial Number Date Purchased Warranty? (How long?)

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Serial Number</th>
<th>Date Purchased</th>
<th>Warranty? (How long?)</th>
</tr>
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<tbody>
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<td>34T45571</td>
<td>5/23/90</td>
<td>Yes: 1 year</td>
</tr>
<tr>
<td>Samsung Mono VGA monitor</td>
<td>SM207T-4</td>
<td>5/20/90</td>
<td>Yes: 2 years</td>
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<td>IBMK 16-bit VGA board</td>
<td>VGA34</td>
<td>5/23/90</td>
<td>Yes: 1 year</td>
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<td>Logitech bus mouse</td>
<td>LG-MS19</td>
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<td>Hayes 2400 modem</td>
<td>2349-0</td>
<td>5/23/90</td>
<td>Yes: 1 year</td>
</tr>
</tbody>
</table>

**Fig. 9.1.** Example of a “cheat sheet” that lists important information about your computer system.
Selecting a Work Area

The area you work in is almost as important as the machine you work with. If you take the time to think about and set up a work area that makes it easy for you to concentrate, uses the best possible light, and makes you the most comfortable, you will be halfway toward your goal of productive work with your system.

A good work area has the following qualities:

- Good indirect lighting that allows you to see the monitor clearly but doesn't cause glare on the screen
- Adequate space, giving you plenty of room to move the mouse (if you use one) and to move about between the printer and the system
- Desktop room for working with conventional tools like paper, pens, and books
- Privacy that keeps you out of the mainstream of the office or house but still gives you accessibility to the places you need to go
- A desk or worktable that allows you to position your monitor relatively close to eye level. This position keeps you from slouching or sitting up too straight as you work intently with the monitor.
- Access to a power outlet within a reasonable distance (you don't want to run power cords all over the office or room just to get to one outlet). You should also invest in a surge protector to guard your system against badly timed power bursts.
- A good chair is another vital consideration. Will you be hunched over? Does the back hit you in the wrong place? Be sure to adjust your chair (or purchase a new one) before you start spending eight hours a day in it.

Unpacking the Computer

Next, you need to unpack your computer. Be sure to keep the packing slips, styrofoam packing materials, plastic wraps, and boxes
from the packaging. Remember to store the boxes—just in case you need to box up your system and move it.

Again, make sure that you have all the pieces you need. Whether you are using an IBM, Mac, Apple, or a PC clone, you should have the same basic pieces:

- System unit
- Monitor, cable, and power cord
- Keyboard and cable

With a PC system, you have separate power cords for the monitor, system unit, and printer. Unbox all the pieces, and if anything's missing, call your dealer.

Go ahead and unbox your printer too, and make sure that you have the printer cable and power cord.

---

**Positioning the Computer**

The way you set up your computer depends on both the type of system and your personal preferences. As you read in Chapter 3, several types of systems are available, in various shapes and sizes. If you have one type of system, such as a conventional PC desktop system, you may want to set up your system one way. If you have a different kind of system, such as a tower system or a portable, you will want to arrange your work area differently. As you position your system, make sure that you choose the arrangement you will be happiest working with. And remember that if you are not 100 percent satisfied with your system the way you arrange it, you can move items around until you hit an arrangement that’s comfortable for you.

In the work area you have prepared, position the system the way you want it by following these steps:

1. If you are using a conventional desktop system, position the system unit so that you can easily insert and remove disks into and from the drives. If you plan to place the monitor on top of the system unit, place the system unit so that you can see the screen easily.

   If you are using a tower system (in which the system unit is vertical), choose a place for the system that gives you easy
access to the component. Whether or not the system unit was sold as a "tower" PC, many people prefer to place it under their desks, out of the way of bumps and mishaps. System unit stands are available for around $15; these stands let you stand your system unit on one end. Now that shorter tower systems are being designed, some people prefer to leave the system unit on the desktop.

2. Place the keyboard in front of the system unit.

3. If you use a mouse, place it to the right (or left, if you're left-handed) of the keyboard.

4. Position the printer. Make sure that you have the printer cable and the printer's power cord. Position the printer so that paper can enter and exit the printer freely.

5. Position any other components. Remember to leave yourself room to work with papers, folders, and other necessary desktop annoyances.

6. Arrange the lighting so that you have enough light for the desktop, but you don't have a glare on the screen.

Figure 9.2 shows one sample work area for a PC system. This system is a "traditional" desktop system, in which the system unit is horizontal. Figure 9.3 shows the work area for a tower system. Notice that in this figure additional components (graphics tablet and external modem) have been added.

![Figure 9.2. A sample plan for a PC work area.](image-url)
Fig. 9.3. A work area plan for a tower system.

Evaluating Your Work Area

Now that you have your system positioned, take a few moments and decide whether you're happy with the work area you have created. Ask yourself these questions:

- Is the lighting right?
- Did you leave room for working with hard copy reports, files, and other extra materials?
- Will you be able to get to the phone easily?
- Did you position the printer so that you can print without the paper's being restricted either entering or exiting the printer?
- Do you like the monitor where it is? Will it be easy for you to spend hours working with the monitor?
- Can you get to the disk drives easily?

If you're not happy, make changes now—before you connect all the components.
Understanding Cables

A cable is the lifeline of your computer system. Without cables, nothing would be attached—every piece of your computer system would be a lifeless, expensive paperweight. A power cable brings the electricity your computer needs in order to run. A cable communicates video signals to and from your monitor. A cable connects your keyboard to the system unit, allowing you to enter data and run applications. A cable communicates information to and from the printer.

The cable looks like a simple wire encased in some kind of plastic covering. That description is partly right. Actually, a cable is more complicated—it consists of 2 to 50 small wires bundled together so that some wires relay power and some wires relay data to and from the components in your computer system.

The cable connectors at the ends of the cable allow you to plug the cable into the appropriate port in the back of your system and into the components you are connecting. For example, if you are using an Apple IIgs, you plug the keyboard cable into the keyboard and into the port (opening) in the back of the Apple IIgs system unit. The connectors are small metal pieces that contain a certain number and formation of pins—little metal pieces that fit into the port in the back of the system unit (see fig. 9.4).

Different cables have different kinds of connectors. For example, the keyboard cable may be a small round cable that fits into a circular opening in the back of the computer, and the printer cable is usually a long thin connector that is rounded on the edges and has one side slightly shorter than the other (see fig. 9.5).

Understanding Ports

Most of the work you do with your computer system requires that you gaze into the screen and work with the disk drives in the front of the unit. In the setup phase, however, the back of the computer is where you spend quite a bit of your time. Take a look at the back of the system for a moment. Figure 9.6 shows the back of a PC-compatible computer. Labels on the figure identify where the various components attach to the back of the system.
In figure 9.6, you can see several different "plug-like" receptacles in the back of the computer. These receptacles are called ports. When you need to add another component, such as a printer, to your system, you plug the printer cable into the printer port on the back of the computer. The computer can then send and receive information through the port and cable to and from the printer. When you print a document, the program sends the data through the port and the printer cable to the printer, where it is printed.

Because different computers have different arrangements of ports, your system may not look like the one shown in figure 9.6. Ports are different sizes, also.
Fig. 9.5. A printer cable connector.

Fig. 9.6. The back of a PC-compatible computer.
As you add components to your system (such as a printer, mouse, scanner, and so forth), you will notice that the cables also are different sizes and that each cable fits into a port just its size on the back of your computer. You add new ports—such as serial and parallel ports, game ports, and ports for new equipment—by adding plug-in cards inside the computer. These cards plug into the motherboard of your system.

When you plug a cable into a port, you may notice that different cables attach in different ways. Basically, however, the procedure is the same:

1. Determine which cable attaches to which port.
   - You make this determination either by judging from the shape of the port and cable connector or by looking at the small icons above the ports themselves—on the Apple IIgs and Macintosh computers.

2. Align the cable with the port.

3. Push the cable connector into the port firmly.

4. Tighten the cable. Some cable connectors require that you use a small screwdriver to tighten the cable connector; others, like the Apple IIgs, the Macintosh, and the PS/2 have thumbscrews you can use to tighten the connector. Figure 9.7 shows a typical cable connector and the port to which it connects.

Figure 9.8 shows a rear view of the PS/2 Model 50. Notice that the locations of the connectors and ports are different.

As a point of comparison, consider figure 9.9, which is the back of an Apple IIgs. The ports appear in a sequence and shape different from those on the PS/2. To show which cable attaches where, Apple uses small icons both above the port itself and on the connecting end of the cable (see fig. 9.10).

Figure 9.11 shows the back of a Mac SE/30. As you can see, you have yet another configuration of ports. Unlike its cousin the Apple IIgs, the Mac has its keyboard and mouse connectors on the left side of the system unit.
Fig. 9.7. A typical cable connector and port.

Fig. 9.8. The back of a PS/2 Model 50.
Fig. 9.9. The back of an Apple IIgs.

Fig. 9.10. The Apple port icons.
Fig. 9.11. The back of the Macintosh SE/30.

**Attaching the Monitor**

The first thing most people do after they place the system unit where they want it is decide where they want the monitor. This component, after all, spends a great deal of time gleaming at you—you had better be comfortable looking back. Most people prefer to have the monitor as close to eye level as possible, with a minimum of glare and the fewest number of distractions (like an open window) possible.
Now that you understand the basics of cables and ports, attaching the monitor should be easy. Although your system may be slightly different, most monitors come with a power cable and a connector cable, which connects the monitor to the system unit. In most cases, the connector cable is hard-wired into the back of the monitor (meaning that the connector cable is not detachable), but the power cord can be unplugged from the back of the monitor.

To attach the monitor, follow these steps:

1. Position the monitor where you want it (on the system unit, on the desktop, beside the system unit).
2. Attach the end of the connector cable to the back of the system unit.
3. Attach one end of the power cable to the monitor and the other end to the surge protector or power outlet.

If you are using an Apple IIgs or a Macintosh computer, you will see an icon indicating the port into which you plug the monitor cable. (Of course, if you are using a Mac SE or SE/30, the monitor is built into the system.) If you are using an IBM or a PC-clone, plug the monitor into the connector that fits the monitor cable.

Attaching the Keyboard

With your PC's keyboard, you should find a keyboard cable, which you use to connect your keyboard to the system unit. Unlike the Macintosh and Apple computers, the keyboard cable is not a separate cable; it is attached to the keyboard.

On all systems, to connect the keyboard, simply position the keyboard where you want it and plug the end of the keyboard cable into the appropriate connector (port) on the back of the system. On Apple computers, you can tell the keyboard port by the icon above the port opening. On other computers, you can find the keyboard port by looking for the port that fits the connector on the end of your keyboard cable. On some systems—and specifically on an Apple, a Mac, and some PC clones—you need to plug the keyboard cable into the keyboard, as well. If you are using an Apple IIgs, you have the option of connecting the keyboard cable to either the right or left end of the keyboard.
Attaching a Mouse

Depending on the type of system you have, attaching a mouse may or may not be a simple task. If you have a newer PC computer, your system may be equipped with a mouse port. In this case, you simply plug in the mouse and go. (The PS/2 Model 50 does include a mouse port, but all IBMs before the PS/2 line did not.)

If your PC does not have a mouse port, or if you are using a bus mouse (which is installed inside the system unit), you need to have a technical support person install the mouse for you.

If you are using an Apple IIgs or a Macintosh, connecting the mouse is easy:

- On an Apple IIgs, simply plug the mouse cable into the connector in the end of the keyboard. (As you may have noticed, the Apple IIgs keyboard has two connectors—one at each end of the keyboard. This feature allows you to plug the keyboard connector in one side and the mouse connector in the other, in locations you prefer.)

- On a Mac system, you plug the mouse cable into the mouse port in the back of the computer. You can tell the right port by the icon above the port opening.

Attaching the Printer

The printer is all that remains to be set up. (You may also have other peripherals, which you attach after you set up the printer.) When your printer is unpacked and positioned, you connect it by plugging the cable into the appropriate place in the back of the printer and into the printer port on the back of the computer.

Take a minute to investigate a little printer technology. Earlier in this chapter, you learned that the cables allow data and power to travel back and forth between the system unit of the computer and the peripherals, such as the monitor, the mouse, the keyboard, and the printer. Computers send and receive this data in different ways—either in serial or parallel configurations. A port that sends and receives the data, then, is known as a serial or a parallel port.
With a *serial port*, information is sent one bit at a time, as if in a single-file line. With a *parallel port*, information is sent two bits at a time, like double—or parallel—lines. Obviously, information sent through a parallel port can be sent twice as fast as through a serial port.

When you are looking at printers, you will see the terms *serial printers* and *parallel printers*. These terms refer to the way in which your printer transmits data to and from the system unit. When you purchase your printer, be sure to find out (from the salesperson or the manufacturer) which type of printer you are purchasing so that you know which port to connect the printer to. (If you are unsure which port is which, ask for assistance from a technical support person or the dealer from whom you bought the system.)

The Apple and Macintosh computers cannot use parallel printers without a special hardware device, such as the Grappler C/Mac/GS and the Grappler LQ from Orange Microsystems.

The printer cable and the cable connector are larger than other cables. Remember when you set up your system that the printer has its own power cord and cable.

**Conclusion**

In this chapter, you have assembled your system by unboxing it, setting up a work area, positioning the computer, and connecting all the cables. The next chapter brings all this machinery to life in "Getting Familiar with the Operating System."
A "Before You Begin" Checklist

Now your system is all together. It's probably not working yet (I cover that in the next chapter), but you are well on your way. Before you juice up that machine for the first time, take a quick look around and make sure that you have taken care of everything. Ask yourself these questions:

- Are all cables connected securely? (Take the time to tighten the little thumbscrews and use your Phillips screwdriver to attach those connectors, if necessary. Otherwise, your peripherals won't work.)

- Is the work area arranged the way you want it? If you need to do any moving, do it now. (You can move things later if you want to, but once everything is connected, it's more trouble to move the system.)

- Did you fill out your warranty and/or registration cards?

- Did you save all the boxes?

- Do you see any "spare" parts lying around? (You shouldn't!)
In the last chapter, you put your computer system together. You chose a work area and placed the components. You connected the components with the appropriate cables. Now you’re just aching to turn everything on and get going... but there’s a catch. Your computer won’t work without an operating system.

So in order to follow the natural progression of things—before you can flip that power switch and watch your system come to life—you have to do a little sidestep and learn about operating systems first. Specifically, this chapter answers these questions:

- What is an operating system?
- What are the differences among operating systems?
- What can you do with an operating system?
- What types of operating systems are available?
- How do you get an operating system into your computer?
What Is an Operating System?

As you may know, the operating system is a special software program that is as important a part of your computer system as the hardware itself. The operating system tells your computer how to interact with all the hardware and software and with you.

At its most basic level, an operating system gives your computer the instructions it needs to operate. The operating system contains instructions (also called programs) that allow you to carry out many different disk and file maintenance tasks—regular housekeeping chores that help you keep your system in order.

Additionally, the operating system interacts between you and your computer, communicating in a language the machine will understand. The operating system also controls how you interact with your computer. For example, if you are using a Macintosh, you communicate with the operating system by clicking file and folder icons and using the mouse to select options from menus. If you are using a PC with DOS, you may communicate by entering commands at a prompt.

Depending on the type of computer you are working with, you may see the operating system referred to differently. A variety of operating systems are available—different systems for different computers. If you are using an Apple IIgs, your operating system may be referred to as GS/OS or the Finder. If you are using a PC, you may be using MS-DOS, PC DOS, or OS/2. Specifically, you will see the following names of operating systems:

- MS-DOS or PC DOS
- Finder
- OS/2
- GS/OS
- ProDOS
- UNIX or XENIX
- Windows*

*Microsoft Windows is actually a software product for PCs but is often referred to as an operating system. Windows is examined later in this chapter.
DOS—which you may see written as MS-DOS or PC DOS—is an operating system that is used widely on IBM and PC-compatible computers. (MS-DOS is a version of IBM's original PC DOS, which was created by Microsoft Corporation.) Apples typically use ProDOS (also called Apple DOS), and the Macintosh uses the Finder. Other types of popular operating systems include CP/M, UNIX, XENIX, and OS/2. Additionally, operating environments, like the extremely popular Microsoft Windows, give you another choice in the way you interact with your computer. For more information on individual operating systems, see "What Types of Operating Systems Are Available?" later in this chapter.

The following list shows you the operating systems used by the most popular personal computers:

<table>
<thead>
<tr>
<th>Computer</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM PC, XT, AT, XT 286, PS/2 Models 25, 30, 60, 70, and 80</td>
<td>DOS, OS/2 for later model PS/2s and high-end PCs</td>
</tr>
<tr>
<td>Apple II</td>
<td>ProDOS (Apple DOS)</td>
</tr>
<tr>
<td>Apple IIgs</td>
<td>GS/OS (Finder)</td>
</tr>
<tr>
<td>Macintosh</td>
<td>The System Folder and Finder</td>
</tr>
</tbody>
</table>

Most computers are sold with a current version of their operating system. For example, when you purchase an Apple IIgs, the current version of the operating system is part of the deal. When you purchase a PC, the dealer may or may not install the operating system for you—but it most likely is included with the sale. You will also receive a manual about the operating system and disks—be sure to keep the manual in a safe place so that you can refer to it as necessary.

What Are the Differences among Operating Systems?

Most operating systems work on only one type of machine—such as DOS on PCs, the Finder on Macs, and so on. Generally, computers run under one operating system only, but some new computers on the market have operating systems that can read
How Do You Find Out What Operating System Your Machine Uses?

If you have just purchased your system, your head may be swimming with various pieces of advice and warnings from fellow computer users. You have brought the system home (or to the office), unboxed it, connected all the cables... and your mind goes blank. What operating system do you have?

Of course, if you are using an Apple IIgs or a Macintosh, you don't have anything to worry about. Your system uses the Finder. The System Folder and the Finder come in different versions, which are discussed later in this chapter. But for now, you can rest assured that you know what operating system you have.

If you are using a PC, your choices are slightly more complicated—but just slightly. To determine whether you have just purchased a system that will run MS-DOS, PC DOS, or OS/2, first check the invoice that came with the system. The programs should be itemized, telling you specifically which version you have. You should have received manuals with your system, as well, so you can check to see which manuals accompanied the software.

Chances are, if you purchased a true-blue IBM, you have IBM's PC DOS. If you purchased a PC clone, you have a version of MS-DOS. If you purchased another IBM-compatible computer, like one of the extremely popular COMPAQ computers, you probably have a version of DOS that was created specifically for COMPAQ computers—COMPAQ DOS, which is a slight variation of MS-DOS. Check your manuals for specific information related to your individual operating system. Because all versions of DOS are similar to a great extent, I use the term DOS to refer to all MS-DOS and PC DOS operating systems throughout the rest of this chapter. If your machine is an OS/2 machine, you will have received a set of OS/2 manuals and software with your system.

files created under another operating system. On systems capable of running more than one operating system—such as a 386 PC that can run DOS or OS/2 (or UNIX or XENIX)—only one operating system can be in use at one time.
The differences in the "workings" of the operating systems include the following:

- The user interface
- The capability of multitasking (performing more than one operation at once)
- The software supported by the operating system

Operating Systems and the User Interface

The term *user interface* is an over-used piece of computerese that refers to what the user sees and works with on the screen as he or she works with the computer. You will see *user interface* used in connection with both operating systems and application programs.

For example, consider the Macintosh Finder screen shown in figure 10.1. As you can see, the Macintosh interface includes icons representing files and folders. The entire use of the Macintosh interface is visual. To move a file, you simply click the icon and drag it where you want it. When you want to discard a file, you drag its icon to the trash can in the bottom of the screen. Because everything is easy to understand and use, the Macintosh user interface was deemed user friendly; and other operating systems and programs began to work this visual approach into their own user interfaces.

By comparison, the operating system used on earlier PCs was not what you would call user friendly. DOS—specifically versions of DOS before Version 4.0—required that the user enter commands at the DOS prompt. This requirement meant that users needed to have a pretty good understanding of what they were doing before they did it—which is sometimes difficult when you are trying to learn new procedures.

Here's an example to illustrate the difference in user interface types. Suppose that you want to copy a file. Basically, copying is a simple operation.

- With the Finder (on the Macintosh), you click the icon of the file you want to copy, open the File menu, and select
Duplicate. Then you have the copy of the file, right beside the original. You can then drag the icon to the place you want it.

With DOS Version 3.3, when you see the DOS prompt (which looks like \> if you are using a hard disk), enter the COPY command, in the form

COPY thisfile thatfile

This command makes a copy of the first file (named thisfile) and names the copy thatfile. If you want to move the file to another directory, you indicate that in the COPY command, as in

COPY C:\this.directory\thisfile C:\that.directory\thatfile

With the introduction of DOS Version 4.0, the DOS operating system moved a bit closer to the user friendly status of the Macintosh. Now with the menu system in DOS 4.0, you can choose your commands from menus, which allows you to bypass the DOS prompt command-entry method, if you find it intimidating.
The type of operating system you are most comfortable with depends on your past computer experience. Many new users prefer the Macintosh interface because it seems easy to learn and use. Other people prefer DOS because they feel restricted working with icons and not being able to work at a command level with their operating system and applications.

**Multitasking Capabilities**

Another major difference in operating systems concerns whether the systems are capable of multitasking. *Multitasking* is the capability to run more than one application program at a time.

DOS is not a multitasking operating system, but OS/2 is. The Finder and MultiFinder allow you to have several applications open on-screen at one time (in the form of windows)—as many as the memory of your computer allows. The Finder and MultiFinder do not, however, allow you actually to work in more than one window at once.

At this point, the distinction between *open* windows and *active* windows is important. Although the Apple IIgs and the Macintosh operating systems allow you to have several windows open at one time, you can work in only one window at a time. The window in which you are working is known as the *active* window. If the Apple IIgs and the Mac had true multitasking capabilities, you would be able, for example, to sort database records in one window while performing spreadsheet operations in another. Figure 10.2 shows an example of an Apple IIgs with several applications open on-screen.

For many users, multitasking is a major issue. For example, suppose that you are producing a report for your department. In this report, you need to include financial data, graphics, and text from a word processor. As you are writing with the word processor, you realize that you have forgotten the statistics of a product. You need to open the spreadsheet file that stores the information, but here you are in the word processor.

If your operating system and application program support multitasking, you can open the spreadsheet file, check the information you need, and return to the word processor without much trouble. In a true multitasking environment, you also could
start a search-and-replace procedure in the word processor, leave that application and go to the spreadsheet file, and then return to the word processor without interrupting the operation. If your operating system does not allow multitasking, and you are using a variety of stand-alone programs (as opposed to an integrated software package), in order to accomplish this task, you must exit one program, load another, open the file you need, close the file, exit the second program, restart the original program, and open the file you began with. Not difficult to do, but if you repeat that scenario enough during your work sessions, you lose a considerable amount of time loading and exiting programs.

What Can You Do with the Operating System?

Basically, in addition to the internal communicating your operating system carries on with the hardware, the operating system allows you to perform these kinds of functions:
Disk Management

Disk management sounds a little more complex than it is. Everyone needs some method of preparing, organizing, and working with disks. When you first begin computing, you will have just a few disks, and chances are, they will be fairly easy to control. You will know what files you keep on which disk because—at least at first—you will take the time to label the disks accurately. You need to know how to prepare the disk for data storage (known as formatting the disk) and, eventually, you will need to understand more “sophisticated” tasks like copying and erasing disks.

Whether you use a hard disk or floppy disks, your operating system provides you with the means of performing the following disk management tasks:

- Formatting the disk (preparing the disk to store data and programs)
- Copying files from one disk to another
- Erasing disks
- Displaying a list of the files on the disk (displaying a directory)
- Organizing the location of files on either floppy or hard disk

These procedures are explained in Chapter 11.
Disk and File Basics

A disk stores the programs and data you work with on your computer. Whether that disk is a floppy disk, which you insert into a disk drive—5.25-inch or 3.5-inch—or the disk is a hard metallic disk that turns inside a hard disk housing, the function is basically the same. The disk stores data so that you can easily retrieve it and work with it later.

A file stores a collection of information about a specific item. For example, a file can be a letter you create in a word processor, a piece of art you draw with a graphics program, a client list from a database, or a program. A file can be a 20-word memo or a 200,000-word novel. A file can be as small as a single word, number, or line or as large as the memory in your computer (or your disk space) allows. Throughout this book and in other computer texts, the word file generally refers to a collection of information you create with a specific application program. For example, with a word processor, you open a file, enter data, and save the file. You can then later reopen the file, work with the data, and perhaps print it from the file.

Every operating system gives you a method of working with and organizing disks and files. The more files you create, the greater the need for file and disk organization, because the greater your chances of needing to reuse disks (which means that you need to know how to erase the files already stored on the disks) and copy files. Chapter 11, "Using Your Computer," explains many of these basic disk and file maintenance tasks.

File Management

As you begin working with files, you soon will need a method of organizing and working with them. Your operating system will help you perform the following file management functions:

- Make copies of files
- Copy files to disks
- Set up directories to organize your files
interaction with application programs

Although operating systems are a kind of software, they are not the kind of software you use to perform specific tasks, such as word processing, accounting, or managing data. A different kind of software, known as an application program, is used to help you carry out the operations you bought your computer to perform. The operating system, on the other hand, controls the basic working of the system and gives you a method of working with files and disks and running the application software.

No matter what type of program you ultimately choose, you need some way to format disks, copy files, erase files you no longer need, rename files, and so on. Rather than leave it up to each application program to provide a means of performing disk and file maintenance tasks, the operating system gives you everything you need for taking care of files and disks. This factor allows the makers of the application programs to keep their programs down to using the smallest amount of RAM possible, because they don't need to create program routines to take care of operations performed by the operating system. When you purchase an application program, you need to make sure that the program runs under the operating system you are using on your system. Some programs are available for more than one operating environment, such as Microsoft Excel, which is available in both IBM and Macintosh versions.

You start most applications from the operating system level of your computer, although in some cases, you may set up your system so that certain programs boot automatically as soon as you turn on your computer. For the most part, however, you will need to activate the applications programs you use by doing something from the operating system level. If you're using an Apple IIGS or a Macintosh, that something may be double-clicking the program
icon, which in turn causes the program to be loaded into memory. If you are using a DOS machine, that something may be typing word at the DOS prompt to activate Microsoft Word. For more information about working with programs, see “Installing and Starting Programs,” in Chapter 11.

Many application programs include options that allow you to make copies of files, rename files, or delete files from within the program. Other programs may include an option that allows you to return temporarily to the operating system level in order to perform a few commands and then return to the program. For example, WordStar, a popular DOS-based word processing program, contains a routine that allows you to escape to DOS level, carry out a DOS command (such as COPY or RENAME) and then return to the program by pressing a key.

What Types of Operating Systems Are Available?

Because this book focuses primarily on the three major personal computer types—PCs, Apples, and Macs—you have not, as yet, seen equal treatment for all the popular operating systems. As mentioned earlier in this chapter, different operating systems are used on different machines for different tasks. This section gives you an overview of the following operating systems:

- DOS
- OS/2
- UNIX and XENIX
- ProDOS or AppleDOS
- GS/OS
- System Folder and Finder

You also learn about the operating environment, Microsoft Windows.
DOS

DOS is the "original" operating system designed for the IBM PC, XT, and PC AT family of computers. You will see DOS referred to as MS-DOS, PC DOS, and just plain DOS. DOS (which is short for disk operating system and is pronounced "doss"), is a generic reference to the operating system used by IBMs and compatibles.

From the earliest DOS release in 1981, users have used DOS by entering commands after an on-screen prompt and pressing Enter. The newest release of DOS, Version 4.0, introduces a new feature called the DOS Shell, which gives users the option of displaying and selecting commands from a menu system rather than remembering and entering commands after the prompt. Many new users found the original command-entry method to be unfriendly and intimidating, claiming that unless you had memorized many commands or had access to a reference manual at all times, finding your way through file and disk procedures was cumbersome, at best. The newest version of DOS gives users the best of both worlds—giving those who prefer the old command-entry method the option of using the DOS prompt and giving new users a friendlier method of using the DOS shell to select commands and options.

Figure 10.3 shows the display after the DIR (directory) command has been issued at the DOS prompt. (The DIR command displays a list of all files in the current directory on the current disk.) Figure 10.4 shows the DOS shell, available with Version 4.0.

Que Corporation publishes several books that can help you get up to speed with DOS. Specifically, you may want to consult Using DOS (Que Corporation, 1990) or MS-DOS QuickStart (Que Corporation, 1989).

OS/2

IBM and Microsoft got together to bring a new operating system into the world with the advent of the IBM Personal System/2 family of computers. OS/2, which is short for Operating System/2, was expected to burst on the market as the new operating system standard, but it has fallen somewhat short of its anticipated immediate success.
Volume in drive A has no label
Volume Serial Number is 0FD9-2E4E
Directory of A:\

COMMAND COM 37637 06-17-88 12:00p
CHKDSK COM 17771 06-17-88 12:00p
DISKCOPY COM 10428 06-17-88 12:00p
PCIBMDRV MOS 295 06-17-88 12:00p
PCMSDRV MOS 961 06-17-88 12:00p
PCMSPD RV MOS 801 06-17-88 12:00p
PRINT COM 14163 06-17-88 12:00p
SHELL CLR 4438 06-17-88 12:00p
SHELL HLP 66977 06-17-88 12:00p
SHELL MEU 4588 06-17-88 12:00p
SHELLB COM 3937 06-17-88 12:00p
SHELLC EXE 153975 06-17-88 12:00p
DOSUTIL MEU 6660 06-17-88 12:00p
012345 678 109 06-17-88 12:00p
DOSSH ELL BAT 184 10-14-88 8:22a
SHELL ASC 0 10-21-88 4:45p
16 File(s) 35328 bytes free

Fig. 10.3. The display after the DOS command DIR was used.

Fig. 10.4. The DOS shell with Version 4.0.
Early releases of OS/2 didn't meet with instant public approval, although as more and more software developers create applications that run under OS/2 and as the price of computers powerful enough to take advantage of its features drop within affordable ranges for many users, the popularity of OS/2 is gaining.

What does OS/2 offer that DOS cannot? The biggest answer to that question is *multitasking*. With OS/2, you can have several different applications open and working at one time. Additionally, OS/2 can recognize an enormous amount of memory, including expanded and extended memory. DOS is limited in the way it recognizes memory, and because that restriction limits the number of programs DOS can have in RAM at one time, DOS cannot support multitasking.

Similar to the latest version of DOS, OS/2 also offers users a choice of command mode or a menu system known as the *Presentation Manager*. With the Presentation Manager, you can use the mouse to select commands and options. Figure 10.5 shows an example of the Presentation Manager.

![Fig. 10.5. The OS/2 Presentation Manager.](image)

OS/2 also offers a DOS mode, which allows you to use most of the DOS commands you may be familiar with. For more detailed information about OS/2, consult *Using OS/2* (Que Corporation, 1990).
UNIX

For completeness' sake, I have opted to include UNIX in your whirlwind tour of operating systems. Because UNIX is basically an operating system for engineers and programmers, it is doubtful that you will be using this operating system for your new computer unless you are investigating the revolutionary new Next computer, which uses the UNIX operating system exclusively. However, UNIX has some important features that should be mentioned here.

UNIX is a powerful operating system used largely on mainframe computers and in high-end business applications that require the utmost sophistication from computer hardware and software. UNIX is not only a multitasking operating system (meaning that you can have more than one application active at one time), but UNIX also is a multiuser operating system, which means that the operating system can support more than one user at a time (as in a network of computer systems). UNIX also has sophisticated security features that allow users to protect programs and files from unauthorized access.

Microsoft Corporation (maker of MS-DOS) created its own version of UNIX and named it XENIX. XENIX is now widely used and is recognized as the most successful UNIX clone in the market.


ProDOS or AppleDOS and GS/OS

The operating system available for the Apple II family of computers used to be AppleDOS. Today, the new standard is ProDOS—a revised operating system for current Apples. Both ProDOS and Apple DOS are text-based operating systems you use by entering commands at a system prompt.

Although ProDOS is a significant improvement over Apple DOS, it is not capable of multitasking.

The Apple IIgs introduced yet another version of an Apple operating system: this operating system in known as GS/OS (for GS
Operating System). GS/OS is designed specifically to take advantage of the sound and graphics capabilities of the Apple IIgs. Basically, GS/OS and ProDOS are the same, except that GS/OS is a graphical interface, allowing users to work with the operating system by clicking icons and using the mouse to select menus and options.

The GS/OS operating system includes a version of the Finder—the user interface portion of the operating system of the Macintosh. The Finder makes everything on-screen friendly—trash cans for erasing files, windows to store programs and files, easy-to-use menus and command sequences.

The System Folder and the Finder

The operating system of the Macintosh family of computers—called the System Folder (and sometimes referred to as the Finder), was responsible for the renovation of the way many people look at their computers. This operating system, first introduced with the original Mac in 1984, brought users a computer with a friendly face and an easy-to-understand and easy-to-use concept.

The Macintosh operating system was based on the concept of a desktop. Because the computer screen was a graphical representation of a desktop, users could easily understand the connection between disks, files, folders, and windows. You displayed the contents of a disk in a window that opened on the desktop. Inside the window, folders and program files were stored. To start a program, you simply positioned the mouse pointer and double-clicked the program icon. To open a folder, you double-clicked the folder icon and revealed the files inside.

The concepts were simple, and a new generation of computer users was born. The Finder was the tool responsible for this friendly on-screen interaction; the Finder was the graphics interface that made the Macintosh appear as it does on-screen. Although users had the option of having several folders or windows open on-screen at one time, the Finder was not capable of multitasking. Several windows could be open, but only one window could be active at any one time. The introduction of MultiFinder further increased the speed with which users could move between applications, but MultiFinder is not truly capable of multitasking either.
The Macintosh operating system was a great success; new users found it easy to understand and use. Even experienced users liked the ease with which they could manipulate and organize files. For more information about the Finder, see Que's *Big Mac Book* (Que Corporation, 1989).

**Microsoft Windows**

Microsoft Windows is a special kind of software that falls more under the category of *operating environment* than *operating system*. Microsoft Windows gives DOS users the capability of opening several applications at once— in windows on the screen.

Suppose, for example, that you open a document in Word for Windows (a popular word processing program). Suppose next that you want to cut a paragraph of text from Word for Windows and paste the paragraph into a document in Aldus PageMaker, a desktop publishing program that runs under Windows. Then, you cut and paste a graphic from Micrografx Designer (a high-end drawing program that runs within Windows). Similar to the Macintosh and Apple IIgs environments, Windows allows you to move between applications with a minimum of hassle.

The newest version of Windows, Version 3.0, was made available in the spring of 1990. This new version is faster than earlier versions, works on 386 computers, and includes an automatic installation procedure. Windows 3.0 also adds several features, such as a Program Manager, which helps you organize applications and files; a File Manager, which provides powerful disk-management capabilities; and the Record feature, which allows you to record keystrokes so that you can automate frequently used procedures. Figure 10.6 shows an example of Microsoft Windows Version 3.0.

More than four hundred different applications programs have been created to work with Microsoft Windows.
How Do You Install an Operating System?

As you probably read in the last chapter, your computer needs access to the disk operating system in order to run properly. Now that you have all the pieces put together and you're armed with a basic understanding of your particular operating system, you need to make sure that your operating system is installed.

But first, let's back up a little. What does install mean? Put simply, when you install a program—whether it is an operating system or a program—you are placing the files on the hard disk of your computer so that the program (or the operating system) can access the important program information it needs. Some programs have actual installation procedures that place the files on the hard disk so that the program will know how to find important program information.

What if you don't have a hard disk system? If you are using a floppy disk system—that is, a system with only one or two floppy
disk drives—you must have a copy of the operating system start-up disk in drive A each time you turn on the computer. The operating system is loaded into memory (or installed) when you turn on the computer.

---

**Preinstallation Questions**

Before you install any software on your computer, ask yourself (or your computer dealer) these questions:

- **Has the software been installed before?**
  
  If you purchased the computer, the operating system, and the software from a retail dealer, the dealer's technicians may have already set up the system for you. Some computer stores do this as part of the service of their store; others charge for this service. If the outlet you are working with offers installation as an option, let the technical support staff install the software and set up your system for you. This service lessens your learning curve and gets you into hands-on mode much faster.

- **Does the software have a specific installation routine you must follow?**
  
  The best place to find this answer is in the manual that came with the software—whether the software is the operating system or a program you plan to use on the computer. Usually these instructions are given in the first part of the book—or in a separate small installation manual. The manual either gives you instructions that show you how to copy the files to your hard disk or tells you how to activate the installation procedure. Many popular PC application programs allow you to start the install program by typing either `install` or `setup` and pressing Enter. This method depends on the individual program and does not work for all programs.

---

The sections that follow provide a basic overview of the installation procedures you can use for your respective operating systems. An overview of each of the following operating systems is given:
Chapter 10: Getting Familiar with the Operating System

- DOS (PC)
- OS/2 (PC)
- GS/OS (Apple IIgs)
- The System and Finder files (Mac)

Installing DOS

The way you install DOS depends on whether you use a hard disk or a floppy disk system. As mentioned previously in this chapter, the term installing doesn't really fit unless you are placing the files on your hard disk; with a floppy disk system, technically, you are installing DOS into RAM each time you boot the machine. The following sections explain how you can install DOS.

Preparing the Hard Disk

Before you can place any programs or data on the hard disk of your computer, you must prepare the hard disk to store the information. This procedure can be a risky business and is best left to people comfortable with this sort of technical work (so when in doubt, find a tech support person to help you). The process of preparing the hard disk involves basically these steps:

1. Use the FDISK program (supplied with the DOS operating system) to partition the hard disk, allowing you to set up an organization for the way the computer stores your files.

2. Format the hard disk by using the FORMAT command. (This procedure is essentially the same as formatting a floppy disk, but on a larger scale.)

After these steps, you will want to set up directories on your hard disk to store and organize the program and data files you work with. (Note: If you have an IBM PC AT, you must run the SETUP program before you do anything else.) For more information about preparing the hard disk of your computer, see Using DOS, by David Solomon, (Que Corporation, 1990).
On a Hard Disk System

The way you install DOS on your hard disk depends on the version of DOS you are using. If you have MS-DOS Version 3.3, you install DOS by creating a directory and copying the DOS files to that directory. (As you learned earlier in this book, a directory is a section of your disk on which you store a group of similar files. In this case, you create a directory to store all your DOS files.) If you are using MS-DOS Version 4.0, you use the SELECT program to install DOS.

Versions of DOS up to and including Version 3.3 consist of a system disk and a disk containing supplemental files or diagnostics. When you install Version 3.3 on your system, you follow these basic steps:

1. Place the DOS system disk into drive A.
2. Turn on the computer. If the computer is already on, press Ctrl-Alt-Del to restart the system.
3. Create a directory to store the DOS files by typing `md dos` and pressing Enter.
4. Change to the new directory by typing `cd dos` and pressing Enter.
5. Copy all files from the DOS system disk in drive A to the new directory by typing `copy a:*.* c:` and pressing Enter.
6. When DOS finishes copying the files from drive A to drive C (the hard disk), remove the disk and insert the next disk.
7. Repeat steps 5 and 6 until the files from all disks have been copied.

If you are using DOS Version 4.0 on a hard disk system, you use the SETUP installation procedure to install DOS. If you purchased your computer and DOS Version 4.0 from a dealer, you may want to ask the dealer to help you install DOS on your hard disk. If another operating system—such as OS/2, UNIX, or XENIX—is already installed on your hard disk, you need to read the *Getting Started* manual that was packaged with your version of DOS.
DOS Special Files: AUTOEXEC.BAT and CONFIG.SYS

As you begin to read about and work with DOS, you will undoubtedly run across references to two important files: AUTOEXEC.BAT and CONFIG.SYS. Here's what they do.

AUTOEXEC.BAT is a batch file, a file that is nothing more than a batch of command lines. The command lines in AUTOEXEC.BAT give your computer important information, such as where the system can find certain application programs and whether you're using additional external devices like a printer or a mouse. You don't have to create an AUTOEXEC.BAT file in order for your computer to work, but because AUTOEXEC.BAT provides your computer with this important information each time you start the system, an AUTOEXEC.BAT file saves you the trouble of entering all the instructions manually at the beginning of each work session.

CONFIG.SYS is a file used by both DOS and OS/2 to give your computer important configuration information. CONFIG.SYS contains information that tells the computer about any peripheral devices you are using and instructs the computer how to find the drivers (individual programs that include information about the device, such as a mouse or printer driver) that run these devices. Additionally, CONFIG.SYS contains the settings for the number of files the operating system will allow to be open at one time and the number of buffers used to store data.

For more information about AUTOEXEC.BAT and CONFIG.SYS files, see Using DOS, by David Solomon, (Que Corporation, 1990).

On a Floppy Disk System

Installing DOS on a floppy disk system (a computer with one or two floppy disk drives) is different only because of where DOS finds the files it needs to start the program. The computer must locate the operating system files in order to work. If you use a hard disk, all the DOS files are copied to a specific directory on the hard disk, so you don't have to have a DOS disk in the floppy disk drive. If you use a floppy disk system without a hard disk, you must have a DOS disk in drive A each time you start your system so that the computer can load into RAM the files it needs. To load
DOS into RAM, you simply make sure that the DOS disk is in drive A when you turn on the system.

Making copies of important disks is always essential, whether they are original program disks or important data disks and whether you use them frequently or infrequently. If you are using a floppy disk machine, it’s more than important—it’s imperative—that you make copies of all disks before you use them. Create a “work” disk you can use every day—one that is a copy of the original program or data disk. Then if anything happens to your work disk, you have the original copy of the disk, safe and sound. Copying disks is explained in Chapter 11.

For more information about installing and working with DOS, see *Using DOS*, by David Solomon, (Que Corporation, 1990).

**Installing OS/2**

The procedure for installing OS/2 is a little different from the DOS procedures. Because this operating system is literally unusable on a system without a hard disk, you cannot simply boot your computer from a single disk. OS/2 comes with a full-fledged installation procedure, during which you tell the operating system the type of hardware you are using. Here’s an overview of the steps involved in installing OS/2. (For a more complete installation procedure and detailed information about this operating system, see *Using OS/2*, Que Corporation, 1990.)

1. Insert the OS/2 Installation disk into drive A. (*Note: You should write-protect the original disk before you use it.*)

2. Turn on the computer. If the computer is already turned on, press Ctrl-Alt-Del to reboot the system.

3. Turn on the monitor, if necessary.

   Your computer will go through a series of self-tests to make sure that everything is functioning properly. The computer will then beep and begin reading the operating system information on the disk in drive A.
The OS/2 installation procedure is then started. A copyright message and a welcome screen are displayed.

4. Press Enter. Then follow the installation instructions displayed on the screen.

5. After you go through all the installation screens, OS/2 prompts you to press Enter to complete the installation of the operating system. Press Enter.

6. Remove the Installation disk from drive A.

7. Press Ctrl-Alt-Del to reboot the computer.

Installing GS/OS

The operating system of the Apple IIgs computer is perhaps the simplest to install. You simply insert the disk, turn on the system, and... there it is, ready to go: The Finder desktop.

If you have purchased an external hard disk for your Apple IIgs, you need to use the System tools to prepare the hard disk. The System Tools disk that came with your Apple IIgs system contains specific programs that you use to prepare the hard disk to store information, create start-up disks which include the operating system software the computer needs to begin a work session, and hook up to and use AppleTalk network printers. (For more information about these features, consult the documentation that was packaged with your computer system.)

To install the operating system for your Apple IIgs, simply follow these steps:

1. Insert the System disk into the drive hooked directly to the system unit of your Apple IIgs.

2. Turn on the monitor.

3. Turn on the system unit.

The computer then takes a few minutes to load the operating system files. When the process is complete, the Finder desktop is displayed.
Installing the System and Finder Files

The Macintosh uses a different version of the System software and the Finder. The current version of the Macintosh System file is Version 6, although 7 is due to be released late in 1990.

As you may know, the Macintosh operating system is not called an operating system by most manuals—the Macintosh operating system is actually a combination of several files, primarily the System files and the Finder. The Finder is the graphical interface you use when you work with the Mac. The Finder controls the little pictures you click to open folders, disks, and files and controls the pull-down menus and the desktop from which you work. The System files include basic operational files and extra files for performing different functions, such as installing fonts, making macros, and a variety of other functions.

When you want to install the System and Finder files on your Macintosh (again, your best bet is to have a retailer or technical support person do it for you), you can refer to the following general steps. (For more detailed information, however, refer to The Big Mac Book, Que Corporation, 1989.)

1. Place the Macintosh System Tools disk in the drive. Unless you have made a copy on another machine, you may have to use an original. If you must use an original disk, use it only once—and then make a copy before using the original again. (Copying procedures are discussed in the next chapter.)

2. Turn on the Macintosh.

3. Turn on the monitor, if you have a separate monitor.

4. Open the System Tools disk by positioning the mouse cursor on the disk symbol (also called an icon) and double-clicking the mouse button.

5. Open the Installer folder by double-clicking the icon (see fig. 10.7). Note: If you don't see the Installer folder, look in the Utilities or Setup folder.

6. Select the Installer for your type of Macintosh (see fig. 10.8).

7. Choose the drive in which you want to install tools.

8. Click the Install button. The Installer then transfers the important files to the drive you specified.
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Fig. 10.7. The Installer icon.

Fig. 10.8. Selecting an Installer script.
Conclusion

In this chapter, you have learned the basics about your operating system. In the next chapter, you learn to use your computer and operating system to perform basic file and disk maintenance tasks, such as formatting and copying disks and viewing, copying, renaming, and deleting files.
This chapter rounds out the hands-on section of the book with some practical applications. Whether you are using a PC, an Apple, or a Macintosh, as you begin working with your computer, you will find that many short procedures make up one work session. For example, in order to write a letter, you need to start the computer, load the program you want, open the file you need, write or edit the letter, close the file, perhaps print the file, and exit the program. That’s quite a series of steps. At first, each step seems to be yet another series of smaller steps (and some, in fact, are). But as you get more used to working with your computer and your programs, you will find that the simple procedures illustrated in this chapter become second nature to you.

The very first thing you learn is to start your computer. Then you learn to format your disks—a procedure necessary in order to prepare your floppy disks to store data. Next, you find an introduction to working with files—the common denominator among all computers and computer users. Specifically, you will find these procedures:

- Starting your computer
- Formatting and copying disks
- Displaying contents of directories and disks
- Organizing files
First a Few Definitions...

Before you get started, you need to tackle a few terms you will see used throughout this chapter. If you don't understand the entire concept of each term at this point, that's okay. Further discussion later in this chapter will make the concept clearer.

Backup copy. A copy of a program or data disk, that you keep for daily use in order to protect the originals from damage.

Booting. The process of starting the computer.

Cold boot. Also known as power-up; the procedure when you initially turn on the computer for the current work session.

Default. A setting or value the program assumes if you do not supply a new setting or value.

Density. A term used to measure the amount of data that can be stored in a square inch on a disk.

Directory. In the PC world, a directory is analogous to the conventional filing cabinet drawer in which you store files related to a certain subject.

DOS prompt. The on-screen indicator displayed by DOS to show you that the system is ready to accept commands. If the current disk drive is C, the DOS prompt is displayed as C>.

File. A named collection of information stored as a unit (For example, you create a letter and save it in a file on disk.)

Folder. In the Apple IIGs and Macintosh world, a folder is analogous to a conventional drawer in a filing cabinet. Each folder can store many files.
Formatting. The process of preparing a disk to store data
Icon. An on-screen graphical element, or symbol, that represents a certain item, such as a file or folder
Logged drive. The disk drive where the operating system looks for files to retrieve or save; also called default drive or current drive
Path. The route the operating system or program takes to a specific directory or folder to locate or save a specific file
Subdirectory. With PCs, subdirectories are directories within other directories. You can create many subdirectories and many levels of subdirectories within a single directory. (Apples and Macs have folders for this purpose.)
Warm boot. Restarting the computer while the power is on. You perform a warm boot (also known as rebooting) by pressing Ctrl-Alt-Del on DOS computers.
Write-protecting. A term used to describe the process of protecting a disk from receiving information. Write-protecting prevents accidental erasure and overwriting of files. It is especially important to write-protect disks that store important information like programs (and operating systems).

Starting Your Computer
By now, you must be eager to see that intelligent-looking system do its stuff. The first step is to turn on the system. The following sections describe the procedures for turning on PC, Apple, and Macintosh systems.

Starting Your PC
Basically, once you get all your components connected, you simply turn on the computer.

1. Make sure that all cables are attached correctly, any thumbscrews are tight, and the power cords are plugged in.

2. Locate the On/Off switch. This switch may be in the front of the system (as it is on the PS/2 Model 50 in fig. 11.1), or the switch may be on the side or in the back of the machine.
3. If your computer system requires that you start the computer from a DOS disk, insert the disk into drive A and close the drive door. (You follow this procedure if your computer does not have a hard disk.)

4. Flip the switch to the On position.

![Diagram of PS/2 Model 50 with labels for A: 1.44M floppy disk drive, B: Second 1.44M floppy disk drive, C: Fixed disk, and components labeled Disk in-use lights, Power-on light, and On/off switch.]

**Fig. 11.1. The power switch on the PS/2 Model 50.**

Your computer should then come to life. You will hear a variety of whirring and grunting noises while your system processes the tasks it goes through at the start of each work session.

Depending on the types of applications you are using, the operating system you use, and the way your machine is configured, you may see different messages.

Your machine probably works through a power-on self-test (POST) during which the computer checks its parts, making sure that everything is in working order. During this time, you may see a message like System initializing or some other message informing you that the computer is performing a self-check. The initial self-test may last from a few seconds to several minutes.

If everything goes the way it should, your computer should then display the C> prompt or ask you to confirm the displayed date. If everything doesn't go the way it should, you may see a message like this:

The boot operation failed—check the disk!!

— Hit any key to reboot —
How Do You Know Which Disk Drive Is Which?

You have probably seen the terms drive A, drive B, and drive C batted around throughout this and other computer books. If you have been working around computers for any length of time, you get used to these terms and don’t struggle deciding which drive is which. At first, however, the distinction can be confusing. Here are a few guidelines for drive names:

- In a two-drive system with the floppy disk drives arranged one on top of the other, the drive on the top is usually drive A. If you’re using a PC with a side-by-side disk drive arrangement, drive A is usually on the left.

- In this same situation, the drive on the bottom is usually drive B. For a side-by-side arrangement, B is usually on the right.

- The hard disk is usually referred to as drive C.

- References to drives D, E, F, and so on, are probably references to portions of the hard disk that have been set off so that the software “thinks” of the storage as a series of separate drives.

Within DOS, you can assign the disk drives any name you like. Most people use the A, B, C standard, however, in order to be consistent with popular software configurations and with other computer users.

If you need to place a disk in drive A but you’re not sure which drive is which, try putting the disk into the drive on the top (in a vertical arrangement) or on the left (in a side-by-side drive arrangement). If this drive is not the A drive on your computer, your system will beep and let you know that the procedure is not going to work until you put the disk in the right drive. The beep may be a little embarrassing, but that’s the worst that can happen—just remove the disk, place it in the correct drive, and get busy.

Or perhaps you will see this message—it’s a bit friendlier:

```
Cannot find operating system.
Press any key to reboot.
```
If you get one of these messages, don't panic. Your computer is shouting at you because it cannot find the operating system files it needs to carry out the basic start-up procedure. To solve the problem, find the DOS system disk, insert it into drive A, and reboot the computer by pressing Ctrl-Alt-Del. That step should solve the problem. If you start your machine with DOS Version 3.3, you see the following display:

SA-Screen Attributes, Advanced Edition, © Copr 1987, Peter Norton

IBM Personal Computer DOS Version 3.30
[C:]\]

Inserting Disks

You have seen several instructions to insert the disk into drive A. Now you know where drive A is, but when you put the disk into the drive, which way does it go?

With a 5.25-inch disk, follow these steps:

1. Make sure that no disk is in the drive you want to use.
2. Make sure that the disk drive door is open. (If the door is closed, the little lever will be in a vertical position, blocking the slot in the drive. To open the door, move the lever to the right or up.)
3. Hold the disk so that your thumb and forefinger grasp the labeled edge of the disk. The edge of the disk with two small notches should be facing away from you toward the drive. The write-protect notch should be on the left side of the disk.
4. Slide the disk into the disk drive slot.
5. Close the drive door by moving the lever to the left (or down).

With a 3.5-inch disk, follow these steps:

1. Make sure that no disk is in the drive you want to use.
2. Hold the disk so that the label is up and the metal shutter is facing away from you and toward the drive.
3. Slide the disk into the disk drive slot. The disk drops down into the drive automatically. (There is no door to close.)
Next, depending on the version of DOS you have, you may see that DOS displays what it sees as the current date. If the displayed date is incorrect, type the correct date in the format mm-dd-yy, such as 08-17-90 for August 17, 1990. If you make a mistake while you're typing, press the Backspace key to erase the characters and type the correct date. When the date is correct, press Enter. (Note: With some versions of DOS, you must type DATE (upper- or lowercase letters) and press Enter to display or change the date setting.) After you press Enter, DOS displays the time and gives you the option of entering a new time setting:

SA-Screen Attributes, Advanced Edition, © Copr 1987, Peter Norton

IBM Personal Computer DOS Version 3.30
[C:\] date
Current date is Sat 7-14-1990
Enter new date (mm-dd-yy):

[C:\] time
Current time is 11:45:03.94
Enter new time:

Today's computers are generally equipped with a built-in battery-backed calendar and clock. The clock usually keeps correct time even when the system is not in use. With some systems, however, the time displayed by the clock may be off by a few minutes. You can accept the value displayed by DOS by pressing Enter, or you can enter a new value in the format hh:mm:ss. If you are using a version of DOS before V4.0, the time is displayed in military format. If you are using V4.0, you will see traditional 12-hour time followed by a or p, indicating A.M. or P.M.

What If You Don't Get a Date and Time Prompt?
There is a slim chance that your machine may not prompt you to confirm the date and time. If your machine displays C: without first displaying the time and date prompts, the clock in your system is maintained automatically—without your intervention—or someone has changed the way DOS is set up so that these prompts are bypassed. If you want to change the date, you can display what DOS sees as the default by typing DATE and pressing Enter. Likewise, you can display and change the time by typing TIME and pressing Enter.
Starting Your Apple

This section takes you through the steps involved in starting an Apple IIgs. As you may recall, the Apple IIgs uses an operating system called GS/OS. (It is also referred to as the Finder, similar to the Macintosh operating system.)

Basically, once you get all your components connected, you simply insert the system disk, turn on the computer, and go. Follow these steps:

1. Make sure that all cables are attached correctly, thumbscrews are tight, and the power cords are plugged in.

2. Insert the system disk into the drive. (If you have two drives and are unsure which drive to use, place the disk in the drive connected directly to the system unit.)

3. Turn on the monitor. The On/Off button is located in the top right side of the display (see fig. 11.2).

Fig. 11.2. The On/Off button on the side of the display.

4. Turn on the Apple IIgs. The opening screen is displayed. Then the Finder desktop is displayed, showing the system disk in the upper right corner of the screen (see fig. 11.3).
A Tour of the Apple IIgs

If this session is your first exposure to an Apple computer—or if you have recently made the jump from an Apple II to an Apple IIgs, you may want to take a few minutes and go through the GS's fabulous disk tour. On the "Tour of the Apple IIgs" disk, you find a jungle adventure (complete with a hero, as well as terrific graphics) that helps you learn to identify the different components of your system, understand the basic functions of the computer, and learn about using the mouse and the Finder interface. (Even if you already know everything about working with the GS, the story line and the terrific graphics of the tour—not to mention the authors' collective sense of humor—make the tour an enjoyable diversion in a humdrum afternoon.)
Starting Your Mac

This section takes Macintosh users through the steps involved in starting the Macintosh. As mentioned earlier in this chapter, the Macintosh operating system uses the graphical interface known as the Finder, which displays all files, folders, and disks as icons on an on-screen desktop.

Many retailers install the operating system on the Mac before they send it home with you. If your operating system is already included on the hard disk of the Mac, you don't need to boot the computer from a system disk. (If your operating system isn't on your hard disk—or you don't have a hard disk, follow the procedures listed in Chapter 10 for installing the System and Finder files.)

After you get all your components connected, you simply turn on the computer and go. Follow these steps:

1. Make sure that all cables are attached correctly, thumbscrews are tight, and the power cords are plugged in.
2. If you need to boot from a system disk, insert the disk into the drive.
3. Turn on the system. The On/Off button is located in the back left corner of the computer (see fig. 11.4).

You see a “Welcome to the Macintosh” screen and then the Finder desktop (see fig. 11.5). The Macintosh Finder is a different version from the Apple IIgs; the Mac Finder also offers a few different commands in the operating system menus at the top of the screen.

Working with Disks

The next step, now that you have your computer up and running, is preparing disks to store programs and data. This discussion starts, however, with a section on protecting your original disks.

You see this warning over and over again through every computer book you ever own: “Don't use original (or master) disks—always work from a backup copy.” Why?
Fig. 11.4. The On/Off button on the back of the computer.

Fig. 11.5. The Macintosh Finder desktop.
Overview of the System and Finder Desktop

The Macintosh desktop (also called the Finder desktop) is organized to look and "feel" like the top of a desk. Disks appear as icons (small pictures that represent files, folders, disks, and programs).

The desktop offers a menu bar with a wide range of choices you can use to perform a variety of operations, such as

- Opening files
- Closing files
- Saving files
- Deleting files
- Creating a new folder
- Selecting all files and folders on the desktop

This list gives you just an idea of the variety of functions you can perform from the Finder desktop. Later in this chapter, you learn about performing these procedures in the Macintosh environment.

The answer to that question is changing rapidly. Although 5.25-inch disks are still one of the disk standards, 3.5-inch disks are rapidly gaining in popularity for two reasons: (1) you can store more information on 3.5-inch disks, and (2) because of their plastic casing, 3.5-inch disks are much harder to destroy. The flexibility of the original "floppy" disks and the fact that the mylar surface of the disk is vulnerable to outside elements through the read/write hole demonstrate the importance of always working from a backup copy of a master disk or any disk that stores important information you don't want to lose.

Picture this: You have been working on a spreadsheet for almost four hours. When you're a little more than half done, a coworker comes up and asks to print something from your computer. You're a nice person—and some M&Ms sound good right about now—so you say "Sure," and go to get your goodies. You're gone only a few minutes, but when you return, your coworker is sitting at your desk looking dejected and more than a little nervous. He explains that he removed your disk from drive A, placed it next to the computer, inserted his disk, and printed his file. Then, after he
finished, as he was removing his disk, the phone rang. He inadvertently jumped (no doubt thinking that the caller was his mother-in-law) and accidentally knocked over your coffee, soaking your disk, your printouts, and your favorite picture of your English bulldog, Jelly Roll.

If you had saved a backup copy of your spreadsheet, saving your work would have been simple: just get the copy you keep in a safe place (away from in-law-phobic coworkers), make another copy of that disk, and put the original away again... just in case.

The following sections introduce you to three basic procedures you need to know when you are working with disks. First, you learn to write-protect the disks so that you can keep yourself (or others) from inadvertently writing data on disks that should be preserved. Then you learn about formatting disks (preparing them to store information); and finally, you learn about copying disks (making backups so that you can keep your original or important disks safe).

## Protecting Original Disks

The chance is slim that something horrible will happen in that slight moment when you use that original disk... but whenever possible, you should make copies of original disks and use only the copies for daily (or even occasional) use. (Making copies of entire disks is covered in the next section.)

Before you use any original disk for anything, you should write-protect the disk. Write-protecting the disk preserves the data on the disk and keeps any other data from being written to it. This process is not irreversible, however; you can "un-write-protect" a disk later. Depending on whether you are using 5.25-inch or 3.5-inch disks, the procedures for write-protecting the disk are different.

- For 5.25-inch disks, you place a write-protect tab over the write-protect notch along the top right edge of the disk (see fig. 11.6). Most packages of disks include a set of write-protect tabs.

- For 3.5-inch disks, you simply slide the write-protect shutter, which automatically protects the disk (see fig. 11.7).
Fig. 11.6. Write-protecting a 5.25-inch disk.

Fig. 11.7. Write-protecting a 3.5-inch disk.

Formatting Disks

Before you can place any information on a disk, you must format it. Formatting prepares the disk and writes important information to it so that the computer knows how and where to place information. Specifically, the computer creates a file allocation table (known as a FAT), which the operating system uses as an index to help it place and later find and retrieve files from the disk. Formatting divides the disk into tracks and sectors, which will store the data when you save files on the disk. (For more information about tracks and sectors, see Chapter 3.)

PC Formatting

When you want to format a disk on your PC, follow these steps:

1. Start the computer. (Insert the DOS disk into drive A if necessary.)
2. Type `FORMAT A:` (upper- or lowercase letters) and press Enter. DOS prompts you to insert the disk you want to format into drive A.

   *Note:* If you want to format the disk in drive B, type `FORMAT B:`.

   **Warning:** Do not type `FORMAT C:` and press Enter, or DOS will format the hard disk of your system, and you will lose all the data on your hard disk.

3. Insert the disk and close the drive door.

4. Press Enter. DOS then formats the disk.

   Some versions of DOS, such as Version 3.3, display the percentage of the disk formatted as the process is being carried out. When the procedure is finished, DOS asks you whether you want to assign a name (called a *volume label*) to the disk. This name is optional. (If you want to assign the disk a name, see the sidebar “DOS, Apple, and Mac Disk-Naming Conventions,” in this chapter.) For now, just press Enter.

   DOS then asks whether you want to format another disk.

   Your screen looks something like this:

   ```
   [C:\] format a:
   Insert new diskette for drive A;
   and strike ENTER when ready
   Format complete
   1213952 bytes total disk space
   284160 bytes in bad sectors
   929792 bytes available on disk
   Format another (Y/N)?
   ```

   If you want to format another disk, type `Y` and press Enter. If you don't, type `N` and press Enter.

---

**Apple Formatting**

When you want to format a disk on your Apple computer (this is usually known as *initializing* the disk), follow these steps:

1. Place the System disk in the drive closest to the system unit, and turn on the system.
2. When the Finder desktop is displayed, insert the disk you want to format into the second drive. (If you have only one drive, remove the System disk from the drive by pressing the disk drive button to the right of the disk drive opening.)

The Apple IIgs displays a window telling you that the operating system cannot read the disk you have inserted (see fig. 11.8).

![Fig. 11.8. Initializing a disk on the Apple IIgs.](image)

3. Click the Initialize button.
   The Finder prompts you to supply a name for the volume (disk).

4. Type a name for the disk that in some way reflects the information you plan to store on the disk. (If you are unsure what data you will store on the disk, you may want to name the disk according to the type of program you will be using; for example, WORD_DATA1.)

5. Click the OK button.

6. The Apple displays another window, asking you to specify the density of the disk. (If you are unsure how much information you can store on the disk—800K or 400K—check the disk's package.) Click the correct density setting (see fig. 11.9).
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Fig. 11.9. Selecting the density of the disk to be initialized.

7. Click the Initialize button. The Apple IIgs then initializes the disk.

**DOS, Apple, and Mac Disk-Naming Conventions**

Whether you are using a PC, Apple, or Macintosh computer, you can provide a volume label for your disk after you have formatted it.

- With DOS, you must limit the name to 11 characters with no spaces, no periods, and no underscores.

- With the Apple and the Macintosh, you can use up to 15 characters, the first character of which must be a letter. (Other characters can be letters, numbers, or periods.)

- Also with Apple and Macintosh, no two disks in the same folder or on the desktop at the same time can have the same name.
Mac Formatting

The procedure for initializing a Mac disk is similar to the procedure for the Apple IIgs. When you want to format (or initialize) a disk on your Macintosh, follow these steps:

1. Start the system.
2. When the Finder desktop is displayed, insert the disk to be formatted in the drive.
   The Mac tries to read the disk and finds that the disk is unreadable. The computer asks whether you want to initialize the disk (see fig. 11.10).
3. Select whether the disk you want to format is one-sided or two-sided.
   The Macintosh displays a warning that the initialization process will erase all information on the disk.
4. Click the Erase button to continue the format.
5. Enter a name for the disk and click the OK button. The Macintosh then begins formatting the disk. After the format is finished, the Macintosh verifies the format and creates a directory. The disk is then displayed on the desktop with the name you specified.

Fig. 11.10. The Mac prompts you to initialize the disk.
Copying Disks

When you make a backup copy of a disk, you make a duplicate of the disk—so that the programs and data are written on the copy the same way they are placed on the original. Whether you use a PC, Apple, or Macintosh computer, copying a disk is a simple procedure and one you should perform often.

Get into the habit of making a backup copy of each new program you get as soon as you receive it; then put the original away for safe-keeping and use the copy for your day-to-day tasks.

Copying PC Disks

When you want to make a copy of an entire disk, you use the DISKCOPY command in the following format:

\[ \text{DISKCOPY A: B:} \]

This command tells DOS to copy the entire contents of the disk from the disk in drive A (known as the source disk) to the disk in drive B (known as the target disk). If you are using a single-disk system, you can use the command in this format:

\[ \text{DISKCOPY A: A:} \]

DOS prompts you when to swap the disks in the drive.

Following is the procedure for using the DISKCOPY command to make a copy of an entire disk:

1. Type \textit{DISKCOPY A: B:} and press Enter.
2. Insert the source disk into drive A.
3. Insert the target disk into drive B. (If you do not have a two-drive system, skip this step. DOS will prompt you when to remove the source disk from drive A and replace it with the target disk.)
4. Press Enter. DOS then begins the DISKCOPY procedure. The operating system displays information about the process as it reads the data from the source disk and places the
information on the target disk. (Note: If you are using only one disk drive, DOS prompts you to remove the target disk and insert the source disk again.)

5. When DISKCOPY is finished, DOS asks whether you want to copy another disk. If you do, type Y; if not, type N.

Copying Apple Disks

When you want to copy an entire disk on your Apple IIgs, follow these steps:

1. Make sure that the Finder desktop is displayed.

2. If you have two disk drives, insert the disk from which you want to copy the information (the source disk) into one drive, and place the disk to which you want to copy (the destination [or target] disk) into the other drive. (You need to eject the System disk first.)

3. When both disk icons appear on the screen, position the mouse cursor on the source disk.

4. Press and hold the mouse button and drag the source disk icon onto the top of the destination disk icon.

5. A screen is then displayed warning you that the contents of the destination disk will be replaced with the contents of the source disk (see fig. 11.11). Click OK to continue the copy procedure. A screen is displayed showing you the progress of the copy (see fig. 11.12).

Copying Mac Disks

The procedure for copying disks and files on the Macintosh is similar to that for the Apple IIgs. With a Macintosh SE/30 like the one used in this example, you have only one drive.

To copy an entire Macintosh disk, follow these steps:

1. Make sure that the system is on and the desktop is displayed.

2. Insert the disk you want to copy into the drive.

3. Place the mouse cursor on the disk you want to copy.
**Fig. 11.11.** The Apple asks whether to proceed with the copy procedure.

**Fig. 11.12.** The progress of the copy procedure is displayed.
4. Press and hold the mouse button. The disk is displayed as black with white lettering, giving the appearance that it is highlighted.

5. Drag the disk icon to the top of the hard disk icon.

6. Release the mouse button. When you do so, the Macintosh copies the contents of the disk to the hard disk. A screen is displayed, showing the progress of the copy procedure.

Displaying Disk Contents

Now that you have learned the basics of formatting, write-protecting, and copying disks, you need some way of looking at the files on the disks. You may want to display the contents of a disk, for example, when you are looking for a particular file and you didn't label the disk. The procedure for viewing the contents of a disk is known as displaying a directory of the disk. If you are using an Apple or a Mac, this procedure may seem obvious. But if you are using a PC, you need some way of displaying the contents of your disks.

Displaying PC Files

After you have copied files to a disk, you need some method of checking to make sure that the files actually got there. Displaying the contents of a disk is known as getting a directory of a disk.

To get a directory of a disk, follow these steps:

1. Insert the disk for which you want to display a directory into drive A.

2. Type `DIR A:` and press Enter.

DOS then displays a directory of the files you have stored in the current directory of the disk. You will also see the size of each file (shown in number of bytes) and the date and time the file was created or last updated. The following is an example of the type of display you will see:
[C:\] dir a:

    Volume in drive A has no label
    Directory of A:\

ITC16       KM    18816   6-19-90   11:34a
ITC18       KM    21120   6-21-90   3:01p
ITC20       KM    15872   6-25-90   10:41a
ITC19       KM    24064   6-24-90   6:23p
ITCFM       KM    4480    3-12-90   10:41a
ITCH05      REV   66560   5-16-90   10:22p
ITC17       KM    18176   6-20-90   10:51a

  7 File(s)    759808 bytes free

[C:\]

Displaying the Contents of Apple and Mac Disks

If you are using an Apple IIGs or a Macintosh, you can easily see what's stored on each disk because of the graphical interfaces of both computers. The Finder desktop allows you to display the contents of disks by double-clicking the disk's icon; the files on the disk are then displayed in a window (see fig. 11.13). Depending on the view you have chosen for displaying the files, you may see only the file icon and the file name. In another view (such as the By Name view), you see the file name, type of file or folder, and the date the file was last modified. This information is important, for example, when you need to see the most recently modified file in a particular folder on disk.

With the Apple IIGs and the Macintosh, you have further control over the way your computer displays files. In the Finder's View menu (located along the upper edge of the screen) are a variety of options for the way you display the files in the window. These options are as follows:

<table>
<thead>
<tr>
<th>Option</th>
<th>Displays files</th>
</tr>
</thead>
<tbody>
<tr>
<td>by Small Icon</td>
<td>Shows a smaller icon</td>
</tr>
<tr>
<td>by Icon</td>
<td>The default display; shows large icon with file names underneath</td>
</tr>
</tbody>
</table>
Fig. 11.13. Files viewed by icon on the Finder desktop.

<table>
<thead>
<tr>
<th>Option</th>
<th>Displays files</th>
</tr>
</thead>
<tbody>
<tr>
<td>by Name</td>
<td>Displays files alphabetically by file names; also shows kind of file (or folder) and displays the date the file was last modified</td>
</tr>
<tr>
<td>by Date</td>
<td>Displays files organized by date last modified (from present to past)</td>
</tr>
<tr>
<td>by Size</td>
<td>Displays files from largest to smallest</td>
</tr>
<tr>
<td>by Kind</td>
<td>Displays files organized according to kind of file</td>
</tr>
</tbody>
</table>

The option currently selected is highlighted with a check mark. If you want to display files by date, follow these steps:

1. Open the View menu.
2. Select the By Date option. The Finder then reorganizes the files in the window according to the date last modified (see fig. 11.14).
Organizing Your Files

No matter which type of computer you are using, you need some method of organizing your files. When you first begin working with computers, keeping track of files may seem like no big deal; but as your computer experience grows (and so does the number of files you use), you need some reliable method of saving files so that you can find and retrieve them easily later.

If your system does not have a hard disk and all the files and the programs you work with are loaded from disks, your organizational method is different than it is if you are using a hard disk.

Whether you do all your work from floppy disks or you use floppy disks only to store backups of your work, having a few organizational rules helps keep you on track:

- Store all data files for a particular program on one disk.
  For example, if you work with Lotus 1-2-3 and Professional Write, you may want to store all your 1-2-3 data files on one disk and your Professional Write information on another.
You may prefer to store all files relating to a particular project on one disk. For example, if you are working on a page layout project for a client, you may want to store the text and art files for that particular project on one disk.

Label the disks clearly so that you don't accidentally overwrite them with other files.

Keep the disks in a disk holder to keep them protected from dust and dirt, coffee, and other hazards of office life.

Be compulsive about backups. Make sure that you save all important files and programs on backup disks.

Write-protect disks that you want to protect against accidental loss of data.

Working with PC Directories

If you have worked with a PC or a DOS-based machine before, you may be familiar with DOS's intriguing method of helping you organize the files on your hard disk.

With DOS, you organize your files by placing them in directories and subdirectories. (As defined earlier in this chapter, a directory stores files related as you specify, and a subdirectory is a directory within a directory.) The main directory on the hard disk is known as the root directory, which is the only directory that exists on your hard disk until you issue a command to create additional directories. These additional directories are known as subdirectories.

Many people think of DOS’s organization of directories in terms of a tree structure. Like an upside-down tree, the directories in DOS begin with one main directory (the root directory) and divide into smaller subdirectories (like the branches of a tree). Figure 11.15 shows an illustration of this concept.

Organizing your files in this manner is much like categorizing files. For example, suppose that you use four major programs for most of your work: First Choice, PC Paintbrush, WordStar, and Q&A. You could organize the hard disk so that you can access each of those programs from the root directory. This organization looks like the one shown in figure 11.16.
Fig. 11.15. The tree structure of DOS directories.

Fig. 11.16. DOS directory tree structure with subdirectories for major programs.
Beyond that, then, you may want to create further subdirectories. Suppose, for example, that you are working with several different types of documents in WordStar. You could create additional subdirectories to help you keep those files organized as well (see fig. 11.17).

To create a directory,

- When the C> prompt is displayed, type `MD directoryname` (substitute the name of the directory you want to create in place of `directoryname`) and press Enter. MD stands for make directory. This command tells DOS to create in the current directory a directory with the name you specify.

To return to the root directory from within any directory, type `CD \` and press Enter.
You will want to change to different directories when you want to work with different program or data files. For example, suppose that you have been writing a letter in WordStar (in the WS4 directory) and now you want to work on a spreadsheet (in the 123 directory).

To change to a different directory,

- When the C> prompt is displayed, type `CD directoryname` (in this case `CD 123`) and press Enter.

  CD stands for change directory. This command tells DOS to change to the directory you specify if it exists in the current directory.

You probably will want to remove directories you have created. For example, suppose that you have just completed a major project. You have saved all the necessary files to a disk, so you no longer need these files on your hard disk. Before you remove the directory, you must delete the files (covered later in this chapter). Then, to remove a directory,

1. At the C> prompt, make sure that no files are in that directory by typing `DIR` and pressing Enter. (If you try to delete a directory that contains files, DOS displays an error message telling you that the directory is not empty.)

2. At the C> prompt, type `RD directoryname` and press Enter.

   RD stands for remove directory. This command tells DOS to remove the specified directory.

Before you can remove a directory, you must delete all program and data files in that directory. (Erasing files is covered later in this chapter.)

Working with Apple and Mac Folders

The procedure for working with Apple and Mac files and folders is less complicated than working with the PC.
The Finder allows you to keep everything in order on your desktop through the use of folders. If you have been working with a DOS-based application, you will understand the connection between folders and directories: a DOS directory is the same as an Apple folder.

As you learned earlier in this chapter, you can display the contents of a disk by double-clicking the disk icon. The contents of the disk are then displayed in a window on the desktop. Inside the window are folder and file icons (see fig. 11.18).

When you double-click a file icon, the operating system runs the program. For example, double-clicking the PRODOS icon in figure 11.18 causes the Finder to load and run the program ProDOS. If you double-click a folder icon, the contents of that folder will be displayed in another window on the screen (see fig. 11.19).

You can add a new folder one of two ways:

- You can open the File menu and select the New Folder option.
- You can press ⌘-N.
The Finder then displays a new folder in the current window. The program automatically assigns the folder the name Empty Folder. You can then rename the folder, if you want, by clicking the name once and typing the new name.

**Working with Files**

Now that you know the basics about starting your computer, working with disks, and organizing your files, you're ready to get down to some basic file-maintenance techniques. The following sections introduce you to these procedures:

- Copying files
- Erasing files
- Renaming files
Copying PC Files

Sometimes you want to copy a disk of files or a single file on your PC. For example, you may want to give a copy of a spreadsheet to a coworker. To copy a file, follow these steps:

1. Insert the disk from which you want to copy (the *source* disk) into drive A.
2. Insert the disk to which you want to copy (the *target* disk) into drive B. (Instead, you may want to copy the files to drive C.)
3. Type the COPY command in the following format:

```
COPY A:\filename B:
```

This command copies the file you specified (*filename*) from the disk in drive A to the disk in drive B. If you want to copy the file to drive C instead, you would enter the following:

```
COPY A:\filename C:
```

You also can use the COPY command to copy the entire contents of the disk. The command line for this operation is

```
COPY A:*.* C:
```

4. Press Enter to begin the copy procedure. After the copy procedure is complete, DOS V3.3 asks you whether you want to copy anything else. If you do, type *Y*. If you don't, type *N*.

Copying Apple and Mac Files

When you want to copy a file on the Apple IIgs, follow these steps:

1. Place the disk from which you want to copy the file (the *source*) in the drive.
2. Double-click the disk icon to display the contents of the disk.
3. Place the disk to which you want to copy the file (the *destination*) in the other drive. (If you have only one drive, remove the source disk and replace it with the destination disk.)
4. Double-click the destination disk icon to open it.

5. Click the file you want to copy from the source disk and drag the file to the destination disk window.

6. The Apple's operating system may prompt you to reinsert the System disk so that it can find the copy information it needs.

7. A screen is then displayed, showing the progress of the copy procedure. When the copy is complete, the icon of the file is shown in the destination disk window.

You can select more than one file for copying, if you prefer. To select more than one file, simply click the first file and then press and hold the Shift key while you click the other files.

When you want to copy a file (or files) on the Macintosh, follow these steps:

1. Place the disk from which you want to copy the file (the source) in the drive.

2. Double-click the disk icon to display the contents of the disk.

3. Double-click the hard disk icon to open it.

4. Click the file you want to copy from the source disk and drag the file to the hard disk window.

5. A screen is then displayed, showing the progress of the copy procedure. When the copy is complete, the icon of the file is shown in the hard disk window.

Be careful when you are assigning names to files you are copying. If you give a file a name that already exists, the new copy may overwrite the existing file.
Erasing Files

Along with computer proficiency comes the problem of disk population. How many files can you store on a disk before it starts bulging like the Macintosh trash can icon? (Just kidding—a too-full disk gives you a warning message.) Obviously, you need some recourse for doing away with files you no longer need. This section explains how to erase files.

Erasing PC Files

When you want to erase files on your PC, the steps are simple:

1. Change to the directory in which the files you want to delete are stored. (Remember that the DOS command for changing directories is CD.)

2. Type the following command:
   
   ERASE filename
   
   Substitute the name of the file you want to delete for filename in the preceding example.

   As an alternative, you can use the DEL command to delete a DOS file. Use the same format, just using DEL instead of ERASE, as in
   
   DEL filename

   Be careful when deleting files—especially if you are using a PC and DOS. If you accidentally delete a file (or worse—a subdirectory of files), you cannot unerase the file. Once it's gone, it's gone. (Some "quick unerase" utilities, like the one included with Norton Utilities, can retrieve some accidentally obliterated files.)

Erasing Apple and Mac Files

The procedure for erasing Apple and Macintosh files is more entertaining than its PC equivalent. When you want to erase a file on the Apple IIgs or the Macintosh, follow these steps:
1. Open the folder storing the file you want to delete.

2. When the mouse cursor is positioned on the file you want to delete, press and hold the mouse button.

3. Drag the file icon out of the window and over to the trash can.

4. The trash can is highlighted when the file is “in” the trash (see fig. 11.20).

5. Release the mouse button. The sides of the trash can bulge, indicating that something has been thrown away.

If you accidentally throw away a file, you can retrieve it from the trash can. To display the contents of the trash can, double-click it. A window is then displayed, showing the last item you threw away. If you want to recover the file most recently placed in the trash can, you can select the file and drag it from the trash window onto the desktop.
Renaming Files

You also will want to rename files from time to time. Suppose, for example, that you have been working on a report for your department's annual meeting. You have been revising and revising—now you think that you're ready to call it a final draft. In the file's previous incarnations, you named it DRAFT1; now you're ready to put a final name on it.

Renaming PC Files

To rename a file by using DOS, follow these steps:

1. Go to the directory that stores the file you want to rename.
2. Type the command in the following format:
   
   \[ \text{RENAME oldfilename newfilename} \]

   Replace \text{oldfilename} with the name of the file you are renaming and \text{newfilename} with the new name for the file.

   Be sure to use a unique name when you rename your files. If you assign an existing file's name to a new file, the existing file will be overwritten.

Renaming Apple and Mac Files

The graphical interface of the Finder makes renaming files and folders easy. To rename a folder, for example, follow these steps:

1. Open the disk containing the folder you want to rename.
2. Click the folder. The folder is then highlighted.
3. Type the new name for the folder.
4. Press Enter. The Finder then saves the new name for the folder.

To rename a file, open its folder and follow the same procedure.
Installing and Starting Programs

Whether you use an Apple, Mac, or PC, your operating system is the launching pad for your applications. This section explains how to load your applications from the operating system.

Installing Programs

Depending on the type of program you use, you will run into different types of installation procedures. As you may recall, installation is covered as an overview of operating systems in Chapter 10. Installation of software programs may be somewhat different, but the concept is basically the same:

- On a hard disk system, installation means putting the program on the hard disk and setting up the program to work with your computer's particular components (the specific printer type, monitor type, and so on).

- On a floppy disk system, installation means loading the program into your computer's memory each time you start a work session and also setting up the program to work with your system. (These settings are then saved to the floppy disk rather than saved on the hard disk.)

Some software programs have elaborate installation routines that automate the procedure so much that all you do is insert the disk into drive A and type a simple command, like install. The program's installation routine then leads you through a variety of screens, prompting you when to insert which disk and helping you make choices about the types of hardware you are using.

Other programs offer nothing more than a simple copy-and-it's-installed procedure, which means that you create a directory on the hard disk (remember MD for make directory?), copy the files to the directory, and start the program.

To find out which type of program you have and to find your program's specific installation instructions, consult the documentation packaged with your software. If the documentation is unavailable, you may want to see whether a file called README.DOC is present on any of the program disks. Often,
software manufacturers include late-breaking news about software releases in this README.DOC file, which is included on the software disks. (To find out whether this file is present on your disks, use the DIR command, or if you are using an Apple IIgs or a Mac, display the contents of the disk by double-clicking it.)

If you find a README.DOC file and you want to display the contents of the file, you can type

```
TYPE README.DOC | MORE
```

and press Enter. (If the name of your README file is different, enter that name in place of the README.DOC file name shown here.) The pipe character (|) and the word MORE tell DOS to display the README.DOC file a screenful at a time. When the screen is full, DOS pauses and waits for you to signal that you want to see the next screenful by pressing another key.

Be sure that you read your installation instructions carefully before you install a program on your system. And remember, when in doubt, find a technical support person or contact a local bulletin board or user group for help.

Starting Programs

Now you're getting right to the heart of the matter: This is what you bought your computer to do, right? Run programs. Get things going. This section explains how you can start programs on your PC, Apple, or Macintosh computer. (Remember, software programs vary greatly, so this procedure is different to some degree for every computer and program. For that reason, this section provides only an overview of the steps involved in starting individual programs.)

Starting PC Programs

The way in which you start programs on your PC may differ slightly depending on how your program is installed. For most programs, the procedure goes like this:
1. Change to the directory where the program files are stored.

2. Type the program start-up command and press Enter. (The command you use to start the program varies from program to program. Generally, the command is some variation of the program name; for example, the command to start Microsoft Word is *word*.)

### Starting Apple and Mac Programs

Starting a program on an Apple IIcs or a Macintosh is as simple as pointing and double-clicking. Here are the steps:

1. Open the disk on which the program is stored.
2. Locate the program icon. (If necessary, open the folder that stores the program.)
3. Double-click the program icon. The Finder then loads and runs the program.

### Turning Off the Computer

The last section in this chapter explains how to end your work session.

### Turning Off the PC

When you are ready to end your work session with your PC, follow these steps:

1. If you were using an application program, make sure that you have saved the file you were working on.
2. Return to the operating system level. (If you are unsure how to do that, look in the program’s documentation for instructions on how to exit the program.)
3. When the operating system prompt is displayed (such as C for DOS on a hard disk system), you can safely turn off the system. If you are using a power surge protector strip, turn
off the system there; otherwise, turn off the monitor and then the system by flipping the power switches.

Turning Off an Apple IIgs

When you want to end your session with your Apple IIgs, follow these steps:

1. Exit the application program you were using. You are then returned to the desktop.
2. Close the windows that are open on the desktop.
3. Point to the Special menu in the menu bar at the top of the screen.
4. Open the menu and select the Shut Down option (or press ⌘-Q, if you want to bypass the menu selections).
5. When the Finder asks you whether you want to continue, click OK.
6. You can then turn off the Apple IIgs safely.

Shutting Down a Mac

Similar to an Apple IIgs, the Macintosh uses the Finder operating system. When you are ready to turn off your Macintosh, follow these steps:

1. If you are using an application program, exit the program now. The desktop is displayed.
2. Close any open files and folders. Click the close box in the upper left corner of any open windows to close them.
3. Point to the Special menu in the menu bar at the top of the screen.
4. Open the menu and select the Shut Down option.
5. The Finder tells you that you can switch off the Macintosh safely. If you choose, you can start another session by clicking the Restart button in the bottom left corner of the window.
6. You can then turn off the Macintosh either at the surge protector strip or on the back of the computer.

Troubleshooting

At the start of a computer session, at least, things usually work correctly. But what if they don’t? The following examples give you a few ideas about what to check if something goes wrong:

**Problem:** Your Apple displays a message that says Check startup device.

**Solution:** Remove the system disk from the disk drive in which it currently resides and insert the disk into the other disk drive. Then restart the computer.

**Problem:** Your PC’s monitor didn’t turn on when you turned on the system.

**Solution:** Your computer may have a separate power source. Check to see whether you have plugged in the power cord for the monitor. If you have, check the cable connecting the system unit and the monitor to make sure that it is securely fastened.

**Problem:** Your Apple IIgs displays the message GS/OS can’t read this volume. Do you want to initialize it?

**Solution:** You have inserted a disk that was not formatted with the GS/OS operating system.

**Problem:** You type characters, but the system does not seem to “see” them.

**Solution:** Try tightening the keyboard cable running between the system unit and the keyboard.

**Problem:** You get the message Non-system disk in drive A.

**Solution:** You have placed in drive A a disk that has not been formatted. Format the disk and try again.

**Problem:** The disk whirs and spins but nothing happens.

**Solution:** The disk may not be in properly. Remove the disk; insert it into the drive again, making sure that it is placed in the drive correctly; and close the drive door.
Conclusion

This chapter has introduced you to a wide range of procedures you will use in your day-to-day use of computers. Beginning with a basic discussion about working with disks, this chapter explains the elementary procedures for preparing disks; organizing files; copying, erasing, and renaming files; and starting and shutting down your computer. The next chapter starts Part IV of the book by exploring some of popular software programs currently available.
IV
A Software Review

Up to this point, you have learned about the options you need to consider as you make your hardware purchases. This section provides you with an overview of the types of software available.

So many different kinds of software are available that it is impossible to mention every major program in this book. The sections that follow briefly introduce you to the software identified; and for further reference, books are listed to which you can turn for more information. To learn more about the various types of software available you may want to refer to Chapter 8 of this book.

Because this software review includes a mix of PC, Apple, and Mac products, marginal symbols have been used to highlight the individual software types.

Spreadsheets
Word Processing
Data Management
Integrated Software
Desktop Publishing
Graphics
Communications
Educational and Recreational Software
Computers do effortlessly what most of us struggle to do: compute correctly and quickly. Give a computer (or, more specifically, a spreadsheet program) a list of numbers, for example, and the computer can add the numbers faster than you can reach for your pencil. Of course, people are capable of computing numbers accurately—but anyone who is asked to compute a spreadsheet with over one hundred calculations has a pretty good shot at making a mistake or two.

If you aren't a numbers person, a spreadsheet program takes the worry and the hassle of number crunching off your shoulders. If you are a numbers person, you will find that the power of the electronic spreadsheet helps you accomplish an incredible range of financial feats—and in a fraction of the time the conventional accountant's pad-and-pencil method requires. This chapter introduces you to several of the most popular spreadsheet application programs.

What Is a Spreadsheet?

A spreadsheet is an electronic on-screen representation of an accountant's columnar pad. Figure 12.1 shows an example of a typical spreadsheet program. As you can see, the display is
organized in columns and rows, similar to the paper spreadsheet's organization. The number of rows and columns available for the spreadsheet depends on the spreadsheet program you are using. The intersection of each row and column is called a cell. You enter data and formulas in the spreadsheet cells and can perform myriad numeric operations on them—including sorting, calculating, copying, moving, and formatting.

![Spreadsheet Image]

**Fig. 12.1.** An example of a spreadsheet program.

### What Can You Do with a Spreadsheet Program?

Spreadsheet programs can replace anything you previously did with a calculator. Whether you balance your checkbook once a month or are responsible for the financial accounting of a large company, a spreadsheet makes your work easier and more accurate. Specifically, you can use a spreadsheet for the following tasks (among others):

- Creating a simple profit and loss statement
- Forecasting sales for the first quarter
Computing bowling scores
Balancing your checkbook
Creating a household budget
Keeping track of payroll information
Doing a cost analysis of the production of a new product
Doing a what-if analysis to see whether you can afford a new car
Creating a graph showing stock trends
Performing simple database functions

In addition to the basic "add 'em up" features of spreadsheets, with most spreadsheets you can also create and print graphs to represent the data in the spreadsheet. Additionally, you can print the data from the spreadsheet in a variety of report formats.

From a simple spreadsheet that adds and subtracts a few numbers to a complex worksheet that uses sophisticated built-in financial functions to produce results, a spreadsheet saves you time, trouble, and headaches when you are working with financial data. These built-in functions, such as Net Present Value, Mean, Average, and so on, are formulas that are already set up to calculate values based on variables the user enters.

What Are the Benefits of Spreadsheet Programs?

There are a number of reasons for the popularity of the spreadsheet program. Here are just a few:

- Data entry can be automated and checked for errors.
- Once you enter the data, it's there; you can then work with and modify the spreadsheet without having to re-enter the data or recompute the formulas.
- You can set any cell or group of cells to display the data or values in a variety of ways called formats. These formats automatically show values with dollar signs, commas, percent signs, or one of several other ways.
The column and row format is easy to understand and use.
Formulas perform calculations and are saved with the spreadsheet.
Columns and rows can be sorted, copied, and moved with formulas intact.
The spreadsheet can be printed in a variety of formats for financial reports.
Many spreadsheet programs have built-in graph generators, which allow you to create simple graphs from the data in the spreadsheet.
Most spreadsheet programs allow you to do "what if" scenarios to determine what values are needed to get a certain result. Some spreadsheets even let you start with a result and work backward.

Who Uses Spreadsheet Programs?
As you probably know, available spreadsheets range from super-simple to complex and powerful. Likewise, the range of users goes from people who need to perform only a few calculations to people who need a sophisticated spreadsheet capable of a wide range of diverse functions. Here's an idea of the kinds of users looking for spreadsheet programs:

- Owners of small businesses who want a spreadsheet program that will allow them to do all their bookkeeping
- Managers who are responsible for a variety of financial reports and projections
- Support personnel who are responsible for maintaining departmental cost spreadsheets
- Personnel responsible for accounts payable and accounts receivable
- Home users wanting to create a budget
- Teachers wanting a method of tracking grades
What Spreadsheet Programs Are Available?

Although hundreds—perhaps thousands—of spreadsheet programs are available, there are several that users seem to reach for most often. These spreadsheets are included in the following section.

*One note before we get started:* This section lists spreadsheet programs, but other popular spreadsheets are available in many integrated packages. For example, many users wanting an easy-to-use spreadsheet really like using the spreadsheet portion of PFS:First Choice. (Refer to Chapter 15 for information about integrated software packages.)

Lotus 1-2-3

Lotus 1-2-3 is the definitive spreadsheet program available for PCs. Currently, over 5 million users are working with 1-2-3 throughout the world. Several versions of 1-2-3 are available, depending on which type of system you use (286 and 386 machines have different versions available).

Although its spreadsheet feature gets more press than anything else, 1-2-3 is actually the combination of three main features:

- Spreadsheet
- Database
- Graphics

With 1-2-3, users can create simple or complex spreadsheets, use the spreadsheet as a database, or graph spreadsheet information. Figure 12.2 shows a simple spreadsheet created in Lotus 1-2-3.

Who uses 1-2-3? 1-2-3 has a wide range of users—from the inexperienced to the sophisticated user. From accountants to financial planners to support staff, business owners, and managers, 1-2-3 is the PC user's spreadsheet of choice.

Among its many features, 1-2-3 offers an easy-to-use spreadsheet layout, an understandable control panel, a wide range of functions, easy printing procedures, graph creation and printing techniques, and macro capability. (A macro is a series of stored keystrokes, which have been saved to perform repetitive operations.)
Que Corporation has a library of books devoted to Lotus 1-2-3. In these books, you will find everything you need to know about installing and working with all current 1-2-3 versions.

**Address:** Lotus Development Corp.
55 Cambridge Parkway
Cambridge, MA 02142

**Price:** $340–$400, depending on version

**For Further Reference:**

1-2-3 QueCards, Que Corporation.
1-2-3 QuickStart, Que Corporation.
1-2-3 Quick Reference, Que Corporation.
1-2-3 Release 2.2 Quick Reference, Que Corporation.
1-2-3 Release 3 Quick Reference, Que Corporation.
1-2-3 Release 3 QuickStart, Que Corporation.
1-2-3 Release 3 Workbook and Disk, Que Corporation.
Upgrading to 1-2-3 Release 3, Que Corporation.
Quicken

Quicken is a computer-based bookkeeping system for personal or business use. Quicken can help you keep track of your finances, whether you do that at home or on the corporate level. Some of Quicken's features include balance and budget sheets, a register, bill minder, and check writing.

Who uses Quicken? This program is designed for people who need to manage personal or business finances. Many people using Quicken are bookkeepers or accountants. Figure 12.3 shows an example of a Quicken screen.

With Quicken you can generate income and cash flow statements and keep track of monthly inventory in a business. This program maintains your check register and deducts payments and adds deposits to a checking account. Quicken reduces the possibility for overdrawing an account due to miscalculations and lets your
computer generate checks for you. Quicken also allows you to track tax deductions and compare budget information. The program can be used to perform basic bookkeeping functions; manage assets and liabilities; and keep track of investments, receivables, credit lines, mortgages, and business payables. You can use Quicken as an accounting package and compare and keep track of budgets.

**Address:** Intuit Corporation  
155 Linfield Avenue  
Menlo Park, CA 94026

**Price:** $59.95

**For Further Reference:**  
*Using Quicken*, Que Corporation.

## Quattro Pro

Quattro Pro is a professional, yet easy-to-use spreadsheet that is fully compatible with Lotus 1-2-3. An electronic replacement for traditional accounting tools, Quattro Pro allows you to create files easily and save worksheets in a variety of formats compatible with other applications. Figure 12.4 shows an example of a Quattro Pro screen.

![Fig. 12.4. An example of a Quattro Pro screen.](image-url)
Quattro Pro offers all the standard spreadsheet features and includes easy-to-use printing and graphing techniques. You also can perform data management functions, create statistical applications, work with macros, and create your own menus.

**Address:** Borland International  
1800 Green Hills Road  
Scotts Valley, CA 95067-0001

**Price:** $279

**For Further Reference:**  
*Using Quattro Pro*, Que Corporation.

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**Microsoft Excel**

Microsoft Excel is an extremely popular spreadsheet that was originally available only for the Macintosh. Now, in keeping with Microsoft's make-it-easy-for-the-user mind set, the program is also available for the PC.

Microsoft Excel for the PC works with Microsoft Windows (an environment that allows you to run similar programs in individual windows). Because this program was originally created in a Macintosh environment, Excel offers users the easy-to-understand on-screen menu system and gives PC users the capability to use the mouse. Many operations that require typing in other applications can be accomplished with the mouse in Microsoft Excel. Additionally, you have options for producing a variety of reports in different fonts, a feature usually limited—or unavailable—in PC spreadsheets. Figure 12.5 shows an example of an Excel screen on the Macintosh.

**Address:** Microsoft Corporation  
16011 NE 36th Way  
Redmond, WA 98073-9717

**Price:** PC Version: $495  
Mac Version: $395

**For Further Reference:**  
*Excel QuickStart*, Que Corporation.  
*Excel Tips, Tricks, and Traps*, Que Corporation.
In this chapter, you have learned a little more about spreadsheets and have seen an overview of a few of the most popular spreadsheet programs. In the next chapter, you find out about word processing programs.

**Conclusion**

In this chapter, you have learned a little more about spreadsheets and have seen an overview of a few of the most popular spreadsheet programs. In the next chapter, you find out about word processing programs.
The introduction of word processing brought a great sigh of relief from typists all over the world. No more correction fluid. No more crumpled-up pieces of paper littering the floor near—but not in—the wastepaper basket. No more carbon paper or erasable bond.

If you have ever typed and retyped something until you got it right, you can appreciate the time and trouble word processing can save you. Everything you type is saved in a file so that you can make changes without retyping anything. Just fix the error, print, and you're done.

What Is Word Processing?

Word processing is the electronic replacement for that Smith Corona typewriter sitting in your office. Anything you previously did on a typewriter—or with a pen and paper, for that matter—you can now do with word processing. In fact, in the years since its introduction, word processing has progressed to the point that you can actually do some pseudo-typesetting, producing printouts that rival professionally typeset text in terms of print quality and layout.
Part IV: A Software Review

Here are some specific examples of what you can do with a word processing program:

- Write routine correspondence, save the file, and reuse and modify it as necessary
- Create business reports
- Write articles or books
- Generate lists
- Type term papers
- Compose any kind of business document
- Create letterhead for your company
- Perform mailmerge functions

What Are the Benefits of Word Processing?

In addition to replacing the standard tools of the trade, word processing brought with it the following benefits:

- Reusable data—you type the document only once and then store it on disk to be used again
- Easy text entry and editing features
- On-screen formatting capabilities, such as bold text, underlining, highlighting, and so forth
- Increased accuracy (Most word processing programs have spelling checkers, and some also have additional features like a thesaurus or grammatical checker.)
- A variety of print options, allowing you to customize the program for your printer
- Capabilities to change the font and style of text
Who Uses Word Processing?

Basically, anyone who works with words on a regular basis can benefit from using a word processing program. If you have ever been frustrated by having to retype something because of one misspelling, you will understand the drastic savings in time and effort a word processing program can offer you. Specifically, word processors are used by the following people:

- Writers wanting some method of retaining text without retyping it
- Editors who receive writers' word processing files and edit the entered text
- Managers needing to produce reports
- Support personnel responsible for creating correspondence
- Home users who need a method of printing information for files

What Are the Differences in Word Processing Software?

Like everything else, with word processing software, you have the easy and the not-so-easy, the powerful and the not-so-powerful. How do you decide which program is for you? This section explains some of the differences in word processing software so that you can better make that decision.

The qualities you want in a word processor depend on what you are trying to accomplish. Will you use the word processor to create a couple of letters once a month? Will you be doing 80 percent of your work with the program, creating complex documents, reports, and proposals? Will the documents you create be used by your staff for in-house training programs, or will your publications go outside to clients and prospective customers (mandating that the items you produce are the highest quality possible)?
Word processors differ in many areas:

- **Ease of use.** How easy a word processor is to use is a major consideration for many people. If you are going to be using the program only sparingly, you don't want to have to spend 40 hours learning to use it. Something that easily produces a simple letter quickly will appeal to you. Often, the ease of use and range of features go hand-in-hand; most likely, the programs with the largest number of special features are the most complex to learn.

- **Quality of output.** The quality of the output available with word processing is another major point for potential users. How good do you want your letters to look? If you want to be able to use a PostScript printer, special fonts, and high-resolution graphics, you will need to get a word processor that allows you to create that kind of high-level output. If you need something simple that you can use to print out a quarterly report four times a year—for your use only—a little word-crunching program that enables you do no more than put words on a page will suffice.

- **Range of features.** The range of features available with popular word processors is enormous. Depending on your needs, you can get anything from the simplest words-on-paper program to a complex document-building word processor that enables you to do everything from entering text to creating elaborate tables of contents, indexes, and custom dictionaries. Of course, the greater the number of available features, the higher the price tag. Along the way from simple to complex, however, are many intermediate programs with intermediate price tags. In this chapter, you will see an overview of these programs.

### What Word Processing Programs Are Available?

This section introduces you to several of the most popular word processing programs currently available. Again, in this chapter, you will find references to word processors that are actually part of integrated packages. These programs are listed here and also in the
integrated packages chapter because the word processing application is strong enough that many users purchase the program just for that applications. Let's get started.

First Choice (Word Processor)

The First Choice word processor is part of the PFS: First Choice integrated package. This word processor is popular in business applications, in part because of its easy-to-use features and in part because of the easy integration between the word processing application and the other applications in the program (spreadsheet, database, graphics, and communications).

The menu system in First Choice makes it easy for users to move in and out of the word processor without having to learn a long list of new commands and procedures. On-screen formatting, support for a variety of printers, and easy print routines enable users to become productive using the First Choice word processor right away. Additionally, the easy integration of applications gives users access to information from the database, spreadsheet, or graphics applications, that they can use in their word processing documents. Figure 13.1 shows an example of the First Choice word processor screen.

As this report details, 1988 was a record-setting year for ECM Information Services. In many areas, we met and exceeded milestones that were important for our company. This report is divided into the following sections:

Fig. 13.1. The First Choice word processor screen.
WordPerfect

WordPerfect is the most popular software program on the market today. A full-featured word processor with an incredible range of features, WordPerfect appeals to users who need many sophisticated tasks from their word processors. Among WordPerfect's features are:

- Easy text entry
- Powerful thesaurus and spell-checking routines
- Support for a wide range of fonts and printers
- The capability to create custom dictionaries
- On-screen formatting
- Preview capabilities (so that you can see how your document will look in print)
- The capability to import and print graphics
- Column capabilities, allowing you to create documents in multicolumn format

Figure 13.2 shows a sample document in WordPerfect 5.1 on the IBM. This program is available for both the PC and the Macintosh.

Additionally, as part of its more sophisticated features, WordPerfect offers a powerful macro language and macro editor. (A *macro* is a small program that is assigned to one key. When you press the assigned key combination, the program carries out the macro, performing the operation you assigned to the key. For example, suppose that you always end your letters the same way. You can assign the closing lines to a macro and then, each time you get to that point in your correspondence, you press the macro key combination. WordPerfect inserts the lines for you.)
Memo

To: All employees using WordPerfect

From: Ms. Rose

Re: Using the Block command to save time!

You can save time using the block command! With this command, you highlight the area of text you want to change, move, copy, delete, save, or print. You can use some features, like text enhancements, while you type. But often it's easiest to type your whole document, then go back through it and edit the text with the help of the Block command.

Using the Block command is easy. Position the cursor at the beginning of the block of text you want to highlight, and press Block (Alt-F4). Then move the cursor to the end of the text. That's it!

Blocked text appears highlighted on your screen. In a sense, blocked text is text that's identified as being "ready" for a second operation.

Block on

---

**Fig. 13.2. A document created in WordPerfect 5.1.**

WordPerfect also has a master document feature for assembling one large document from a series of subdocuments. WordPerfect is equipped with a tutorial to help the inexperienced user. WordPerfect also can be used to program, plan, and draft writing projects.

WordPerfect is especially popular in corporations and among programmers, college students, attorneys, consultants, professors, trainers, desktop publishers, and accountants.

**Address:** WordPerfect Corp.
288 W. Center Street
Orem, UT 84057

**Price:** $245

**For Further Reference:**

*Using WordPerfect 5*, Que Corporation.
*Using WordPerfect Workbook and Disk*, Que Corporation.
*WordPerfect QuickStart*, Que Corporation.
*WordPerfect QueCards*, Que Corporation.
*WordPerfect Tips, Tricks, and Traps*, Que Corporation.
*WordPerfect Advanced Techniques*, Que Corporation.
Microsoft Word

Microsoft Word is a state-of-the-art word processing program with a wide range of features that are both powerful and easy to use. Word is popular among both PC and Mac users, and has a large following of dedicated users who prefer this word processor to anything else on the market.

With Microsoft Word, you can integrate text with graphics and revise information within a document. Microsoft Word has special features such as print preview, side-by-side columns, built-in outlining, and automatic pagination. This program is designed to help you print reports, memos, and documents. It performs all the basic word processing techniques, such as deleting, italicizing, and highlighting. Additionally, Word has flexible tabs to give you great-looking tables and enables you to mix fonts and font sizes easily. Microsoft Word also has a spelling checker, thesaurus, and an undo command. Additionally, Word has an elaborate and well-written tutorial that takes the user through a wide range of Word features. Figure 13.3 shows an example of a screen from Microsoft Word.

![Microsoft Word Screen](image-url)

**Fig. 13.3.** A screen from Microsoft Word for the Macintosh.
Many users prefer Word because of the compatibility issue. If your office uses both PCs and Macs, it would be to your advantage to use a word processor that is available for both systems and, in fact, can share data between systems (on higher-level Macs). Additionally, many people use Word because of its compatibility with the PageMaker desktop publishing program. You can set up style sheets in Word that then can be brought directly into PageMaker, making your page layout as simple as flowing the text onto the pages.

Another version of Microsoft Word, available for PC users, is called Word for Windows. This version of Word works within Microsoft Windows, enabling you easily to use text you create in Word in other Windows applications.

**Address:** Microsoft Corporation  
16011 NE 36th Way  
Redmond, WA 98073-9717

**Price:** $495

**For Further Reference:**

*Using Microsoft Word 4: Macintosh Version,* Que Corporation.  
*Using Microsoft Word 5: IBM Version,* Que Corporation.  
*Using Word for Windows,* Que Corporation.

**WordStar**

WordStar has long been a favorite of PC word processing enthusiasts. One of the original word processors, WordStar has been around for a long time and has a dedicated group of users. Early versions of WordStar took some criticism for the large numbers of Control-key combinations and menu sequences required to carry out some operations, but experience has proven that the combinations are easy to use and remember, and users are given the option of displaying the menu on-screen (helpful for novices) or removing it altogether. (You actually have three menu levels to choose from—full menu, partial menu, or no menu.) Additionally, WordStar has an elaborate help system that aids the user in "stuck" moments. Figure 13.4 shows an example of a WordStar document.
As you know, the mainstay of our company has been the Standard Widget, the best in the business. Because of increased foreign competition, however, we have been losing market share, and sales have leveled off. The New Products Committee has spent the last six months studying new widget models.

We have concluded that a Premium Widget using improved materials would give us the edge we need. In addition, a Super Widget including even more advanced features would create a profitable high-end market. Specifications for new products are attached. Please study these specifications and submit a sample letter outlining pricing to our customers and a report on how we can best market our new product line.

cc: F. Arguelt  
S. Clemens  
R. Penniman  
E. Souse

Fig. 13.4. A sample WordStar screen.

The current version of WordStar is Version 6.0. This version of the program offers page preview capabilities with tiling (the capability to show up to 15 mini-page icons for preview), full font capability for a variety of fonts, enhanced printer support, and a full-featured spelling checker and thesaurus. Although WordStar is equal in terms of power to WordPerfect and Microsoft Word, no version of WordStar is available at this time for the Macintosh.

Address: WordStar International  
201 Alameda del Prado  
Novato, CA 94949

Price: $495

For Further Reference:

Using WordStar, Que Corporation.

Professional Write

Professional Write is a word processing program designed for people who don't have time to learn a complicated software
program. This program can help you create documents, memos, reports, letters, and other business-oriented paperwork.

Professional Write is designed for many different types of people. In business, Professional Write is used for basic word processing tasks, including writing correspondence and publishing reports. Professional Write is also helpful for business managers who need to produce printed documents fast or for support people who require on-line help and pull-down menus. This program is designed to assist anyone who needs a word processor that is powerful but also easy to learn and use. Figure 13.5 shows an example of a Professional Write screen.

![Professional Write screen](image)

**Fig. 13.5. An example of a Professional Write screen.**

With Professional Write, you can produce impressive reports, merge address files with documents, and import spreadsheets and graphs. Professional Write also has other perks, such as a spelling checker and a thesaurus. With this program, you also can edit and enhance text, preview full pages before you print them, display a help menu at all times, and import graphs. Professional Write has a context-sensitive help menu to dig you out of problem times and macro capability that allows you to record frequently used keystrokes or menu selections.
AppleWorks GS Word Processor

For the Apple II family of computers (including the IIgs, IIE, and IIC), there's no definitive word processor other than the one packaged in AppleWorks (AppleWorks GS, for GS users).

As you will learn in the chapter on integrated software, AppleWorks gives you several different applications all rolled into one. The original AppleWorks, available for the IIE and IIC families, includes spreadsheet, word processing, and database capabilities. AppleWorks GS includes six different applications, including word processing, spreadsheet, graphics, database, page layout, and communication capabilities.

The AppleWorks word processor—whether you are using an Apple IIE, IIC, or IIgs—is popular because it offers you a wide variety of features in an easy-to-use format. Figure 13.6 shows an example of the screen displayed in the AppleWorks GS word processor.

The AppleWorks GS word processor is used by many different users: business users who create reports and letters, users who design and produce publications, people who create visual presentations, managers who are responsible for writing training materials, writers, and home users.

Address: Claris Corporation
440 Clyde Avenue
Mountain View, CA 94043

Price: $299

For Further Reference:

*Using AppleWorks GS, Que Corporation.*
*AppleWorks QuickStart, Que Corporation.*
At Cosmopolitan Catering, creativity is our keyword. Looking for elegant entertaining on a shoestring? Banquet Advisor Denise DennisON has the answer. Want a home-cooked meal for 500 your closest relatives? Cosmopolitan Catering can create the food, atmosphere, and ambiance necessary to make your special event a success.

Fig. 13.6. AppleWorks GS word processor screen.

FullWrite

FullWrite, from Ashton-Tate, is a full-featured word processor available for the Macintosh. Along with all the major features available with most word processors, FullWrite also offers the following capabilities:

- Walk-down menus that allow you to bypass menu selections
- The capability to merge print information from a database
- A variety of printing options
- The capability of printing a background picture

Figure 13.7 shows a screen from the FullWrite word processing program. As you can see, the Macintosh interface is similar, although several different menus are available.
The famed "Maxwell Shoe," by the famed Australian artist Jonathan Maxwell, is reproduced in a 1/10th scale version. The original is in place at the National Academy of the Arts in Melbourne and measures 37 feet across, but this one is small enough to fit in your living room.

Fig. 13.7. A screen from FullWrite.

Address: Ashton-Tate
20101 Hamilton Avenue
Torrance, CA 90502

Price: $395

For Further Reference:


Conclusion

In this chapter, you have learned a little more about word processing programs and have explored some of the popular programs available for the PC, Apple, and Macintosh. In the next chapter, you find out about popular database programs.
You are a data manager. Every time you make an entry in your check register, every time you make a grocery list, every time you add another name to your Rolodex, you are organizing the data in your life. Depending on how much data you have to organize, you may benefit from using a database program on your new computer.

What Is Data Management Software?

Data management software—also called a database program—gives you an electronic means of entering and working with your data, whether that data includes keeping an up-to-date list of clients or maintaining a household inventory.

Different data management programs offer different capabilities. Although all database programs do basically the same thing—help you organize and access data—the additional features in the programs vary widely. For example, you may need a simple database program that enables you to enter client names and addresses and print mailing labels. A low-end database program will do the trick. High-end database programs offer an incredible range
of sorting, searching, and programming features, allowing you to build your own intricate data management system as far-reaching as your needs warrant.

What Are the Benefits of Data Management Programs?

Whether you need a simple program or something that will allow you to design an elaborate database, there are many benefits of using a database program to organize your data. For example, consider the following benefits:

- You can reuse data. You can enter data once and sort, search, and arrange data. Once the data is entered into the database, you can access it easily, create reports, print labels, or perform other functions with the data without having to re-enter anything.

- You can arrange data easily by using the database program’s sort feature. All database programs have some capability to sort the items in the database. For example, you may want to sort your client’s records alphabetically by last name. Or perhaps you want to arrange all inventory items by the date they were purchased.

- You can quickly find the data you need by using the program’s search capabilities. You easily can search for specific items in the database. For example, suppose that you can’t remember the name of a company, but you can remember the last name of the contact person. You can enter the name of the person in the correct place on the data entry form, press a key, and the database will display the record you want. *(Note: The actual keys and procedure for finding specific records varies from program to program.)*

- Printing features allow for mailing label and report generation. All databases provide some sort of print routine—whether you need to print complex reports,
produce simple columnar printouts, or perform a variety of customized operations, such as hiding certain fields, calculating columns, or adding headers and footers.

Who Uses Data Management Programs?

Database programs are used by a wide variety of users—ranging from support personnel responsible for printing mailing labels to high-level managers who need some method of keeping track of personnel information. Specifically, database programs are used by the following people (to name a few):

- Managers who need a method of recording and working with data about products, people, and places
- Owners of small businesses who need to maintain a client list
- Buyers who need to create and maintain a supplier list
- Salespeople who keep in contact with specific customers
- Home users wanting to organize household inventory
- Support personnel who keep up-to-date name and address information
- Marketing people who create and send out mass mailings to a large number of people
- Business information people, such as those in accounting, inventory, and job cost

How Is a Database Organized?

The database is built on a concept that's simple enough. You need some method of organizing your data so that you can get to it later. A Rolodex does the job, but so can a telephone book, a shoe
box of receipts, and a three-ring binder. The benefits offered by the electronic database far outweigh any time you will spend getting up to speed with the program, however; you save time not only when entering and maintaining the data but also when searching for and printing data from individual records.

With any database program, you enter data into a data entry form (not unlike filling out a paper form with a pen or typewriter). Figure 14.1 shows the sample data entry form from a popular database program.

![Data Entry Form]

**Fig. 14.1. A data entry form.**

Each data entry form is known as a *record*. A *record* stores information about one particular subject—in this example, one client in a database. You enter the data in individual fields on the form. (Here the fields are shown as Last Name, First Name, and so on.)

With any database, once you enter the data, you have the choice of displaying it, sorting it (for example, alphabetically), searching for specific records, or printing it. Some databases also allow you to search and copy subsets of data (for example, creating a new database of records with a 317 area code). Figure 14.2 shows an example of several records displayed in a table view.
In the sections that follow, you will see two categories of databases: flat file and relational. A flat file database is the simplest form of database. In a flat file database, each individual record contains all the information related to that particular topic.

On the other hand, a relational database allows for linking between databases. For example, suppose that you have created an extensive inventory database. The database displays the number of items last ordered, the number sold, and the number on-hand. With a relational database, you can link to the first a second database that tells you, for example, information about the manufacturer of the inventory item, so that when you get low in stock, you can contact the supplier to order more.

Like everything else, databases span the range of capabilities from simple to very complex. Depending on what you need from your database program, you will be able to find one that simply records names and addresses or one that you can program to create customized screens and automate data entry processes.
What Data Management Programs Are Available?

This section introduces you to several of the most popular database programs available for PC, Apple, and Macintosh computers.

Q&A

Q&A is a sophisticated but easy-to-use database program for PCs; it combines a data manager with a report generator and a word processor. Additionally, Q&A was the first database program to market the "artificial intelligence" interface, allowing users to type their questions in easy-to-understand, English-style sentences. For example, this interface, known as the Intelligent Assistant, allows you to enter a request such as "Find all clients in Minnesota" and the database will locate and display all records that have MN entered in the State field. Figure 14.3 shows an example of a Q&A screen.

![Q&A Screen](image)

**Fig. 14.3.** An example of a Q&A database screen.
The database capabilities of Q&A are actually only part of the package: Q&A Write and Report are two other modules that are designed so that the data you enter in the database portion of the program (known as Q&A File) can be used seamlessly with information in the Report or Write modules. For example, suppose that you want to create a business letter and send it to one hundred clients. You can create the letter in Q&A Write and then use the data from Q&A File to insert the names and addresses of the clients.

Other highlights of Q&A include the capability to include graphic images in the database and an easy-to-use import/export feature that lets you bring data in and out of Q&A with a minimum of effort.

Q&A is flexible enough to meet the needs of people with varying degrees of experience. New users like the easy-to-use features of Q&A; experienced users find the capabilities of the program powerful enough to meet even the sophisticated database needs.

Address: Symantec Corporation
10201 Torre Avenue
Cupertino, CA 95014

Price: $215

For Further Reference:


dBASE

dBASE is the home-run hitter of PC database software. Long the standard in data management, dBASE first appeared on the market as dBASE II, the first definitive database program for the PC. Since dBASE II, other versions of the program have evolved—namely, dBASE III, dBASE III Plus, and dBASE IV. Currently, dBASE IV is still the standard, but dBASE V will be appearing soon.

Early versions of dBASE were not very easy for the novice user to use; detractors claimed that the program was for programmers and that beginning users had to have an expert create databases for them to use. Today’s dBASE has evolved into the “user friendly” mode, offering a menu system for new users or the old dot-prompt
commands for experienced dBASE users. Figure 14.4 shows an example of the menu system available with dBASE IV.

**Fig. 14.4.** An example of the menu system in dBASE IV.

dBASE IV has extensive data manipulation options that enable you to enter, search, sort, index, link, summarize, and create reports from records and subsets of records. dBASE IV also added Structured Query Language (SQL), a database management language developed by IBM to work primarily on mainframe and minicomputers. The addition of SQL (frequently pronounced *sequel*) gives you the power to link sophisticated database systems.

dBASE IV brought the power of the sophisticated database program to new users; with the addition of the Control Center, even novice users found it easy to find their way around and perform the data maintenance tasks they needed. dBASE IV is used for a wide variety of business applications and is capable of crunching even the most complex sets of data. Another high-level benefit of dBASE IV is the addition of a batch processing mode, which allows you to select specific tasks, such as accounting transactions, while the other processing operations are going on. Further, the networking capabilities of the program make it a good choice for any type of high-level business database need.
A version of dBASE also is available for Macintosh users, called dBASE Mac. This version takes the best of the Mac and combines it with the power of dBASE. One great benefit of dBASE Mac is the easy linking capability of the program. For example, suppose that you have created a database of personnel information. In one database, you store the employee's name, address, tax withholding information, and the hire dates and review dates. In another database, you keep track of sick days, personal days, and earned vacation time. With dBASE Mac, you can link the hire date field to the second database to calculate the data for the second database.

**Address:** Ashton-Tate Corporation  
20101 Hamilton Avenue  
Torrance, CA 90502

**Price:** $325

**For Further Reference:**
- *dBASE IV QueCards*, Que Corporation.
- *dBASE IV Quick Reference*, Que Corporation.
- *dBASE IV QuickStart*, Que Corporation.

**Reflex**

Reflex is another popular database program that started on the PC and moved to the Mac. This database program helps you record, keep track of, organize, and analyze information. Used widely in business, Reflex and Reflex Plus allow you to analyze graphic, numerical, and textual data.

Reflex is used in businesses for a wide variety of tasks. Experienced users like Reflex because it gives them the power they need for their data management applications; new users find that they can use Reflex's friendly interface to get up to speed quickly. Figure 14.5 shows a sample Reflex screen.

Basically, Reflex combines two approaches to keeping track of databases of information. In the traditional "file folder" method of organizing data, Reflex enables you to create data entry screens
and enter data and fields as they are most appropriate for your needs. Additionally, Reflex provides a spreadsheet-like approach to organizing data, which can be helpful when you are analyzing data. Other benefits of Reflex include the capability to create customized reports and the import/export capabilities.

**Address:** Borland International  
4585 Scotts Valley Drive  
Scotts Valley, CA 95066

**Price:** $225

**For Further Reference:**  

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**FileMaker II**

FileMaker II, a database program from Claris Corporation (makers of AppleWorks and AppleWorks GS), is a real hit with Macintosh users. The second version of the program, FileMaker II, first appeared on the market in early 1990, providing users with an easy-to-use flat file database that allows picture fields and places
virtually no limit on the number of data records your database can store. Figure 14.6 shows an example of FileMaker II.

![Figure 14.6. A sample screen from FileMaker II.](image)

Address: Claris Corporation  
5201 Patrick Henry Drive  
Santa Clara, CA 95052

Price: $249

For Further Reference:  
*Using FileMaker*, Que Corporation.

**DB Master**

DB Master Version 5 or DB Master Professional are two database management systems for the Apple IIe, IIc, or IIGs offered by Stone Edge Technologies, Inc. These database programs are both versatile and easy to use, offering a wide range of features for the professional Apple user.
DB Master Professional brings additional power to the desktop by providing users with multifile, relational database capabilities. DB Master combines conventional database management capabilities with extended numeric features, customized reports (printouts), and a variety of search, sort, and field features.

Using only 128K of memory, DB Master gives you flexible features, unlimited file storage, and linking capabilities. For those needing extra power, Stone Edge offers a multiuser system for Version 5.

**Address:** Stone Edge Technologies, Inc.  
P.O. Box 3200  
Maple Glen, PA 19002

**Price:**  
$179 for DB Master Version 5  
$295 for DB Master Professional  
$500 for DB Master Version 5 Multiuser

**DoubleData**

For users who are frustrated by the limited number of fields the AppleWorks 3.0 database allows, JEM Software has introduced DoubleData. DoubleData enables users to create up to 60 database fields per record. Additionally, DoubleData imports and exports files easily, working particularly well exporting to spreadsheet files.

**Address:** JEM Software  
P.O. Box 20920  
El Cajon, CA 92921

**Price:** $30

**HyperCard**

HyperCard is an information manager available free with every Macintosh sold (if you don't have a copy of HyperCard, you can get one for $49). HyperCard caused quite a ripple in the development of database and applications software. Organized around a "card" filing system, like the Rolodex, HyperCard presented users with an easy means of designing, storing, and retrieving data from their system.
The fun and flexibility of HyperCard is found in its capability to link cards and stacks (the HyperCard word for database). For example, you can move between cards by adding buttons that link the current stack to another stack. You then can move directly to that stack by clicking the button. Figure 14.7 shows an example of a HyperCard stack.

HyperCard includes several levels—from browsing (where you can simply page through the cards but not change any of them) to scripting (the highest level, which enables you to use HyperTalk, HyperCard's accompanying programming language, to achieve special effects and program the way the database works).

**Address:** Apple Computer, Inc.
20525 Mariana Avenue
Cupertino, CA 95014

**Price:** Free with new Macintosh
$49 retail
Conclusion

In this chapter, you have learned about database software. The next chapter introduces you to integrated software and explores some of the most popular packages available today for PC, Apple, and Mac computers.
As you learned in Chapter 8, an *integrated software package* is a program that is actually several programs in one. Generally, an integrated package includes the following application programs:

- Word processing
- Spreadsheet
- Data management

Often, individual integrated packages also include other programs, such as graphics, desktop publishing, or communications support.

Many users purchase their computer to solve a particular problem. Want help working with words? You can get a word processing program. But what happens when your business grows and you suddenly need help with your bookkeeping as well? And what if you decide that you would really like to design and print your own fliers?

If you do not use an integrated program, you will have to buy additional programs separately. And in the preceding example, you would need both a spreadsheet program and a desktop publishing program. Buying each piece of software independently poses two problems: cost and compatibility. Integrated packages cost *much* less than the price of comparable applications sold as stand-alone programs. Finding stand-alone programs that will be compatible with each other can be a trick (more so in a PC environment than in the Mac world). In this case, compatible programs are those easily able to share information.
What Are the Benefits of Integrated Software?

If you perform a number of different tasks, you may benefit from purchasing an integrated software package. It used to be that the work many people did on their computers was bent in one direction or the other—either you were a words person or a numbers person. If you were words, you needed a word processor; if you were numbers, you needed a spreadsheet.

Today, applications are expanding their borders. Word processors are growing into the desktop publishing market. Spreadsheets include snazzy graphics. Jobs have less definition and more flexibility.

If you find that you "go where the work leads you," which may mean that you are using a word processor on Monday, a spreadsheet on Tuesday, and a desktop publishing program on Wednesday, you will definitely have an advantage working with an integrated program. Not only will you be able to use the data between the various applications you use; your learning curve will be almost nonexistent—once you have learned the commands for one application, you can apply that knowledge to them all. The following list highlights some of the main benefits of integrated software:

- Data is compatible among applications.
  
  For example, you can use information from the spreadsheet in your word processed documents, data from your database in the spreadsheet, and parts of a letter from the word processor in a spreadsheet.

- The menu system is generally the same, lessening the number of menus and options you have to learn.

  Recognizing that learning three or more programs at once can be a bit intimidating to new users, most makers of integrated packages make sure that the "look and feel" of each application is the same as the look and feel of others. For example, all applications have similar menus and options so that you can find your way around in any application, whether you use it daily or infrequently.
Having everything in one package means less time loading programs and opening and closing files.

Most integrated packages are capable of loading everything they need into RAM, which means you don’t have to wait for long delays to go from one application to another. If you are using stand-alone applications, you have to exit one program before you can start another.

Purchasing an integrated package costs considerably less than purchasing the same number of applications individually.

When you strip all the other benefits away and look only at cost, the integrated program comes out the clear winner. If you think that you will use the additional features in the integrated package, it is well worth the additional investment. If you will use only one of the applications, however, you may be better off to investigate a single stand-alone application that will meet your needs at a lower cost.

This chapter highlights some of the most popular integrated software packages. The major disadvantage of integrated packages is that they generally don’t have as many features as a top-of-the-line, stand-alone application. Most integrated databases are not relational and are not as flexible as dBASE or Paradox. Most of the integrated spreadsheets don’t have as many functions as 1-2-3 or Quattro Pro.

Who Uses Integrated Software?

Integrated packages are becoming more and more popular for a variety of business uses. Specifically, the following users are reaching for integrated software:

Owners of small businesses who want a single program that will enable them to do all their bookkeeping, word processing, and data management tasks
Managers who need quick access to data in a variety of forms (for example, data from the database, statistics from the spreadsheet)

Support personnel who are responsible for maintaining client databases and correspondence lists

Users who want a program that will grow with them as their needs grow

Users who are concerned about purchasing software that is compatible with their current system and software

Examples of Integrated Software

This section highlights some of the most popular integrated packages. Where possible, addresses of the manufacturers and current retail costs have been included.

PFS: First Choice

PFS: First Choice, one of the most popular integrated packages available for the PC, is an integrated software package that combines the following applications:

- Word processing
- Spreadsheet
- Database management
- Graphics
- Communications

All these applications follow one easy-to-use format so that you can get up to speed quickly no matter what task you are working on. Figure 15.1 shows a sample screen from the First Choice main menu.

PFS: First Choice has a wide variety of users, from sophisticated business managers to the personal hobbyist. Some examples of its users include business people who type correspondence, balance books, and manage files, and business owners and managers who
analyze and maintain information. Other users include support staff working on data entry, visual presentations, or the production of reports. First Choice is also frequently used by home users and hobbyists in need of a complete package.

PFS: First Choice automates many business tasks that are traditionally done by hand. With this program, you can perform accounting tasks, such as analyzing data, creating and printing spreadsheets. The word processor enables you to type correspondence, produce manuals, print documents, and create presentations, among many other things. PFS: First Choice also allows you to graph data, print graphs, plot graphs, create slide shows, as well as perform basic data entry tasks. With the database management part of PFS: First Choice, you can design database forms, create mailing labels, edit data, update files, retrieve files, analyze data, and create and print database reports. Overall, the program is so easy to use and so affordable that if you think you will use at least two of the five applications, you will be getting more than your money's worth.

Address: Software Publishing Corporation
1901 Landings Drive
Mountain View, CA 94039-7210

Price: $109
For Further Reference:

*Using PFS: First Choice*, Que Corporation.

**Microsoft Works**

Microsoft Works is one of those programs that has become so successful on the Macintosh that it has moved into the PC environment as well. Microsoft Works is an integrated program that combines the following applications:

- Word processing
- Spreadsheet
- Database management
- Communications

Microsoft Works has an enthusiastic following in both the PC and Mac worlds. Because of its easy-to-use features and friendly user interface (menuing system), all the applications in Microsoft Works are easy to understand and use. Both Mac and PC users work with Works in their businesses and at home, and new and experienced users both seem to find their “niche” with Works. Figure 15.2 shows a sample screen from Microsoft Works for the PC.

![Microsoft Works Screen](image)

**Fig. 15.2.** A sample screen from Microsoft Works for the PC.
MicroSoft Works' sturdy word processor allows you to do the basic entering, editing, saving, and printing of text and reports. Additionally, specialized search-and-replace features and a thesaurus and spelling checker help you ensure the accuracy of your work.

With the MicroSoft Works spreadsheet, you can create simple or complex worksheets, perform what-if calculations, and use Works' special formulas to take the drudgery out of your bookkeeping. The data manager gives you extreme flexibility in generating your data entry form, working with fields, displaying data, and generating reports. The communications module allows you to access the world outside your computer by transferring files to and from remote computers. Finally, the features in MicroSoft Works allow you to format, merge data between applications and exchange information with other programs and modules.

Address: Microsoft Corporation
16011 NE 36th Way
Redmond, WA 98073

Price: $92
$177 (Mac)

For Further Reference:


Enable/OA

Enable/OA is a sophisticated integration of five software applications: word processing, spreadsheet, graphics, database management, and telecommunications. Enable/OA also allows you to use a variety of these functions simultaneously and has a Master Control Module that manages the entire program and lets you switch, change, and go from one screen to another easily. Figure 15.3 shows you a screen from the Master Control Module, which is at the center of the Enable/OA program.

Enable/OA appeals to a large audience—made up of both experienced and novice users. Although Enable/OA is not difficult to learn and use, some of the features of the program are rather sophisticated for the average user. For this reason, many of the best applications for Enable/OA are found in business environments.
that need a hard-hitting integrated package with word processing at its center.

Enable/OA allows you to view as many as eight files from any one application, and they can be stacked behind one another for easy access. Enable/OA also has a mailmerge facility, multiple character sets, character transportation commands, and a built-in calculator. With the graphics application of Enable/OA, you can create pie graphs, line graphs, or two- or three-dimensional bar or stacked graphs. The telecommunications module allows you to transmit data and communicate with a host system as a mail service.

**Address:** The Software Group  
Northway Ten Executive Park  
Ballston Lake, NY 12019

**Price:** $495

**For Further Reference:**

*Using Enable/OA, Que Corporation.*
AppleWorks and AppleWorks GS

Because there are two different versions of AppleWorks—one for the Apple II and one for the Apple IIgs—both versions are included here.

AppleWorks for the Apple II is the supremely popular integrated package for the Apple II family. Because AppleWorks includes the basic applications—spreadsheet, word processing, and database—Apple II users rarely have to look anywhere else for business-type information processing programs. Figure 15.4 shows a screen from AppleWorks Version 3.0.

Fig. 15.4. A screen from AppleWorks Version 3.0.

When the Apple IIgs was introduced, a new version of AppleWorks was released. AppleWorks GS makes use of the Apple IIgs's superior sound and graphics capabilities and also adds a few modules. With AppleWorks GS, you have the following applications at your fingertips:

- Word processing
- Spreadsheet
- Data management
- Graphics
- Communications
- Desktop publishing
Each AppleWorks GS application is powerful enough to use independently and yet is part of an integrated whole that makes up a powerful software system. You can meet every business computing need with AppleWorks GS—whether you need to mailmerge letters to clients, publish a quarterly newsletter, create a profit and loss statement, or draw a snazzy logo. Figure 15.5 shows an example of an AppleWorks GS screen.

Fig. 15.5. An example of an AppleWorks GS screen.

Address: Claris Corporation
5201 Patrick Henry Drive
Santa Clara, CA 95052-8168

Price: $214.95

For Further Reference:

*Using AppleWorks GS*, Que Corporation.
*AppleWorks QuickStart*, Que Corporation.
Conclusion

This chapter has introduced you to some of the most popular integrated packages for the IBM, Apple, and Macintosh computers. In the next chapter, you find out about desktop publishing programs.
Not too long ago, putting publications together was pretty painful—if you were on the low end of the publishing spectrum, you assembled documents by typing text and cutting and pasting in graphics. If you were on the high end, you used a typesetter to print the quality text, an artist to produce the art, a layout person to assemble the document, and a printer to print the final pages. That's quite a bit of work for one publication—whether it's a 500-page book or a small advertising flier.

What Is Desktop Publishing?
Desktop publishing brings all those steps together—on your desktop. With the right hardware and software, you can create and print any document you could make the old way—in a fraction of the time and expense. Desktop publishing software is an electronic page layout program that you use to combine text and graphics on a page, creating the document design and layout you want.
What Are the Benefits of Desktop Publishing?

Although the introduction of desktop publishing came much later than the first of the three main software types (spreadsheet, word processor, and database), desktop publishing arrived in time to offer the business world a solution for the time-consuming and cumbersome task of publishing. Specifically, desktop publishing offers users these benefits:

- You have on-screen layout of text and graphics. Desktop publishing gives you the benefit of seeing what you're doing on the screen. (Many typesetting machines do not have this capability.) Additionally, being able to place text and graphics together on the screen helps you make decisions about the design you create and the way you place the text on the page. Most desktop publishing programs offer several different “views,” which you can use to see the page in different sizes. For example, if you want to get an “overall” effect, you may want to zoom out and view the whole page; if you want a close-up view, you can zoom in and see a portion of the page.

- You have the capability to assemble documents quickly and make changes easily. Desktop publishing offers you what conventional publishing cannot offer by allowing you the flexibility to make changes with little effort. With traditional publishing, several steps are involved in order to make a change in layout or design—sometimes a change requires the repasting of a page or several pages. With desktop publishing, you can put your documents together quickly, and if you don't like what you see, you can make a change and print the result. Then, if you still want to make changes, simply make them and print again.

- You can import text from word processors or type the text directly in the program. All desktop publishing programs enable you to import (that is, bring in) text you have created in word processing programs. The desktop publishing programs do differ on which word processing programs they support, however. For example, with PageMaker (one of the most popular desktop publishing programs), you can import files from a number of word
processing programs. With other, low-end desktop publishing programs, the choice of word processors is more limited.

- You can print on a variety of printers—from dot-matrix to PostScript laser printers. Most desktop publishing programs support many popular printers. In fact, most of the low-end desktop publishing programs support a wide range of dot-matrix printers and supply many fonts so that you can create snazzy publications, whether you are working with an expensive PostScript printer or a dot-matrix printer.

Who Uses Desktop Publishing Software?

Although publishing used to fall to a select few who were handy with type, scissors, and paste, today a wide variety of people are getting into the publishing game. Specifically, the following types of users are working with desktop publishing software:

- Owners of small businesses wanting to create letterhead and stationery for their companies
- Teachers needing handouts for training and classrooms
- Managers responsible for producing professional-looking reports
- Business people needing to publish corporate newsletters
- Writers, publishers, and editors creating camera-ready documents
- Advertising specialists responsible for composing graphics and text layouts
- Typesetting personnel responsible for the typesetting and layout of text
What Are the Differences among Desktop Publishing Programs?

Like other popular applications, desktop publishing programs range from simple to complex. The simple desktop publishing programs (referred to here as low-end programs) allow you to perform basic layout functions, including placement of text and graphics, limited column capabilities, and support for a variety of printers. Many low-end programs also include clip art (art you can use in your own documents). Figure 16.1 shows an example of one of the most popular low-end PC desktop publishing programs, PFS: First Publisher.

![Winter's Coming! Don't Get Left Out in the Cold](image)

**Fig. 16.1.** An example of a low-end desktop publishing program (First Publisher).

The more complicated desktop publishing programs (called high-end programs) include more sophisticated features such as table generation, indexing features, automatic page numbering, automatic text flow, and a wide range of other powerful features. Figure 16.2 shows a screen from Aldus PageMaker, one of the most popular high-end desktop publishing programs available.
Chapter 16: Desktop Publishing

An letters. JKesena1icn O'lerheads. reports. and other communications intended for distribution outside TechTile Industries can be produced at the temporary departmental workstations.

You need to produce elaborate professional-quality documents, such as full-length books, training manuals, or visual support materials, you need a more powerful, high-end program.

What Desktop Publishing Programs Are Available?

This chapter introduces you to some of the most popular desktop publishing programs. The desktop publishing arena is bursting with new products—so don't expect to find them all listed here. Basically, when you begin shopping for desktop publishing software, ask yourself these questions:
Box my needs warrant a really sophisticated program?

Do I need something simple that I will use occasionally?

Do I need automatic page numbering?

Is table generation or indexing important for my needs?

Do I have enough memory to run this program?

Do I need a mouse with this program?

PageMaker

Aldus PageMaker is the most popular desktop publishing program currently on the market. Also called a page-composition program, PageMaker allows you to combine text and graphics on the page to compose your documents. You can bring in text from a wide variety of popular word processing programs, and a number of popular graphics formats are accepted.

PageMaker is available for both the Macintosh and the PC. Version 4.0 has recently been released for the Macintosh; Version 3.0 is still the current release for the PC (Version 4.0 is on its way).

Although PageMaker is a high-end desktop publishing program, many people find the program easy to learn and use. Used with Microsoft Windows, PageMaker has familiar menus, pop-up dialog boxes, and a Mac-like screen display that is easy to understand and use (see fig. 16.3).

PageMaker enables you to format the page in a number of columns and formats; use many different fonts; import sophisticated graphics; create on-screen graphic items like boxes, rectangles, and ovals; create master pages; and perform a variety of other high-end functions.

Who uses PageMaker? Basically anyone needing a high-end publishing program. Few people purchase PageMaker for creating business cards—only those interested in power publishing want to spend that much on desktop publishing. Among a variety of other users, professional designers, publishers, and corporate sales departments all use PageMaker to make their projects look their best.
Ventura Publisher

Ventura Publisher is another high-end desktop publishing program, this one available only for the PC. Ventura takes another approach to desktop publishing. Rather than just entering text, as you do in PageMaker, you assemble documents in Ventura by using frames and tags to build your publication.

Ventura offers a number of sophisticated features that enable you to produce long and complex documents easily. Ideal for text books, technical manuals, and large projects involving a number of
operations like indexing and special formatting, Ventura really shines for difficult or involved publications. Figure 16.4 shows an example of Ventura Publisher.

Ventura is well-loved by a vast number of users. Especially in the technical publishing field, users like the framework approach to building documents. Once you learn the basic concept, the menus are easy to maneuver, and options are easy to find. Initially, some users find the tag and frame approach somewhat cryptic, but for complex documents, the power of Ventura more than outweighs its initial intimidation.

**Address:** Ventura Software, Inc.
16160 Caputo Dr.
Morgan Hill, CA 95037

**Price:** $695
PFS: First Publisher

PFS: First Publisher is a program designed to help you produce newsletters, brochures, booklets, and other documents by using desktop publishing. This low-end program comes with all the tools you need to write, design, illustrate, and print documents. First Publisher also comes equipped with a library of clip art that you can use in your own documents and support for more than one hundred popular dot-matrix printers. Figure 16.5 shows an example of First Publisher.

A new version of First Publisher, Version 3.0, was released early in the spring of 1990. Version 3.0 adds a special layout gallery feature that allows you to select the number and placement of columns from a library of over 20 different layout schemes. Another important new feature is the addition of special fonts that enhance the look of your printouts.
A wide audience exists for PFS: First Publisher. From business owners to PTA chairmen to CEOs, anyone who wants to publish something quickly and easily can put First Publisher to good use. The only people excluded from this list are those who need a higher level publishing product to do the things they need.

**Address:** Software Publishing Corporation  
1901 Landings Drive  
Mountain View, CA 94039-7210

**Price:** $129

**For Further Reference:**


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**Express Publisher**

Express Publisher is low-end desktop publishing program that enables you easily to produce professional-looking documents that combine text and graphics. Express Publisher can produce documents at 300 dpi resolution (or the highest resolution of your dot-matrix printer). Express Publisher doesn't have some of the advanced features needed for complex documents, however.

Express Publisher includes scaleable fonts (which give you a wider variety of available fonts). The program also contains advanced page layout tools and over 100 pieces of clip art.

Used mainly by business people who need to produce professional-looking brochures, newsletters, and stationery, Express Publisher has a variety of text-handling capabilities and page layout features within the program. You can place text into frames that are connected to create a page layout. This program enables you to create the exact font size you need for each application, draw boxes, and import several different types of graphics. Express Publisher automatically flows text and has tracking and auto hyphenation to ensure uniform line length. Within this program are a number of powerful drawing and text-handling tools that allow novices to create documents from scratch.

**Address:** Power Up Software Corp.  
2929 Campus Drive  
San Mateo, CA 94403

**Price:** $99
Appleworks GS Desktop Publisher

AppleWorks GS is a combination of six modules: word processing, spreadsheet, database, graphics, communications, and desktop publishing (also called page layout). The desktop publishing aspect of the program allows you to create simple or complex publications by combining text and graphics. You create the text in the AppleWorks GS word processor, or you can type the text directly into the page layout module. You can pull the graphics you create from the AppleWorks GS graphics module, or you can create your own graphics within the page layout using the art tools, displayed along the left edge of the screen. Figure 16.6 shows the screen of the AppleWorks GS page layout application.

Fig. 16.6. An AppleWorks GS page layout screen.

Within page layout, you can perform a variety of functions on text and graphics. You can create, edit, resize, move, arrange, rotate, and flip text and graphics. You can also change font size, insert and delete pages, move to different pages, set up master pages, add page numbers, add dates, specify page settings, check spelling, and choose different shading and line thicknesses for your publication.
Publish It!

Publish It! is a low-end desktop publishing program that is available for the PC, Apple, and Macintosh computers. With Publish It!, you can design, layout, and print professional-looking documents with a minimum of time and trouble.

The whole concept of Publish It! is organized around the "get 'em going quickly" aspect. Publish It! imports documents from a variety of popular word processors and supports graphics in several different formats. Among its other features, Publish It! offers

- Flexible page sizes and layout features
- A wide variety of built-in typefaces
- Bitstream fonts
- A built-in word processor
- Special typesetting functions, such as kerning and leading features
- The capability to create master pages

Publish It! is used by a wide variety of users—from home users producing garage sale signs to business users wanting to publish professional-looking documents. Special time-saving features—such as page guides, quick keys, automatic page numbering, and style sheets—allow you to automate your page layout process.

Address: Timeworks, Inc.
444 Lake Cook Road
Deerfield, IL 60015-4919

Price: $99
Conclusion

In this chapter, you have wandered around the desktop publishing market a little bit. From a basic introduction of page layout to a specialized program-by-program account of individual popular desktop publishing products, this chapter has explored many popular page layout packages. In the next chapter, you learn about programs that you may use with your desktop publishing programs—software packages that allow you to put your creative energies on the screen in the form of graphics.
If you believe that a picture is worth a thousand words, graphics software is right up your alley. Graphics software gives you the capability—electronically—to create simple or complex artwork on your computer, whether or not you have any artistic talent.

Depending on the type of artwork you need, you will find a wide variety of graphics programs on the market. Low-end programs are generally easy-to-use paint programs; high-end programs use a special technology to create perfectly curved lines and high-quality printouts. This chapter introduces you to some of these programs and to CAD (computer-aided design) programs, which are in reality a step above traditional graphics programs but are covered here for completeness' sake.

What Is Graphics Software?

What is graphics software? Put simply, graphics software is a program that allows you to create art on-screen. Beyond that definition, everything is bells and whistles. Depending on the type of capabilities you need, you can find everything from very simple to extremely complex.

Generally, graphics software can be divided into the following categories:
Paint programs
Draw programs
CAD programs

The *paint programs* fall at the low end of the graphics spectrum, although they are capable of providing a good range of artwork. With a paint program, you use a variety of tools, colors, and patterns, to "paint" the screen. This type of graphic is easy to edit—you just magnify the size of the graphic and change the color of a few dots—but the printed output may look choppy, and sometimes you can see the individual dots that make up the art. Figure 17.1 shows an example of a paint program.

Fig. 17.1. An example of a paint program.

High-end graphics programs, also called *draw* programs, generally incorporate some CAD features (defined in the following paragraph) and provide high-quality images that can be exported in a variety of formats. These sophisticated graphics programs usually offer an incredible range of features and are somewhat complicated to learn. Figure 17.2 shows an example of a high-end graphics program.
The final type of graphics program covered in this chapter is often considered a category all its own. The CAD (computer-aided design) program has become increasingly popular in the last several years. CAD programs build on the capabilities of draw programs and have features that make it easier to design anything—from the inside and outside of a house to complicated machine parts. Computer-aided design is popular not only in architecture but also in many engineering and design and graphics arts areas. CAD brings another dimension to graphics applications—literally. By adding the capability of showing an image in 3-D, rotating it, and modifying it in a number of ways, CAD programs give the user the ultimate flexibility in making images come to life. Figure 17.3 shows an example of a popular CAD program.
What Are the Benefits of Graphics Software?

Whether you work with art only when you cannot avoid it or you spend hours at the computer painting on the screen, graphics programs have several major benefits:

- You can use the art you create over and over again without losing any of the quality.
- With on-screen graphics, you don't have to go back to the drawing board every time. You can make small modifications to the original art until you get the design just the way you want it.
- Most paint programs allow you to try a variety of shading and filling techniques.
- Use of the art tools in a graphics program gives you more control over the precision of your creations.
- Drawing programs can output graphics in PostScript printer format, providing you with higher quality output than is available with normal laser printers.
- With many graphics programs, you can import art directly into popular desktop publishing programs.
Who Uses Graphics Software?

Graphics software is being used by a growing number of business and home users. Specifically, the following users are now beginning to work with graphics programs:

- Graphics artists needing sophisticated artwork
- Desktop publishers wanting paint or draw graphics for their publications
- Home users creating invitations and miscellaneous art
- Owners of small businesses who need a logo and a special letterhead
- Business persons needing graphics to illustrate technical information

The next sections introduce you to some specific graphics packages. The programs are divided according to the type of program: low-level paint programs, high-level draw programs, or CAD programs.

What Paint Programs Are Available?

Graphics programs are among the most important programs to learn and the most enjoyable. Graphics added to almost any report can enhance the point you are trying to make. And you will find that you want to use the programs just for fun.

PC Paintbrush

PC Paintbrush is a graphics program used to create on-screen colorful pictures and images, which can be used in desktop publishing, word processing, and other software applications.

PC Paintbrush is used mainly in business by people who need professional graphics and illustrations for documents, brochures,
and newsletters. With this program, you have access to a wide array of drawing tools to help you generate your own sophisticated graphics. A comprehensive tutorial and manual help new users begin to use the program quickly. Additionally, PC Paintbrush IV enables users to scan and work with images directly from within the program.

PC Paintbrush has a wide selection of tools to assist you in the creation of detailed images and graphics. Once you create or import the graphic, you can zoom in or out, displaying a number of different views; use a variety of cursor shapes and thicknesses; and add labels, titles, and banners to your customized drawings.

Additional editing and customizing commands make PC Paintbrush IV one of the most popular PC paint programs currently available. Because of the program's capability of using expanded memory, you can scan and work with large images easily for your more sophisticated graphics.

**Address:** ZSoft Corp.

1950 Spectrum Circle, Suite A495

Marietta, GA 30067

**Price:** $275

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**Logitech Paintshow**

Logitech Paintshow is an interactive graphics program you can use to create and edit high-resolution pictures. Used by people who need graphics for desktop publishing or other business or personal applications, Paintshow is especially useful for businesses that need customized graphics for brochures, newsletters, or other documents. Figure 17.4 shows an example of Logitech Paintshow.

Paintshow lets you automatically display a series of pictures on a screen in a slide-show type of presentation. Because you can save files in a variety of popular graphics formats, importing files into desktop publishing applications is easy. With over 20 tools, Paintshow gives you full capabilities for creating on-screen images. Additionally, a full set of menu options allow you to perform all the basic editing procedures on your graphics. This program also includes a utility with which you can present a slide show or enhance your graphics. Paintshow has speed keys and shortcut
features that help you be as efficient as possible when you are working with the program.

Address: Logitech Inc.
6505 Kaiser Drive
Fremont, CA 94555

Price: $79

Cheap Paint

Cheap Paint is a high-resolution paint program available for the Apple IIgs. The pencil/paintbrush tool is available in six shapes, and you can draw freehand in any color available in the color palette. Additionally, you can use the airbrush to smooth out or shade items, and the usual art tools for drawing lines, circles, squares, curves, and polygons are all available.

Address: P.D.E.
2078C Walsh Avenue, Dept. 160
Santa Clara, CA 95050

Price: $9
MacPaint

MacPaint was the first paint program available with the Macintosh. Today, the newest version of MacPaint—Version 2.0—is extremely popular. MacPaint offers you all the basic paint tools in the familiar Macintosh interface. Figure 17.5 shows an example of MacPaint.

Fig. 17.5. An example of MacPaint.

MacPaint is used by a wide variety of people who need to create artwork on their Macintoshes. For many high-level applications, MacPaint doesn't pack enough punch; but for simple or "fun" graphics, users like the features available with this program.

Address: Claris Corporation
5201 Patrick Henry Drive
Santa Clara, CA 95052

Price $125
What High-Level Draw Programs Are Available?

This section introduces you to several high-level draw programs available for the PC, Apple, and Macintosh computers. With these programs, you can produce more sophisticated results than you can with the programs previously discussed.

MacDraw II

MacDraw II is a Macintosh drawing program that enables users to create sophisticated graphics which demand a high degree of accuracy. Used by many designers, engineers, and architects, MacDraw II is a new version of the old MacDraw, which was originally available on all Macintoshes.

MacDraw II allows users to save graphics files in other popular formats (including PICT2 file format, for saving files in color). The program includes templates for frequently used designs, help features, graphic enlargement and reduction features, and a feature that allows you to create your own patterns for filled objects. Figure 17.6 shows an example of MacDraw II.

![Fig. 17.6. An example of MacDraw II.](image)
Micrografx Designer

Micrografx Designer is a high-level drawing program for PCs. Made specifically for PC users who need a sophisticated, full-color graphic-art illustration package, Designer offers many features not found in other PC products.

Among its many features, Designer includes the following:

- A palette of up to 16 million colors
- A full selection of graphics tools, including tools for drawing ellipses, curves, lines, polylines, parabolas, and more
- Capability to reshape, smooth, and connect objects easily
- Capability to rotate objects up to one-tenth of a degree
- Capability to create up to 64 different layers
- A utility that makes Designer files compatible with AutoCAD

Figure 17.7 shows an example of Micrografx Designer.

Designer includes many clip art files you can use in your own publications. Additionally, Micrografx offers several other clip art packages and drawing and graphing programs.

Address: Micrografx
1303 Arapaho
Richardson, TX 75081

Price: $695
Adobe Illustrator 88

Adobe Illustrator is an extremely popular high-level graphics program, which originally was available only for the Macintosh but is now available also for the PC. With Adobe, you can start with a simple line-art or paint-type piece of artwork and turn it into something spectacular. Perhaps the single biggest reason users purchase Adobe is the quality of the printed output; Adobe—like Micrografx Designer and Aldus Freehand—can output files in PostScript format, giving users the highest quality possible for their printed graphics images.

Specifically, Adobe Illustrator includes these features:

- Autotracing (the program's capability to "trace around" the outside of edges, smoothing rough curves as necessary and turning the paint image into a draw image)
- Color separations
- The capability to customize patterns
Tools for blending shapes, colors, and patterns
Precise freehand drawing tools
Previewing capabilities

Figure 17.8 shows an example of Adobe Illustrator.

Fig. 17.8. An example of Adobe Illustrator.

Like other high-end graphics programs, Adobe can output files in a variety of formats supported by other programs.

Address: Adobe Systems
1585 Charleston Road
Mountain View, CA 94039

Price: $495

Corel Draw

Corel Draw is touted by many as the best high-level graphics program available for the PC. With many of the same features as Micrografx Designer or Adobe Illustrator, Corel Draw goes one step further by including the capability of breaking letters into
their natural curved elements so that they can be manipulated like any other graphic element. This feature means that you can take the letter B, for example, and stretch it and squash it to your heart's content, until you get just the right effect. Then you can print the art without any loss in quality.

Graphics artists, designers, engineers, and illustrators all work with Corel Draw. Specifically, here are some of the product’s attractive features:

- 102 built-in typefaces
- Easy import and export routines for working with files from other programs
- Autotrace feature
- A wide variety of tools for creating sophisticated freehand graphics
- A large selection of clip art
- The capability to work with and convert familiar third-party fonts (such as those from Bitstream of Adobe).

**Address:** Corel Systems
1600 Carling Avenue
Ottawa, Ontario KIZ 8R7
Canada

**Price:** $395

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**What CAD Programs Are Available?**

CAD (computer-aided design) programs replace the drafting table and drafting tools used in engineering and architectural fields. Because of the high degree of accuracy needed in designing, computerizing the design of manufactured items reduces the time and effort spent laboring over plans and schematics.

Although CAD and CAM (computer-aided manufacturing) programs are true applications software like spreadsheets or paint programs, CAD is often used as a highly sophisticated drawing tool. Many
CAD programs go beyond basic high-level graphics programs and include statistical analysis capabilities and a variety of other scientific features.

**AutoCAD**

AutoCAD is the best-selling CAD program currently available for PCs and Macs (II, IIX, and IICx). Since its introduction in 1982, AutoCAD has gone through 10 revisions, making each version of the program substantially more powerful than the preceding versions. Specifically, AutoCAD offers the following features:

- An easy-to-use interface with pull-down menus and dialog boxes
- Support for a mouse or digitizer
- Capability to layer, rotate, copy, mirror, move, stretch, and scale
- 3-D wire frame modeling
- Up to 16 different views

Figure 17.9 shows an example of an AutoCAD screen.

![AutoCAD Screen](image)

**Fig. 17.9. An example of an AutoCAD screen.**

**Address:** Autodesk, Inc.
2320 Marinship Way
Sausalito, CA 94965

**Price:** $3,000
For Further Reference:

*Using AutoCAD*, Que Corporation.
*AutoCAD Advanced Techniques*, Que Corporation.
*AutoCAD Quick Reference*, Que Corporation.
*CAD and Desktop Publishing Guide*, Que Corporation.

**Generic CADD**

Generic CADD is another popular CAD program originally designed for PCs. (Generic’s version for the Mac is called Real CADD Level 1). AutoCAD is used for high-end sophisticated engineering and architectural work; Generic CADD covers a broader base, giving users comparable power in an easier-to-use format than AutoCAD’s format. Specifically, Generic CADD offers these features:

- Built-in symbol libraries
- Capability to display objects in different views
- Rotation capabilities
- Capability to print on different printers or plotters
- Capability of working with a mouse or digitizing tablet
- Capability to add dimensions

Figure 17.10 shows a sample screen from Generic CADD.

![Generic CADD Screen](image)

**Fig. 17.10.** An example of Generic CADD.
MiniCAD Plus

MiniCad Plus is one of most popular CAD programs for the Macintosh. With a full array of tools in a variety of shapes and capabilities, MiniCad Plus gives users sophisticated CAD features in the easy-to-use Macintosh format.

MiniCad Plus enables users to do the following:

- Display objects in a variety of different views
- Show items on-screen in different colors
- Set measurement preferences
- Fill objects with colors or patterns

Address: Graphsoft
8370 Court Avenue
Suite 202
Ellicott City, MD 21043

Price: $495

CADApple 3.5

This program is a CAD program produced for the Apple IIgs, Apple IIc, and Apple IIe. CADApple 3.5 contains sophisticated drafting tools you can use for either educational or professional use.

Address: Versacad Corp.
2124 Main Street
Huntington Beach, CA 92648

Price: $395
Conclusion

In this chapter, you have learned about the variety of graphics programs available. From an introduction to paint programs, drawing programs, and CAD programs, you have explored some of the currently popular graphics software packages. In the next chapter, you take a look at communications software.
Up to this point in Part IV, you have learned about various types of applications software, that is, programs used to perform specific tasks. Although communications software could be placed in the applications category, in reality, communications doesn’t automate tasks like writing letters (as word processing does), balancing your checkbook (as a spreadsheet does), or organizing the names and addresses of your clients (as a database does). Nonetheless, communications can play a significant role in making your life easier by providing you with added flexibility in managing, creating, and transmitting your files.

What Is Communications?

Most new users are a little wary of communications. (Sometimes you see this term referred to as telecommunications.) Communications seems a little more intimidating to the beginning user, and unless you have a specific reason to learn about communications, you may put off exploring that realm until you are placed in a situation that requires it.

At its most basic level, communications is nothing more than communicating—as you communicate normally—on the telephone. The only real difference is that the communication takes place between two computers rather than between two people.
To make communication between computers possible, you need two elements: something to turn the data into a form that can be sent through the phone lines and something to allow users to send and receive that data as necessary. The first "something" is a modem—short for **modulator demodulator**. The modem is a device that may sit outside your computer or be installed inside the system unit (depending on whether you have an external or internal modem). A modem receives the data from your computer and turns the data into electronic pulses, which are then sent through the phone lines. The receiving modem on the other end of the transmission receives the data and **demodulates** it, turning it from electronic pulses back into a form that can be used by the computer. (To find out more about modems, see Chapter 3.)

Along with the modem, you need communications software (the second "something"). Communications software is responsible for actually activating the modem and sending the files. You must use communications software on the receiving end, as well.

Before you get started, you need to know a few terms. As you read about communications software, you may run across dozens of terms that are unfamiliar to you. Here are the most common terms and their definitions:

**Baud.** Used in communications to describe the amount of information transmitted per second. For example, a 2400-baud modem is capable of sending 2,400 bits per second. (As you may recall, a bit is one of the 8 pulses in a byte of information. A byte is roughly equivalent to 1 character.)

**Bulletin board.** Similar to a traditional bulletin board, an electronic bulletin board is used for leaving and receiving messages and files.

**Downloading.** The process of transferring a file from another computer to your computer.

**Host.** The computer that controls the communication; for example, when one user calls a bulletin board and downloads a file, the computer with the bulletin board is known as the host.

**Uploading.** The process of transferring a file from your computer to another computer.
What Can You Do with a Communications Package?

When the field of communications was relatively new, most communications packages allowed you simply to send and receive files. Today, a full range of capabilities are available in communications software, and that range can make selecting one package difficult. Later in this chapter, you learn about several communications packages that seem to rise above the others, but many available programs enable you to send and receive files.

With any communications program, you can do the following things:

- Choose the settings (baud rate, stop bits, parity, and so on) that you need for your modem
- Connect to another computer (using the same software) or a bulletin board service
- Send files
- Receive files
- Disconnect from the other computer or bulletin board service

Additionally, the more popular communications packages allow you to perform many more tasks. Some of the “bells and whistles” include the following:

- Context-sensitive help screens to assist you when you get stuck
- A full variety of file-transfer protocols (the hardware and software standards used to send files so that the sending and receiving systems use the same setup)
- Macros that carry out complex operations with a simple keystroke
- Automatic log-on procedures (connecting to another system)
- Data compression utilities that compress the data you send and send it more quickly and with fewer errors
Automatic retransmission features that re-send any block of data that may have errors

The capability to send files in the "background" while you work on other applications on your computer

Who Uses Communications Software?
As you might expect, communications software is used more widely in business than anywhere else. With the increase in the number of home offices, however, the line between business and home use is becoming less clearly defined. Here are a few examples of the people who use modems and communications software and the tasks they accomplish:

- Sales managers who need to access and download sales information from outside sales points
- Store managers needing to send important information to the home office
- Writers wanting to research topics by using an information service
- Users wanting to make airline reservations
- People in offices needing to transmit files to a central location
- Hobbyists wanting to communicate with other users of their favorite computer or software

What Communications Packages Are Available?
This section explores popular communications packages. As mentioned previously, you can find many low-cost communications programs that offer a variety of features (some you can even find
on public bulletin board systems), but this section lists several of
the most popular communications programs currently available.

Bear in mind, however, that many integrated packages, such as
PFS: First Choice and AppleWorks GS, offer communications
as part of the entire software package. For First Choice and
AppleWorks GS users, then, sending a file is as simple as using
another aspect of the program they already understand.

For everyone else, however, finding and working with
communications software involves a little more work. The
following sections give you an overview of what's available.

**PROCOMM PLUS**

The definitive communications software for PCs, PROCOMM PLUS
is an easy-to-use communications program that packs plenty of
punch. DATASTORM TECHNOLOGIES, the makers of PROCOMM
PLUS, has adopted a new approach to the marketing of its product:
the "test drive." You can take a test drive of the program before
you actually buy it, in order to make sure that it is everything you
hoped. The test drive version is, in reality, a basic working version
of the program, minus some of the additional features that make
PROCOMM PLUS even more intuitive.

With the purchased version of the program, PROCOMM PLUS
includes the following among its primary features:

- Autodial features
- Comprehensive help screens
- An instructional manual including a tutorial
- Keyboard remapping program (Keyboard remapping is
  redefining what the keys do. By remapping the keyboard,
you can set up your system to work better while you are
  communicating with other systems.)
- A built-in text editor
- Samples of script files you can use to log on to frequently
called services (A script file consists of a series of
  commands stored as one command. Script files are used to
  perform repeated functions, such as logging on.)
Free membership to several on-line information services

90 days of telephone technical support

Figure 18.1 shows the command screen from PROCOMM PLUS. As you can see, the program is not lacking in flexibility or power; and yet the features of the program are organized so that even communications novices can find their way around.

Additionally, PROCOMM PLUS includes a powerful language that allows you to build add-on utilities for your communications sessions. (For example, you can build a utility for logging on to another system or for downloading files.) This language, called the ASPECT script language, is available with the purchased version of PROCOMM PLUS, along with several examples of scripts written to automate tasks.

Address: DATASTORM TECHNOLOGIES, INC.
1621 Towne Drive, Suite G
Columbia, MO 65202

Price: $75

For Further Reference:

Using PROCOMM PLUS, Que Corporation.
CrossTalk

Crosstalk Communications has been a contender in the “best communications software for PCs” race since the early days of personal computing. Now, in addition to the original CrossTalk, the company has developed a version of CrossTalk specifically for use with Microsoft Windows. (As you may know, Microsoft Windows is a windowing environment that enables you to use several different applications programs at once.)

CrossTalk for Windows offers the following features:

- The capability to send and receive files in the background while working on another Windows application
- The flexibility of cutting and pasting information from a communications session and using the data in another program running under Windows
- A powerful programming language that allows you to create your own dialog boxes and perform automated tasks (A dialog box is a window the program creates to request or display information.)
- Support for all popular transmission protocols
- A phone book feature, which allows you to store and easily call frequently used numbers

Additionally, CrossTalk for Windows supports all modems currently available and provides 48 programmable function keys for macros or other customized features. You can use the customized pull-down menus or on-screen icon buttons (with the mouse) to select menu items during the work session.

Address: CrossTalk Communications
1000 Holcomb Woods Parkway
Roswell, GA 30076-2575

Price: $117
PFS: First Choice
(Communications)

The communications module of PFS: First Choice makes it easy for First Choice users to contact the outside world and receive data in a familiar form. Because the communications module has the basic "look and feel" of the other applications, communications for First Choice users is nothing more than selecting a few different options from the menu bar. Figure 18.2 shows the option for beginning a First Choice communications session.

Fig. 18.2. The option for starting a First Choice communications session.

Although you do not find a wealth of powerful features in First Choice's communications module, as you do in PROCOMM PLUS or CrossTalk, if you need only to send and receive an occasional file or perform simple communications procedures, First Choice may be all you ever need. Specifically, First Choice communications offers the following features:

- Easy-to-use options in a familiar interface
- Capability to add frequently called numbers to the Service menu
- Macros to dial numbers automatically
Chapter 18: Communications

- Capability to cut and paste information from a communications session into other First Choice applications
- Speed keys for moving around the communications screen and for working with text received

First Choice enables you to connect to any remote computer, whether it is a mainframe in the home office, another PC on the other side of the office, or an on-line information service like CompuServe or The Source. Figure 18.3 shows the First Choice screen when a communications session is started with an information service. The same menus remain on the screen no matter which application you are using.

![Communications Screen in First Choice](image)

**Fig. 18.3.** The communications screen in First Choice.

Of course, the best part of any integrated package is the integration—once you get the information into First Choice, you can use it in the word processing, spreadsheet, database, or even the graphics application.

**Address:** Software Publishing Corporation
1901 Landings Drive
Mountain View, CA 94039-7210

**Price:** $149

**For Further Reference:**

*Using PFS: First Choice*, Que Corporation.
AppleWorks GS
(Communications)

Like the First Choice communications application, the communications application of AppleWorks GS allows users to use their computers to send and receive information while staying within the familiar realm of AppleWorks GS. The communications application has several powerful features, including:

- Support for a wide variety of modems and protocols
- Capability to send and receive individual or batches of files
- Capability to modify the display of the communications window
- A phone book feature that stores and displays numbers
- Speed keys for various communications operations

Figure 18.4 shows a sample screen from the AppleWorks GS communications application. Additionally, with AppleWorks GS, you can use the received data in any of the other AppleWorks GS modules.

Fig. 18.4. The communications screen in AppleWorks GS.
Address: Claris Corporation  
440 Clyde Avenue  
Mountain View, CA 94043  

Price: $215  

For Further Reference:  

*Using AppleWorks GS*, Que Corporation.

**MicroPhone II**

MicroPhone II is a powerful but easy-to-use communications program for the Macintosh. Specifically, MicroPhone II offers these features:

- Easy-to-use icon system for logging on to services
- A series of prewritten setup files (or scripts) that allow you to log on to services easily
- MultiFinder support (MultiFinder allows the Mac to have two programs running at the same time.)
- Capability to work in the background, allowing you to work on other applications while you send or receive files
- A sophisticated scripting language that allows you to automate your operations by writing procedures that streamline your communications sessions

Figure 18.5 shows the opening screen of MicroPhone II.

Address: Software Ventures  
2907 Claremont Avenue  
Suite 220  
Berkeley, CA 94705  

Price: $215
White Knight

White Knight (formerly Red Ryder) is another communications program for the Macintosh. In fact, White Knight was the first communications program to be developed for the Mac. In its current version, White Knight offers the following features:

- A variety of customizable features
- Easy-to-use menu and icon system
- Full communications features, including script support and automatic log-on procedures
- Macro capability that you can add in the form of buttons on-screen

**Address:** FreeSoft
150 Hickory Drive
Beaver Falls, PA 15010

**Price:** $139
SmartCom II

SmartCom II was created by Hayes, one of the leading modem manufacturers. Versions of SmartCom II are available for the PC, the Macintosh, and the Apple II. Specifically, these features are included with SmartCom II:

- An easy-to-use menu system
- A displayable, scrollable buffer that allows you to read through previous sections of information you have received
- Full color capabilities
- Autopilots, which are similar to scripts or macros and allow you to streamline your communications operations
- Start-up procedures that allow you to log on to major information services

Address: Hayes Microcomputer, Inc.
5923 Peach Tree Industrial Park Boulevard
Norcross, GA 30092

Price: $129

What Information Services Are Available?

Communications have many uses—whether you need to transfer a file to the boss on the mainland or you need to download a program from the mainframe in the next room. Another popular use besides the sending and receiving of files from another computer is contacting information services. An information service consists of a large mainframe computer that stores information, which may be related to an incredible range of topics or may be centered around a specific application. Most information services are available to all types of computers. This section introduces you to several of the major information services and tells you a little about each service.
CompuServe

CompuServe is the information service everyone seems to know about. If you want to investigate the weather in Tahiti (does it ever change?), find out about cruises to Alaska, or check stock prices in Equador, CompuServe has the information for you. Whether you want to log on and simply read through information or want to participate in an on-line forum of users, CompuServe can open up world of information you hadn't previously explored.

When you first subscribe to CompuServe, you get a few hours of free time, which help you find your way around the program and get used to the commands and menu systems. You can find information in the following categories:

- Arts and entertainment
- News
- Weather
- Sports
- Travel
- Electronic mail service
- Financial information
- Numerous bibliographic databases
- Industry news and reviews
- Games
- Productivity forums related to particular computer types or applications
- Job markets

This list gives just a few of the many services available on CompuServe. The service can provide fun and needed information.

Address: CompuServe
          P.O. Box 20212
          Columbus, OH 43220

Price: $39.95 for start-up kit
DIALOG

The DIALOG information service is available to both PC and Macintosh users and includes the following features:

- Access to over 300 databases
- Business information
- Chemistry article overviews
- Information on humanities
- Social science studies
- Electronic mail network
- DIALNETZ, custom telephone service
- The new ImageCatcher feature (for Mac users), which enables you to perform a variety of operations on images and text

Address: DIALOG Information Service, Inc.
3460 Hillview Avenue
Palo Alto, CA 94304

Price: $99–$185 for start-up package

GENie

GENie, from General Electric, offers on-line time at a reduced rate, cheaper than other companies offer. GENie offers information on the following topics:

- Business
- News
- Home shopping
- Travel
- Macintosh forums
- PC forums
- Bulletin board of games and miscellaneous utilities
- Computer industry news
Address: GEnie
Dept. 02B
401 N. Washington Street A
Rockville, MD 20850

Price: $29.95 registration fee

Dow Jones

Dow Jones News/Retrieval is the only information service devoted exclusively to business-related information. Whether you need stock quotes, current articles from the *Wall Street Journal*, or a piece of financial analysis software, you may find it on Dow Jones. You will find the following:

- Business information
- Financial information
- Market prices
- Up-to-the-minute news
- Complete edition of the *Wall Street Journal*
- *Barron's* articles
- *Business Week* articles
- *Forbes* articles
- *Money* articles

Address: Dow Jones
P.O. Box 300
Princeton, NJ 08540

Price: $24 and up

BIX

BIX is a relatively new information service that is a spin-off from *BYTE* magazine. BIX strays from the norm set by other information providers by charging users a flat fee—letting them access the service for an unlimited length of time for a single amount (as
opposed to the hourly amounts charged by other companies). Specifically, BIX offers these forums:

- Amiga exchange (for Amiga users)
- IBM exchange
- Mac exchange
- Writers exchange
- Games exchange
- Up-to-the-minute computer industry news
- Support from major hardware and software manufacturers

Address: BIX
One Phoenix Mill Lane
Peterborough, NH 03458

Price: $59 flat rate for three months

Conclusion

In this chapter, you have learned about the various types of communications software available. The next chapter concludes this trek through applications software with a closer look at educational and recreational software.
In some respects, I have saved the best for last—educational and recreational software. Computers don’t have to be the no-nonsense workhorses some applications make them out to be; computers can also be the Indianapolis 500, Dodger Stadium, the home of the U.S. Open, the scene of a murder mystery, or the airway over Madagascar. Computers don’t have just to perform operations for you; computers can also teach you about a world of things you have previously left unexplored—things like world geography, French, typing, or advanced chemistry.

This chapter gives you a brief look at a few of the educational and recreational programs available in the PC, Apple, and Macintosh markets.

Who Uses Educational and Recreational Software?

Whether the objective is to learn something new or just to get away from tedium for a while, the following people are reaching for educational and recreational programs:
Users wanting to learn something new, from typing to tax laws to Tennyson

Kids (or adults) brushing up on math and English skills

Employees reviewing skills related to their jobs

Adults, students, and children wanting to hone their skills with interactive game software

Adults and children wanting to play arcade-type games

What Educational Software Is Available?

This section introduces you to several popular educational programs. So many different types of educational software are available, even to list all the available types here is impossible.

World Atlas

The World Atlas program is an amazing combination of maps, graphics, and a staggering amount of information related to populations, geography, governments, economies, and cultural information. World Atlas includes world, continent, and individual country maps. Each map displays main cities and populations and shows important geographical features.

World Atlas is mouse-driven. (Although you can use the keyboard, the program is extremely slow without a mouse.) Because of the incredible amount of information the program needs at its disposal, World Atlas eats up eight megabytes of disk storage, so the program is unusable without a hard disk. The program runs with only 512K of RAM, however.

Additionally, you can print a wide variety of charts with World Atlas. You can use data, maps, and graphics to product reports that can be imported into desktop publishing or word processing applications.
Idea Generator Plus

Idea Generator Plus is a remarkable "educational" program designed to streamline your decision-making and problem-solving abilities. Some of the largest corporations in the country—including IBM, AT&T, and Citibank—have used this program to help spark fresh, new thinking within their corporations.

Learn to develop business plans, organize anything in writing, and tap into your creative potential with plans for products, proposals, or presentations.

Idea Generator Plus has you look at your way of making decisions and following through on ideas by exploring seven different perspectives:

- Working in similar situations
- Dealing with metaphors for your situation
- Viewing from other perspectives
- Focusing on individual goals
- Reversing your goals
- Focusing on your people
- Making the most of your ideas

Idea Generator Plus is available on both 5.25- and 3.5-inch disks. This program is available for the IBM PC, XT, AT, PS/2, and all compatibles.

Address: Power Up Software
Channelmark Corporation
P.O. Box 7600
San Mateo, CA 94403

Price: $199
The Human Brain

Long a leader in educational software, the Apple shines with this tutorial "quiz show" about the human brain. Used as a teacher's aide or as a self-test, this program educates students about the various parts of the human brain. With excellent high-resolution graphics, this program helps students identify various parts of the brain and their respective functions.

Address: PDE Software
2074C Walsh Avenue, Dept. 694
Santa Clara, CA 95050

Price: $9.95

Spelling Bee

This interactive tutorial spelling sharpener teaches children to recognize and spell words easily. Based on the "flash card" method of displaying words for a set period of time and then asking students to type what they saw, the Spelling Bee allows teachers to use preset lists or customize the lists as needed. Additionally, words can be repeated or displayed in different sequences.

Address: PDE Software
2074C Walsh Avenue, Dept. 694
Santa Clara, CA 95050

Price: $9.95

Children's Writing and Publishing Center

Turn your kids into publishers! With the Children's Writing and Publishing Center, children can learn the basics of desktop publishing designed specifically for younger age groups. With an easy-to-use, friendly interface, children can pick up writing and publishing techniques easily.
Music Studio

With Music Studio, students can compose music using a variety of instruments, tempos, and keys. Do you have a Beethoven in your family? The most popular music program currently available, Music Studio is used by budding musicians everywhere.

Address: PDE Software
2074C Walsh Avenue, Dept. 694
Santa Clara, CA 95050

Price: $39

Fantavision

Fantavision is an incredible on-screen animation program for your Apple IIs. Did you ever want to be in pictures? Fantavision makes you an animator by allowing you to make any object and then animate it by creating a series of frames linked to the initial frame. With an "in-between" feature, which allows you to show where you want your character to start and end, Fantavision can automatically create all the steps between the start and end frames, producing an animated effect that looks like the "real" thing.

Address: Broderbund Software, Inc.
17 Paul Drive
San Rafael, CA 94903-2101

Price: $79

Ernie's Big Splash

Ernie's Big Splash is a problem-solving exercise for young "Sesame Street" enthusiasts. The object is to build a path that leads Ernie's
beloved Rubber Duckie to Ernie in his bathtub. Along the way, you will find all the characters—Big Bird, Cookie Monster, Oscar, and others. Animation, sound effects, and an easy-to-use keyboard template make this program simple for even the smallest computer devotees to learn. Figure 19.1 shows an example of Ernie's Big Splash.

**Fig. 19.1. A screen from Ernie's Big Splash.**

**Address:** Hi Tech Expressions  
584 Broadway  
New York, NY 10012

**Price:** $15

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**Easy as ABC**

The Easy as ABC educational program is actually five educational games in one. Created for children ages three to six, Easy as ABC teaches children to recognize the letters of the alphabet, to understand alphabetical sequence, and to see the difference between upper- and lowercase letters.

Because the games are based on an easy-to-understand picture menu system, children easily find their way around the program.
without much help. Multiple skill levels give users a variety of difficulty levels from which to choose, so once the child has mastered one game or one skill level, she can progress to the next stage.

**Address:** Springboard Software, Inc.
7808 Creekridge Circle
Minneapolis, MN 55435

**Price:** $10

### What Games Are Available?

Games aren't to be underestimated for their power in the personal computing world. Sure, you need your spreadsheets, word processors, and database programs. Yes, graphics programs give you a creative break from data crunching; but for a really good time, find a game you like and check out for a while. (Some games are even available with a "fake" spreadsheet that pops down over the game—for those sticky moments when the boss walks up and looks over your shoulder.) This section highlights a few games available for PC, Macintosh, and Apple computers.

#### Indy 500

You can probably guess from the name—a wild-ride racing game straight from the Speedway's straight-away. Put yourself behind the wheel of an Indy car and take your laps—but be sure to check your tire pressure, gas levels, and other important stuff before you start.

**Address:** Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404-2496

**Price:** $41.99
Chuck Yeager’s Flight Simulator

Whether you are an armchair pilot or an aviation specialist, you will enjoy the ride with Chuck Yeager's Flight Simulator. With 18 different airplanes, created aerodynamically correct with 3-D modeling, you use a variety of fighter planes to accomplish your mission (should you decide to accept it). Using an unlimited number of camera angles, zooms, and pans, you can soar over a variety of landscapes as you cruise along various courses.

Address: Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404-2496

Retail price: $99

Mahjongg

Mahjongg is the ancient game of Chinese tiles—similar to the Americanized game of concentration—in which you match and remove similar patterns of tiles. Versions of this game are available for the PC, Macintosh, and Apple, although you may see the game under different names. Figure 19.2 shows one example of Mahjongg, this one for the PC.

Fig. 19.2. A screen from Mahjongg.
Address: Nels Anderson  
92 Bishop Drive  
Framingham, MA 01701  

Price: Shareware, optional contribution

Monopoly

Now the incredibly popular board game has been electronically captured for your Apple IIe, IIc, or IIGs. With double high-resolution graphics, Monopoly allows you to do all the traditional Monopoly things: buy and sell properties, accumulate wealth, and go to jail.

Address: PDE Software  
2074C Walsh Avenue, Dept. 694  
Santa Clara, CA 95050  

Price: $5

Yahtzee

Another legendary childhood game replicated on your computer system. With dynamic colorful graphics, quick "rolls" of the dice, and a formidable opponent, you play the computer for the best score.

Address: David W. Buell  
Rt. 1, Box 187  
Oak Grove, MO 64075  

Price: Freeware, no cost

Sleuth

This incredible mystery game allows you to play the sleuth and figure out the murder behind a heinous Agatha Christie-like mystery. You can use the characters provided for you or customize the names of the characters (to suit the favorite murderers in your life). You wander around one of several mansions, examine
possible murder weapons, and find the scene of the crime. When you have all your information together, you gather the guests and make your accusation... but will the murderer get you first? Figure 19.3 shows an example of Sleuth.

Fig. 19.3. A screen from the mystery game, Sleuth.

Address: Eric Miller  
Norland Software  
1433 North Fuller Avenue  
Los Angeles, CA 90046

Price: Shareware, $10 optional contribution

Hard Ball

No more slow pitching from the mound... Accolade's Hard Ball brings professional baseball right into your computer. You can choose a traditional nine-inning game (or go into extra innings if the competition is tight) and select teams, change the position of players, and control the type and direction of pitches. Figure 19.4 shows an example of Accolade's Hard Ball.
Fig. 19.4. A screen from Accolade's Hard Ball.

Address: Accolade
550 S. Winchester Boulevard
San Jose, CA 95128

Price: IBM: $14.95, Mac: $44.95

Fool's Errand

If you like getting lost in mazes of any kind, you will enjoy Fool’s Errand, from Miles Computing. This program takes you through more puzzles than any sane person would ever want to decipher in one sitting—more than 42 in all. The jigsaw puzzles and the clues all add up to one thing: the solution. Figure 19.5 shows an example of Fool’s Errand.

Address: Miles Computing
5115 Douglas Fir Road, Suite 1
Calabasas, CA 91302

Price: $49.95
Fig. 19.5. A screen from Fool's Errand.

GATO

If you're into underwater missions, you will love GATO, from Spectrum Holobyte. In this game, you are the captain of a World War II attack submarine. You control the periscope, chart your course, maintain the ship, and attack enemies. And because the game includes many different missions from which you can choose, you will have plenty of practice before you can claim to be the Terror of the Seas. Figure 19.6 shows a screen from GATO.

Address: Spectrum Holobyte
2061 Challenger Drive
Alameda, CA 94501

Price: $14.95
Conclusion

In this chapter, you have looked at a few of the popular educational and recreational software programs available for the PC, Apple, and Macintosh computers. This chapter not only concludes your introduction to education and recreational software types, it also ends your *Introduction to Personal Computers*.

This book has introduced you to the various computer types and software programs and has shown you the wide variety of computer products currently available. From a basic introduction to hardware and software, you have progressed to exploring different types of hardware and software products. Additionally, for the pre-purchase user, this book includes important elements you need to consider as you explore your computer options and select the system and software that is right for you. Remember that although we have tried to touch on all major areas of personal computers, because of the scope of computer information available, undoubtedly some things have been left out. If you didn't find the answer to your specific question or need within these pages, consult other Que publications for more information.
5.25-inch disk. Also called a floppy or minifloppy disk, this disk is a flexible piece of mylar encased in a protective covering that records data.

3.5-inch disk. A smaller, sturdier version of the floppy, called a microfloppy, encased in a plastic housing.

Access light. The light on the front of your system unit, that tells you when the computer is reading from or writing to a disk.

Access time. A term used to describe how quickly the computer can read and write information from and to disk drives and send data to various chips in the computer.

Address. The term used to describe the number that is assigned to a bit of data so that the computer can store and retrieve that data.

Analog. Describes an electronic signal that is a combination of varying intensities; used most often in personal computing to refer to a specific monitor type and the way the monitor receives video signals.

Application. Used loosely to refer to a class of software, such as word processing, spreadsheet, or database applications.

ASCII. An acronym for American Standard Code for Information Interchange, ASCII is an international standard for representing letters and numbers.
Backup. A phrase used to refer to an “extra” copy you make of important programs and data.

Backup copy. A copy of a program or data disk that you use for daily use to protect the originals from damage.

Booting. The process of starting the computer.

Bit. The smallest measurement of data. Taken from the term binary digit, a bit is an electrical representation that is either 0 or 1.

Board. Originally known as circuit boards, boards are used to house computer chips. Chips are attached to the board, and the board is plugged into the appropriate slot in the system unit. See also motherboard.

Bundled software. Software included with the purchase of your computer; the software is “bundled in” as part of the deal.

Byte. Roughly one character, or the equivalent of eight bits.

Cable. A collection of wires that are twined together to form a cable—connecting your computer peripherals to the system unit.

Cache memory. Extra sections of memory the computer sees as a specialized segment.

CAD (computer-aided drawing). A highly specialized type of drawing program used in architectural and engineering work.

Capacity. The amount of storage space on a disk.

Card. Another word for board or adapter.

Chips. Computer chips, technically called integrated circuits (or ICs). Although most computer chips look very much the same, different types of chips perform different operations: the microprocessor (CPU) chip is responsible for all operations performed by the computer; the memory chips store programs and data; other chips, such as a math coprocessor chip, allow your computer to perform other operations.

Clip art. Art images packaged with some computer programs (and also offered separately from software companies) that you can “cut and paste” and place in your own publications.

Cold boot. Also known as powerup, the procedure when you initially turn on the computer for the current work session.
CPU. The “brain” of the computer—also called the *microprocessor*—a small computer chip that is responsible for all the data processing done by your machine.

**Compatibles.** Machines created with a technology similar to IBMs. Also referred to as *IBM clones* or *IBM compatibles*.

**Cooling fan.** A small fan that keeps the boards and ICs cool.

**CPS.** Short for characters per second; used to measure the speed of printers.

**Cursor.** A small on-screen indicator that shows you where the next operation will take place if you, for example, type a character, click a mouse button, and so on.

**Database programs.** Software programs that allow you to enter, organize, and update information.

**Desktop publishing.** The capability to create a typeset quality piece—from start to finish—using your personal computer and desktop publishing software.

**Default.** A setting or value the program assumes if you do not supply a new setting or value.

**Density.** A term used to describe the amount of data that can be stored on a disk.

**Directory.** In the PC world, a directory is similar to the conventional filing cabinet drawer in which you store individual files related to a certain subject of your choosing.

**Disk drives.** Devices that read and write the data to and from disks.

**DOS.** An acronym for disk operating system. This term is used to refer to IBM's PC DOS or Microsoft's MS-DOS.

**DOS prompt.** The on-screen indicator displayed by DOS to show you that the system is ready to accept commands. If the current disk drive is C, the DOS prompt is displayed as C >.

**Drivers.** A software program included with peripheral devices you may buy (such as a printer or a mouse). The device driver communicates necessary information about the component to your system. For DOS systems, the DOS file CONFIG.SYS stores information about device drivers.

**Execute.** Term used to refer to “running” a program.
Expansion ports. The plug-in receptors in the back of the system unit that allow you to attach other devices, such as a printer, modem, and other external items.

Expansion slots. Slots built into the motherboard, that allow for expansion of the system.

Floppy disk drives. A device that allows you to store and read programs and data from a removable disk that you place in the computer.

File. A named collection of information stored as a unit. (For example, you create a letter and save it in a file on disk.)

Finder. The graphical interface of the operating system of the Apple IIgs and Macintosh computers.

Folder. In the Apple IIgs and Macintosh worlds, a folder is similar to a conventional drawer in a filing cabinet. Each folder can store many individual files.

Font. A collection of letters, numbers, and other characters that appear in one typeface, size, and style.

Formatting. The process of preparing a disk to store data.

Function keys. The special keys on IBM and some Macintosh keyboards that give you the option of assigning special functions to the keys. (Software programs control this feature, however; and many programs automatically assign functions to these keys.)

Hard copy. A phrase used to refer to a printed copy of a file.

Hard disk. A data storage device that provides a large amount of storage space for programs and data; housed in the system unit or available as an external or removable unit.

Head. The part of the disk drive that reads data from and writes data to the disk.

Hierarchical directories. A term used to refer to the organizational method of arranging files either in a DOS tree structure or in the file-and-folder method of Apple IIgs and Macintosh computers.

Highlight. The process of selecting something on-screen. The item changes visually (usually appearing in inverse video), showing that it has been selected.
Icon. An on-screen graphical element, or symbol, that represents a certain items such as a file or folder.

Index hole. A small hole in a floppy disk that the computer uses to control the spinning of the disk.

Information services. Communications services run by huge mainframe computers that store a wealth of information about a variety of topics.

Initialize. The process—usually in Apple IIgs and Macintosh applications—of preparing a disk to store information.

Inkjet printer. A type of printer that places characters on the page by squirting ink onto the page.

Installation. A term used to describe the process of placing programs on your computer's hard disk (occasionally used when explaining loading programs on disk-based systems as well).

Keyboard. Typewriter-like component you use to input data, issue commands, and generally interact with the computer and software.

Kilobyte. \(1,024\) bytes (or, roughly, characters) of information. 640K is read as “640 thousand bytes.”

Local area network (LAN). A group of computers linked by a network of cables.

Logged drive. The disk drive to which the operating system goes when looking for files to retrieve or save. Also called default drive and current drive.

Mail merging. The process of merging information from a database with text created in a word processing program.

Megabyte. One million bytes of information.

Memory. A term used somewhat loosely to describe the place where information is stored. See also RAM and ROM.

Menu bar. The horizontal bar across the top of the screen that shows menu titles (in Apple IIgs, Macintosh, and some PC applications).

Microprocessor. The “brain” of the computer—also called the CPU—a small computer chip that is responsible for all the data processing done by your machine.
MIDI interface (Musical Instrument Digital Interface). Used to connect an electronic musical instrument to the computer. With the proper software, the sounds are turned into electric pulses and stored in the computer as a file.

Modem. (short for Modulator Demodulator) Used to connect your computer to another remote computer or to an information service through use of your telephone line and communications software.

Monitor. The computer's display screen.

Monochrome. Refers to a single-color monitor.

Motherboard. The main board in the system, housing the computer's microprocessor chip.

Mouse. A hand-held device that allows users to use a menu and icon system for selecting commands and options instead of typing commands at the keyboard.

Mouse button. The button on the mouse (there may be one, two, or three, depending on the type of mouse you use) that you click to perform operations and make selections.

Multitasking. The capability to open and work with several programs at once.

OCR software (Optical Character Recognition). A program that is used with a scanner to convert text from graphics (as it is originally scanned) into usable text for your applications.

Operating system. A different type of software that allows your computer to communicate with you and your application programs. Every computer must have an operating system in order to work.

Parallel. A term used to explain transferring more than one bit of information simultaneously.

Path. The route the operating system or program takes to a specific directory or folder in order to locate or save a specific file.

Peripheral. A rather intimidating term used to describe the components you hook up to your system unit, such as a printer, mouse, modem, graphics tablet, and so forth.

Pointer. Usually used to refer to the small cursor on the screen, that is controlled by the movement of the mouse.
Port. A socket-like receptacle on the back of your computer into which you plug cables that connect peripheral devices.

Power supply. The device that channels to the system the electricity it needs.

Printer. The device used for printing a variety of computer-generated items (such as mailing labels, reports, letters, and so on).

Prompt. A message displayed by the computer to signal the user that it is ready for input.

RAM (random-access memory). Random-access memory chips store the programs and data you load during your current work session; when you turn off the computer, the information in RAM is erased.

Resolution. A term used to refer to the clarity of images on the screen or characters printed.

ROM (read-only memory). Read-only memory chips contain important information that your computer needs in order to perform basic functions and run built-in programs. This type of memory is permanent and retains the information recorded on the chip when power is turned off.

Scanner. A device that allows you to digitize a picture, line drawing, text, or other graphic element into a form usable by the computer.

Serial. A term used to describe transferring one bit of data after another.

Software. Programs that work with your computer to help you perform specific tasks, such as creating a spreadsheet, writing a report, or drawing graphics.

Soldered. This term refers to the way chips are placed on circuit boards. Chips are soldered onto the board with a melted metal that seats them securely in place. (Some boards now have snap-in chips, making it easier for end users to add and replace chips as necessary.)

Spreadsheet programs. Software programs that replace the accountant’s pad, pencil, and adding machine, giving you an efficient and accurate method of working with numbers.
**Subdirectory.** With PCs (Apples and Macs have folders for this purpose), subdirectories are directories within other directories. You can create many subdirectories and many levels of subdirectories within a single directory.

**System unit.** The main "box" of your computer that includes the hardware that performs all data processing operations, houses power supply and internal disk drives, and other important hardware devices.

**Warm boot.** Restarting the computer while the power is on. You perform a warm boot (also known as *rebooting*) by pressing Ctrl-Alt-Del on DOS computers.

**Word processing programs.** Software programs that allow you to work with words in a way not possible with typewriters, giving you reusable text, easy editing features, on-screen formatting, and good-quality printouts, among other features.

**Write-protecting.** A term used to describe the process of protecting a disk from receiving information. Write-protecting prevents accidental erasure and overwriting of files. It is especially important to write-protect disks that store important information like programs (and operating systems).
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