InfoWorld's ESSENTIAL GUIDE

TO THE

Commodore 64®

*Richard A. Milewski & the Editors of InfoWorld
show you how to get the most out of Hardware,
Software & Peripherals.*

INFOWORLD'S ESSENTIAL GUIDE TO THE COMMODORE 64

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COMMODORE 64

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the Editors of InfoWorld

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Preface

Welcome to *InfoWorld's Essential Guide to the Commodore 64*. This book will help you get the most out of your Commodore 64. Whether you already own a Commodore system or are trying to decide which computer to buy, we think you'll find this guide essential.

As a buying guide, it will help you get the most for your money and discover hidden costs you might overlook. After reading this book, you should have a good framework on which to base buying decisions.

If you already own a Commodore 64 computer system, you'll want to keep this book next to it as a resource of additional information.

To make this guide easy to use, we've divided it into two major parts: an overview of the Commodore 64 and reviews — a representative sampling of hardware and software products. Part 1, the overview, is divided into sections, with an explanation of what's in each section. In Part 2, the reviews — which follow *InfoWorld's* well-known, well-respected format — are arranged by general applications, such as Words and Numbers.

With this arrangement, you can read the whole book straight through or skip around to various areas that especially interest you.

In the back of the book, you'll find a glossary and appendices.

Prepared by the editors of *InfoWorld*, noted author Richard A. Milewski and the *InfoWorld* product-evaluation team, this guide to the Commodore 64 should be on every Commodore 64 user's bookshelf.

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Foreword

The word *computer* means different things to different people.

If you are a Bank of America executive, a computer is a collection of electronic hardware that fills the entire floor of a modern office building, costs several million dollars and processes tens of millions of checks, deposits and interaccount transfers every night.

If you are an astronaut orbiting the earth, a computer is perhaps the most important navigational instrument aboard your space shuttle. It calculates orbital data, telling you precisely when to fire your engines and for how long. Without it you would be as likely to land in the middle of the Indian Ocean as at your intended destination.

If you are a typist for a large corporation, a computer is called a word-processing machine, and it lets you type letters and reports faster and more accurately than a typewriter. If you have such a machine, you only need to type the boss's changes; the machine retypes the rest of the second, third and fourth drafts.

If you are a taxpayer, a computer is that nasty ogre at the IRS that sends a letter telling you that lines 38 through 45 of last year's 1040 don't really add up to $2345.12 and would you please send a check for another $300 no later than last Tuesday.

If you are a home-computer owner, that computer can be a tool, a toy and maybe even a bit of a tax deduction. It will help you keep better financial records and check the math on this year's tax return, so you don't get any more nasty letters. It will act as a word processor to help you write a reply to any nasty

letters you have already received. Whether you are in school or out, the computer will help you learn anything from how to fly an airplane to how to write a letter in Spanish.

When all of the work is done, it will entertain you with games and simulations that let you try your hand at flying a spacecraft, exploring a cave or visiting worlds that never were. If all that is too exhausting, it will stay home next to the fire with you and play a pretty good game of chess.
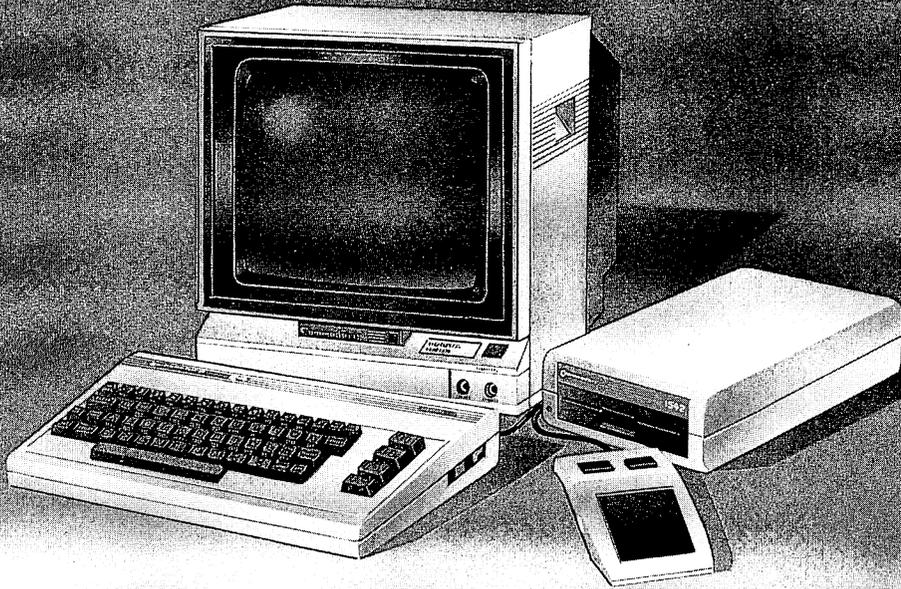
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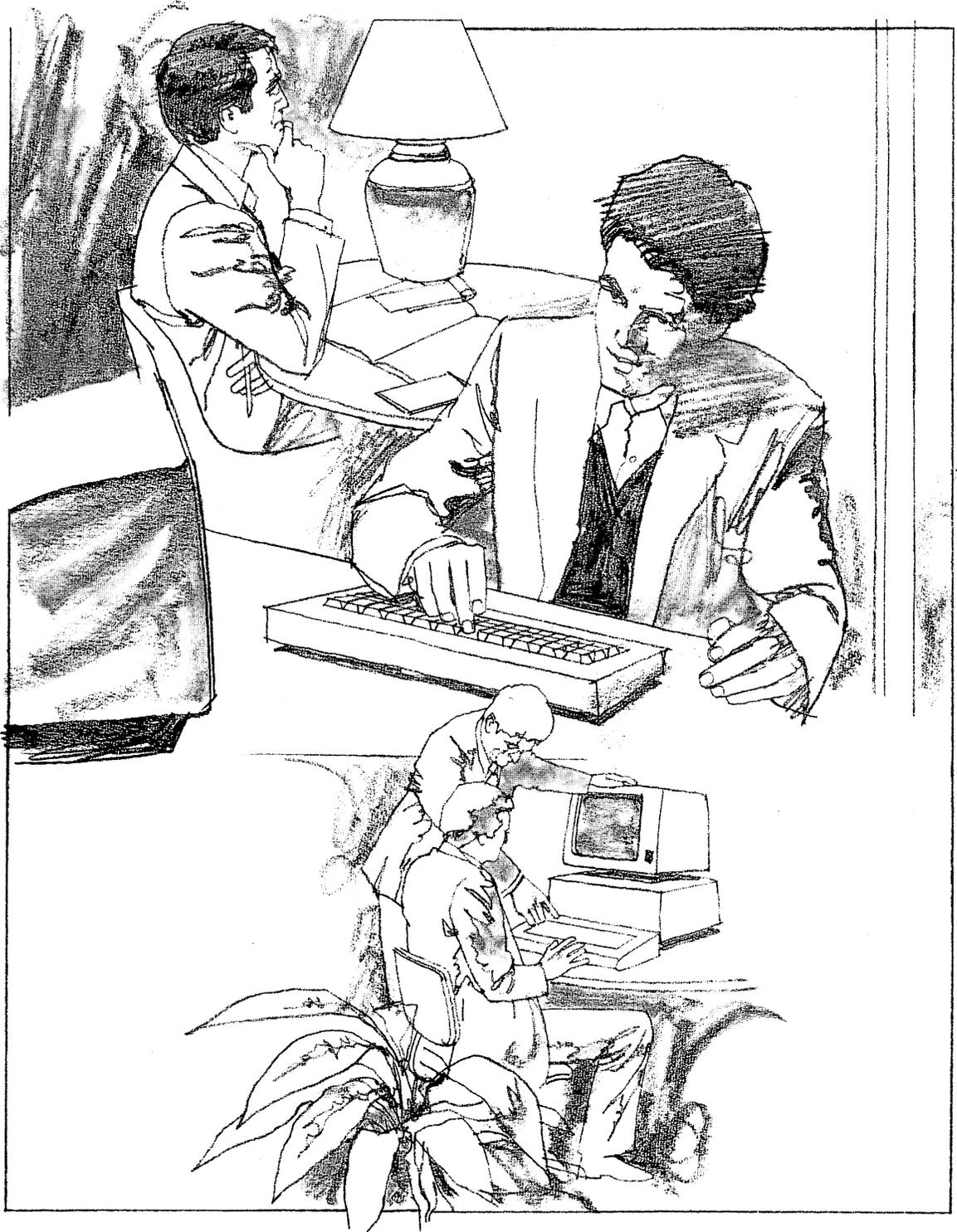
Section One

Getting Started

The Commodore 64 is one of the most popular home computers made.

In this section, we present the basics of the 64, as well as a brief history of the company, Commodore.

We also provide buying advice for anyone contemplating the purchase of a Commodore 64 home computer.

What Is a Commodore 64?
How to Buy a Commodore 64

Chapter 1

WHAT IS A COMMODORE 64?

You bought this book, so you must have either already purchased a Commodore 64 or are seriously considering buying one. Is it for you? If you compile a list of reasons why you want a computer and it looks like the list below, there is a good chance that the Commodore 64 is a good machine for you.

Computer needs list

1. To learn more about computers.
2. To learn how to program a computer.
3. To keep simple personal financial records.
4. To use for personal word processing.
5. To use as a terminal for information utilities.
6. To help make amateur weather forecasts.
7. To run computer games and simulations.
8. To decode Morse code and other shortwave radio signals.

The Commodore 64 is one of the most cost-effective home computers you can buy. It offers a wide range of capabilities, including dazzling color graphics, sophisticated sound synthesis and a 64,000-character memory, enough to handle practical computing tasks.

Any computer is only as good as its software. Fortunately, several hundred companies publish programs that run on the Commodore 64. These programs

range from fanciful games through serious educational programs to hardworking word-processing and personal financial software. Because of the numerous software offerings, you don't need to know how to program a computer to use a Commodore 64. Indeed, most of the people who will purchase a home computer in the next five years will never write even a single line of program code.

Who shouldn't buy a Commodore 64

Not everyone who needs a computer will choose a Commodore 64. If you need to use your computer for tasks such as the ones below, you probably won't find a Commodore 64 to be the perfect machine for you.

- ☐ To equip the word-processing pool at the office.
- ☐ To print 5000 customer invoices each week.
- ☐ To keep the books for a corporation doing millions of dollars' worth of business annually.
- ☐ To store the contents of an encyclopedia.
- ☐ To do a stress analysis of the Golden Gate Bridge.

It's possible that you could perform any one of these tasks with a Commodore 64, but each would be a frustrating undertaking. Other computers — in some cases, even other personal computers — would be a far better choice for applications such as these.

The sort of computer that individuals buy and then use at home or in small businesses is called a microcomputer. Sometimes this same type of machine is called a desktop computer, because all the major parts fit on top of a single desk.

Larger computers are often called minicomputers or mainframes, but the dividing lines between the micros, minis and mainframes aren't exactly drawn. Powerful and expensive microcomputers can do as much as most minicomputers. Some minicomputers occupy several rooms and are larger than the smallest mainframes.

Although a few hobbyists did begin to build microcomputers in the early 70s, these inexpensive machines only became affordable and practical in the late 70s and early 80s. Some of the early favorites were the Apple II, the Radio Shack TRS-80 Model I and the Commodore PET.

Commodore's early days

Commodore began business about 25 years ago as an importer of typewriters and later became a manufacturer of metal office furniture. A division of the company still manufactures filing cabinets, desks and other office-furniture products. In the early 70s, a division of Commodore began to manufacture calculators, and in 1977 this division of the company introduced a remarkable product that became the prototype of the modern personal computer. Called the

PET 2001, it was one of the first all-in-one-box microcomputers to be offered to the public. The brochure that announced its introduction described it this way:

> The PET is a computer. But a very different computer from any you have ever seen before. The PET is a personal computer; it stands for Personal Electronic Transactor. It is very compact, measuring just 16.5 inches wide by 18.5 inches deep and 14 inches high, and quite portable; it can be carried anywhere. It operates on ordinary current available in any office, home or factory.
>
> The PET has a television screen, a keyboard as simple to use as a typewriter and a self-contained cassette recorder which is the source for programs and for storing data in connection with these programs. And it has, in its standard configuration, a 4K (4000 byte) user memory or, as an option, an 8K user memory. (This is in addition to the 14K operating system resident in the computer.)

Even with an announced price of $595 for the version of the machine with a 4000-character (4K) main memory, Commodore was unable to meet the demand for the PET. The company delivered few of the less powerful "standard" version, and an instant waiting list developed for the more expensive $795 version with an 8K memory.

Although the brochure touted "a keyboard as simple to use as a typewriter," the PET, in fact, had a keyboard that used calculator keys instead of regular typewriter keys. This was the most criticized feature of the machine, and after a few months of production, Commodore offered a version of the machine with a regular typewriter-style keyboard. The PET 2001's portability, of which Commodore was so proud, was only portable relative to the size of the large, multiple-component microcomputer systems of its day. The PET weighed in at a hefty 44 pounds, and it would barely fit *in* an airline seat, let alone under one.

Progress in the microcomputer industry has been swift. The Commodore 64 offers eight times the memory of the 8K PET at about the same price the company asked for a 4K memory-expansion module for the original machine. In retrospect, it appears that Commodore had no inkling of the speed with which the industry would develop products, when it proclaimed in the PET brochure:

> Quite portable, very affordable and unbelievably versatile, the PET computer may very well be a lifetime investment.

By 1981, larger companies, such as IBM, entered the market with newer, more powerful microcomputers. Apple continued to have great success with its Apple II line. Radio Shack replaced the Model I with the more advanced Model III. Commodore's PET didn't capture as much media attention as these other machines because it was most popular in schools and outside the United States, particularly in Europe.

Between the introduction of the PET and that of the Commodore 64, Commodore introduced the first true mass-market computer. The VIC 20 was the first computer to become a million-unit seller.

It was widely advertised as the first computer selling for less than $300 (this

package did not include the video display). The Apple and IBM machines, by comparison, cost nearly $2000. Although they had more power and included more equipment than the VIC 20, the latter had enough of both to be useful for education and games.

The Commodore 64 is a direct descendant of the VIC 20. It is even built into a keyboard case that is nearly identical to that of the VIC 20. Although the programs, or software, written for the VIC 20 won't run on the Commodore 64, many of the hardware peripherals, such as tape drives, disk drives and printers, will run on either machine without any trouble.

The Commodore 64 is built in the same way as the VIC 20, with all the central components contained in a keyboard case. But the differences between the Commodore 64 and the VIC 20 are also important. Instead of the 5K of RAM in the VIC 20, the Commodore 64 has a full 64K (hence its name). Other chips in the Commodore 64 are also more powerful than those in the VIC 20.

For example, the SID (sound interface device) chip in the Commodore 64 can play music, with more effects and more range than you can get out of the VIC 20. Another example concerns the screen display. The Commodore 64 can show 40 columns of characters on whatever screen it is hooked up to; the VIC 20 can show only 22.

Every year microcomputers get cheaper and more powerful. The VIC 20 was a great success when it hit the market and it is still offered for sale, but it has been completely overshadowed by the strides made by competing computers. The Commodore 64 added more power and ability to Commodore's home-computer offerings. Its original price of $595 was soon cut to $300 and then $200. At that price, and especially when it is combined with the unusually inexpensive Commodore 1541 disk drive, the Commodore 64 gives the home-computer buyer more for his or her dollar than any machine priced below $500.

What the Commodore 64 has to offer

The Commodore 64 is a computer built into a keyboard. This keyboard is the most obvious feature of the computer. At first glance it looks like the keyboard on a typewriter, but there are some important differences. Unlike the keys on a typewriter, each key on the Commodore 64 has several functions. For example, each keytop bears a picture of its letter just as on a typewriter, but unlike a typewriter, there are also pictures of special characters, called graphic characters, on the front of each key. You can string these graphic characters together to draw pictures in the same manner that you "string" alphabetic characters together to make words.

To type the graphic characters pictured on the right side of a key, you hold down the Shift key while you press the desired key. To type the graphic character pictured on the left side of that same key, you use a special key that is not found on a regular typewriter keyboard. At the left edge of the keyboard is a key labeled with the Commodore logo (a stylized letter C and a pennant). If you use this key — called the Commodore key — in the same way as you use the

Shift key, you can type the graphic character on the left side of your original letter key.

If you hold down the Commodore key and press the Shift key, you change the keyboard's mode of operation. After you do this, the Shift key works much like the Shift key on a typewriter. Keys will display lowercase letters unless you hold down the Shift key, in which case uppercase letters are displayed. This mode is called the Uppercase/Lowercase mode. In this mode, you can still display the graphic characters pictured on the left side of each key by holding down the Commodore key when you type, but you cannot display the graphic characters pictured on the right side of the keys. To change back to the other mode — called the Uppercase/Graphic mode — again hold down the Commodore key and press Shift.

Another important key on the 64's keyboard that is not found on a typewriter keyboard is the one labeled CTRL, the Control key. You use it to force some keys to perform special control functions. For example, you hold down the Control key and then press 9 to cause subsequent characters to be displayed in reverse video — that is, the colors of the character and the background will be reversed. To restore the computer to the normal display mode (the mode that the computer assumes when you first turn it on), hold down the Control key and press 0 (zero, not the letter *O*).

On the right, separated from the rest of the keys, are four large keys called function keys. Some programs written for the Commodore 64 require you to use these keys, usually to perform special, complex functions with a single keystroke. Like other keys on your Commodore 64, these four keys can do the work of eight keys when you use them with the Shift key.

Other special keys are on your Commodore 64, such as the RESTORE, RUN/STOP, CLR/HOME and CRSR keys. Operation of these keys is covered in detail by the *Commodore 64 User's Guide* that is packed with your computer at the factory.

Having looked carefully at the keyboard, you can begin to see the dissimilarities between your Commodore 64 and a typewriter. Typewriters are good for typing and nothing else. Computers, on the other hand, are general-purpose machines that can perform a multitude of tasks. Not all of these tasks require input from the keyboard.

You can connect input devices other than a keyboard — for example, joysticks — to your machine. On the right side of the machine are connectors designed for this purpose. Labeled Control Port 1 and Control Port 2, these sockets accept a wide variety of plug-in accessories.

Also located on the right side of the machine (to the right of the control ports) are the main power switch for the computer and the socket that accepts the cable from the power transformer that comes with your Commodore 64.

On the back of the Commodore 64, you'll find more connection points. Located at the end of the machine nearest the power switch (on the left if you are looking at the back of the machine) is a slot into which you can insert program cartridges. These cartridges permit you to run programs without

having to add any accessories to your Commodore 64.

Nestled next to the cartridge slot is a small, square hole containing a slide switch. If you connect your Commodore 64 to a television, you must choose whether to "watch" your computer's displays on channel 3 or channel 4. For best results, select the channel that is not used by a local television station. Beside the channel switch is the jack into which you plug the cable that goes to the antenna terminals of your television.

If you connect your Commodore 64 to a monitor instead of a television set, you will use a special cable that fits into the next connector on the right. There are advantages to using a monitor instead of a television, and we'll discuss those later in the book. You can also use this jack to connect the sound output of your Commodore to the amplifier of a stereo system. This arrangement will enhance the quality of the sounds you can make with your computer.

The next connector on the right is called the serial-bus connector. You use this jack to connect floppy-disk drives, printers and other devices to your Commodore 64. Keep in mind that when you turn off the power, the machine will "forget" anything you have typed into its memory. There are ways to save information more permanently — using cassette tapes or floppy disks.

The next-to-last connector is the cassette interface. Connecting Commodore's special cassette-type recorder here enables you to save programs and data on tape cassettes.

The connector on the far right of the Commodore 64 is called the user port. Among other things, it enables you to plug communications devices into your computer. One of these devices, called a modem (modulator-demodulator), enables your Commodore 64 to "talk" to other computers over the telephone.

Don't worry yet about exactly which connector on your Commodore 64 is used for what purpose. Devices that plug into these connectors come with explicit instructions on how to install them. Because every connector has a different physical shape, it is unlikely that you could misconnect a device even if you tried. Just follow one simple rule: Always turn off the power before plugging or unplugging any device. This will ensure that you won't damage anything.

Untangling bits, bytes and kilobytes

The rapid proliferation of microcomputers has led to the increasing presence of computer jargon in the English language. Although we will avoid an overabundance of jargon in this book, the terms *bit, byte and kilobyte* are words you do need to understand.

The word *bit* is a contraction of the term *binary digit.* A bit is a unit of information, the smallest amount of information possible in a computer. A bit can be in one of two states, on or off; that is, it is either a 1 or a 0.

A byte is a group of 8 bits. In most computers, the byte is the basic unit by which the volume of data (information) and computer memory is measured. Because most computers use a byte of memory to store a single character, it is

often the most convenient amount of memory for a microprocessor to work with at any one time.

A kilobyte, commonly called a K, is equal to 1000 bytes . . . almost. Because the computers use bits that are in one of two states (1 or 0), things naturally fall into pairs. The number 1024 (2 to the 10th power) is the largest number that can be represented by a binary number ten bits long. This number is close enough to 1000 that the prefixes *kilo* and *k* are often applied to it. More often than not, the terms *K*, *kilo* and *thousand* mean 1024.

A Commodore 64 derives its name from its 64 kilobytes of memory. More specifically, its memory will hold 65,536 (64 times 1024) bytes of information. Computer memory comes in two main types: RAM and ROM. RAM is an acronym for random-access memory. As the name RAM implies, the computer can read or write any random byte in RAM at any time. When people use the terms *memory* or *computer memory*, they are usually referring to RAM.

The other type of memory, ROM, is read-only memory. The computer can only read ROM; it cannot store information in ROM. The computer can only read information placed in ROM when the system is manufactured. The Commodore 64 contains both kinds of memory.

The RAM is in the computer to hold the programs you write or buy and the data those programs manipulate. Some of the RAM is used by the Commodore 64 for such tasks as handling the screen-display graphics. The ROM in the computer holds the fundamental software that tests the computer when you turn it on, controls the screen display, interprets your typing and allows you to program in the BASIC language. Because these fundamental programs must always be present — are, in other words, a permanent part of the computer — they are supplied in ROM; you cannot alter the contents of ROM.

Chapter 2

HOW TO BUY A COMMODORE 64

Making the decision to buy a home computer isn't nearly as hard as making the decision about *which* home computer to buy. The whole world seems to be selling computers, from the corner drugstore to the local television-repair shop to toy outlets.

If you take the time to visit all these sales outlets, eventually one theme emerges — the one, the only, the absolutely best computer for you is whatever that particular shop has in stock the day you walk in the door.

What's a poor, would-be home-computer owner to do? How do you choose? Here's a five-step plan to help you buy a home computer. If you follow it step by step, you can bring home a computer without having to learn the difference between a byte and a brickbat.

Picking the right personal computer

1. List your needs.
2. Find the software to fill those needs.
3. Find the machine that will run that software.
4. Find someone to show you how to use the machine.
5. Find someone to sell you the machine.

Sounds simple? It is, and it doesn't require knowledge of computer hardware. Turn to the next page, and let's take a look at each step in detail.
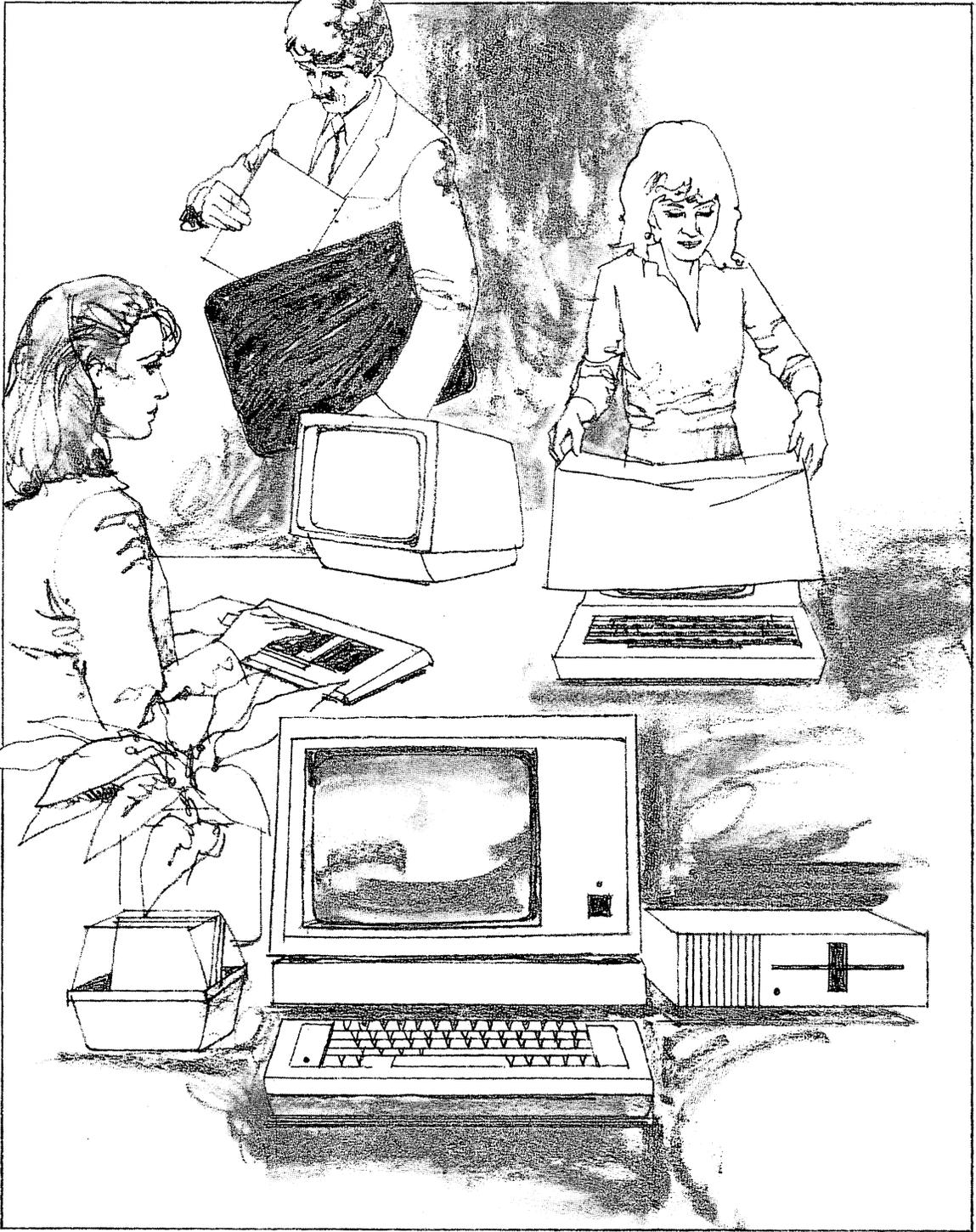
1. List your needs.

Sit down with a pencil and a big sheet of paper. Make a list of the things that you want your computer to do for you. Some items on the list might be:

- ☐ To keep personal financial records.
- ☐ To use for personal word processing.
- ☐ To use for office word processing.
- ☐ To learn more about computers.
- ☐ To learn how to program a computer.
- ☐ To use as a navigational aid on my sailboat.

Your list may be only one item long, or it may be much longer. The important thing is to *write it down*! With a written checklist, you can walk into a store with visible clout to impress the salesperson and show that you're a serious would-be computer consumer.

Even if you ignore everything else in this book, take the time to write this list.

2. Find the software to fill those needs.

When you walk into a store with your list of needs, you may find that the clerk who tried on your last visit to dazzle you with hardware doubletalk about umpteen-bit processors with three zillion K of RAM will change his approach. Suddenly he will begin to show you software. Software is to a computer what records are to a record player. Without something to play on them, both record player and computer are nearly useless. Though you can write your own programs more easily than you can record your own records, the effort involved is only practical if you want to learn about programming or you have very specialized program needs.

As you shop for software, write down the name of the program that will satisfy each need on your list and the names and prices of computers that run that program. Also write down the price of the software and any special equipment (such as printers, disk drives or modems) that you would need to add to the computer to use the program.

Visit as many stores as you can. Scour the computer publications listed in Appendix A for ads. Read software reviews in the back of this book and look through back issues of computer magazines. Look through your local newspaper for computer — and software — store ads.

Find some of the local computer clubs and users' groups, and attend their meetings. You'll find lots of friendly, helpful people with experience. Don't be afraid to ask questions, but remember that some people are extremely loyal to their particular computer.

When, after tapping these various resources, you find a program that ostensibly fills one of your needs, see if someone can demonstrate its use for you. Not all software outlets are equipped to provide this service, however. Members of the aforementioned users' groups may be able to show you how some programs work.

3. Find the machine that will run that software.

Only when you have at least one software solution written down next to each of your needs are you ready to think about which machine to buy. Look over your needs list. If you are lucky, you will find one or more machines that appear next to every need on your list. If not, pick the two or three machines that appear most frequently and focus your second round of software shopping on those machines. Once you have a list of machines that will run the software that meets your needs, you should consider several other factors.

Price is obviously a major factor in any purchase. If the computers you are looking at are too expensive, you may have to shave a few requirements from your list of needs. Although the Commodore 64 is relatively inexpensive, any computer system can grow beyond your budget if you have to buy numerous peripherals such as disk drives, modems, printers and plotters. One reason many people buy the Commodore 64 is that they want to find out what computing is all about. The Commodore 64 meets that sort of need superbly because, although it is one of the most inexpensive computers, it still has a full range of inexpensive software and hardware add-ons that can expand it in whatever direction the owner's interest leads.

Another factor in buying a computer is reliability. You can analyze this factor to help make the decision between different systems that run the software you have chosen. People don't always choose expensive computer systems rather than cheaper systems because they are crazy. Often, particularly in business situations, these people cannot afford — or don't want to worry about — having the computer break down. And though all computer systems break down occasionally, some are rarely out of the shop. They are just like cars or dishwashers in that regard.

Buying from a well-known company is one way to try to win yourself some freedom from reliability worries. The Commodore is in a different league from the IBM PC or the Apple II. Those computers are almost always bought either directly from the company (this is the strategy huge firms use when buying their micros) or at a computer store. Either way, the buyer has some expectation of help when the computer stops computing. The Commodore 64, on the other hand, is so inexpensive that it is often sold through department or toy stores. The people selling the 64s often know next to nothing about computers, so they can't fix one. Most of the time, all they can do is replace your computer with another, just as if you were trading in a toaster.

The answer to questions of reliability is to read consumer magazines and talk to people about their experiences.

The Commodore 64 has had several problems. Some of the Commodore 64s produced in late 1982 had poor screen displays. Commodore 1541 disk drives (the model most commonly used with the Commodore 64) built in middle and late 1983 were failing so often that the *Wall Street Journal* published an article about the problem. Commodore claimed that the problem was related to its hurry to produce enough disk drives. When the Commodore 64 was first introduced, Commodore predicted that most users would buy a cassette-tape

drive to go with it. Instead, almost 80% bought the 1541 disk drive. Not only does a disk drive work faster and better than a tape drive for almost any application, but the 1541 was just about the least expensive disk drive ever offered to the public. Whatever the reason for the 1541 failures, you'll be pleased to learn that most bugs have been worked out of both the hardware and the older software.

If you do have problems, check your warranty, talk to your dealer and let Commodore know about your trouble. In addition, as mentioned below under step 4 of this purchase procedure, try to join a club or users' group. The knowledge you can gain from these groups can help you straighten out problems with the system that may be your fault; the clout of such a group can help you when the problem is the manufacturer's fault.

4. Find someone to show you how to use the machine.

What you do in this step depends a bit upon what you found when you did your research in step 2. If you found an active users' group for the machine you selected, then you're home free. You'll have no trouble getting help.

If you couldn't find a users' group, don't fret. If the machine you want is sold by a local dealer who was more than willing to spend lots of time demonstrating software, then that dealer is almost as good as a users' group.

Another way to find out about your computer is to read books and magazines. The number of both that are published about computers has multiplied in the past few years. There are many books and magazines that specialize in Commodore computers or just the Commodore 64. There are also many general-interest books about programming and magazines that will keep you informed of microcomputer news (such as which machines are showing reliability problems and which software and hardware dealers are leaving behind a trail of unhappy customers).

5. Find someone to sell you the machine.

This is the easy part. You've qualified your machine, and you know where to go to get help when you get stuck. It's time to get out the checkbook and bring home the hardware. But before you do, one word of warning: If you are planning to rely on a computer store for your training and information, resist the urge to save a few dollars by buying your machine from a discount store or mail-order house. You may find yourself paying hefty consulting fees to a dealer who does have the time and staff to teach you about your computer.

Finally, before we launch into an explanation of all the wonderful things you can buy to add to your Commodore 64 system, remember that you don't need anything beyond a Commodore 64 and a TV to begin computing. Sure, word processing, filing and most practical uses require more hardware and software, but you can learn how simple programs work and experiment with a complete computer without buying any of the extras. It's easy to get caught up in the feeling that you always need just one more program, one more piece of equipment or a slightly better printer.
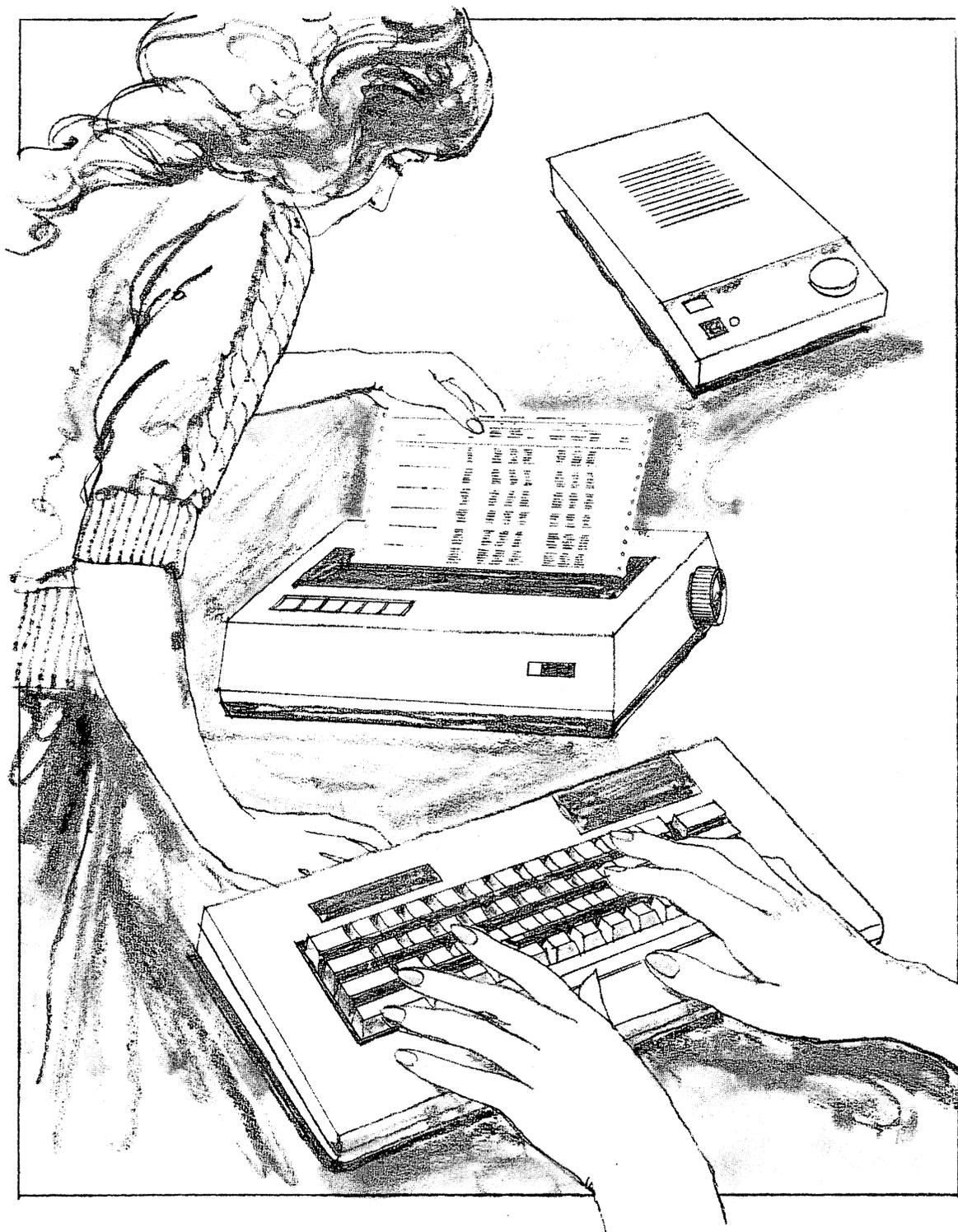
What You Can Do with Your Commodore 64

In this section, we explore what you can use your Commodore 64 for.

Chapter 3 covers the realm of hardware peripherals — from printers to furniture.

In Chapter 4, we explore the array of software available for the Commodore 64, including free and almost free programs.

Chapter 5 tells you how to write your own software — and the potential problems in such a venture (make that adventure).

A final note wraps up the overview, and then we proceed to Part 2, product reviews.

Computer Peripherals
Software for the Commodore 64
Writing Your Own Software

Chapter 3

COMPUTER PERIPHERALS

Assume you have completed your needs list, done your software shopping and decided that a Commodore 64 is the machine for you. The next problem is that a Commodore 64 is not a one-box computer. What you get is a keyboard containing the microprocessor, memory and the electronics necessary to connect these devices to other devices. To make a useful system, you need to add to the basic machine. These add-on products are called *peripherals.*

One bewildering — but exciting — aspect of owning a Commodore 64 is the seemingly endless collection of peripherals you can add to the basic computer. Which ones do you really need? Which ones are simply nice to have? How can you tell *before* you've put down your money? Take a few moments to read through the following discussion of peripherals; we'll show you how to decide which ones to buy.

The screen

The keyboard is the mechanism by which you give information to the computer. You do this either by typing instructions into the machine in a programming language or by answering the questions asked by a program written by someone else. For you to see how the computer responds to what you type, you need to hook the machine up to some sort of display device. Many people simply connect their machines to the family TV set through the cords that come with the Commodore 64 when you buy it. There are, however, some other options, which start on the next page.

Displays — TV or monitor?

Monitors usually provide better results than do TV sets. A monitor is much like a television set except that it cannot tune in a television broadcast. In addition, it shows an image in finer detail than does a standard television receiver. The latter ability will offer a distinct advantage if you plan to use your computer for tasks, such as word processing or programming, that will require you to spend a lot of time looking at text displayed on the screen.

There are some sound technical reasons for using a monitor rather than a television set, however. To produce a reasonably priced television set, manufacturers make design compromises. One of these compromises concerns a feature called video bandwidth. The picture on a television screen is made up of a series of lines called scan lines. (If you look closely at the face of a black-and-white television, you can see them.) These lines are made by a beam of electrons that, controlled by the television electronics, scans across the face of the picture tube. When the beam is turned on (by the television's response to the broadcast television signal), the line is white; when the beam is turned off, the line is dark. Simply stated, video bandwidth is a measure of how fast the line can change from light to dark.

A screen that can change quickly displays sharper images than a screen with low bandwidth that can only change slowly. The rate at which the change from light to dark occurs is measured in megahertz (millions of cycles per second). A good-quality color-television picture requires a video bandwidth of 2-4 megahertz. A good monochrome monitor will have a video bandwidth of 15 to 20 megahertz. Color monitors have a lower effective bandwidth than monochrome monitors. If you plan to spend many hours in front of the screen looking at program listings or other text, you'll want a good-quality, high-bandwidth, monochrome monitor.

Choosing a monochrome monitor is not the end of the decision-making process, though. Monochrome monitors come with white- (synonymous with "black and white"), green- and amber-color screens. The green and amber screens are supposed to minimize eyestrain. If you plan to use your machine for long periods, seriously consider a monitor with a green or amber screen.

There is also a significant difference between the performances of different types of color monitors. The highest-quality color monitor is a type known as the RGB monitor. RGB stands for red-green-blue, the three primary colors of light. To use an RGB monitor, the computer must supply a separate signal for each of these colors. Unfortunately, the video-output circuits of the Commodore 64 do not provide those separate signals. Fortunately, that means you don't even need to consider RGB monitors (which happen to be more expensive than other color monitors).

The other main category of color monitors uses what is known as a composite-video signal. A composite-video signal consists of all of the information required to make a picture — the chrominance signal (the red, green and blue levels), the luminance signal (the overall brightness level) and the timing sig-

nals. A composite-video signal is the type of signal present at the video-output jack on a videotape recorder. A color monitor that uses a composite-video signal produces a substantially sharper image when connected to a Commodore 64 than a standard color-television receiver produces.

Commodore manufactures two color monitors that fall between the standard composite-color monitors and the more expensive RGB monitors. These monitors are the Commodore 1702 and 1703. In addition to having a standard composite-video input jack on the front of the monitor, these devices have inputs on the back panel that will accept separate chrominance and luminance signals. When you hook up your Commodore 64 to these input jacks, the sharpness of the image is substantially improved. Most (but not all) of the Commodore 64s produced do provide separate chrominance and luminance signals.

Most microcomputers have changed since their inception. This change is true of the Commodore 64, the IBM PC and the Apple II. Sometimes the designers discover hardware mistakes that need fixing. Often the manufacturers devise cheaper ways of building the microcomputer. The changes involved in this sort of evolution aren't mentioned to buyers. The computer's case is the same, the name is the same and the microcomputer even runs the same software: in a typical redesign, only a few chips inside are changed.

Some redesigns, however, show on the outside of the microcomputer. One Commodore 64 example of a noticeable change involves the video output.

Very early versions of the Commodore 64 have a 5-pin DIN video-output jack; these machines cannot take advantage of the chrominance/luminance input jacks on the 1702 and 1703 monitors. Largely because of these earlier machines, the cable that Commodore ships with these monitors connects only to the composite input jacks on the front of the monitor. Few Commodore owners realize they can use a different cable to hook up to the rear chrominance and luminance jacks. This happenstance has made the superior performance of the Commodore monitors one of the best-kept secrets in the home-computer industry.

The trick, when shopping, is to insist upon a demonstration of the 1702 or 1703 monitors using the rear input jacks. Because the 1702 and 1703 are priced competitively with composite-input-only monitors, be sure to see the difference in performance for yourself before selecting a non-Commodore monitor for use with your Commodore 64.

If you do choose a monitor instead of a television set, you don't necessarily have to dedicate its use entirely to your computer system. If you own a videotape recorder or a videodisc player, you can connect the video-output jack to your computer's color monitor and get a superb picture. If you choose either the Commodore 1701 or 1702 monitor, you can even connect your Commodore 64 to the connectors on the back panel of the monitor, connect the VCR or videodisc player to the connectors on the front of the monitor and use the switch on the back of the monitor to switch between the Commodore keyboard and the tape or disc player.

Improving the performance of the 1701 monitor

If you use a Commodore 1701 or 1702 monitor with your Commodore 64 and are feeding the signal through the composite-video-input jack on the front of the monitor, you aren't getting the sharpest display possible. Here is how to significantly improve the performance of your display:

Go to a local stereo store and purchase a cable with a 5-pin DIN plug on one end and four color-coded RCA-style phono plugs on the other end. (DIN is an acronym derived from Deutsche Industrie Norm. In English, that's "German industrial standard," and it specifies a series of connectors commonly used in Europe for audio equipment and small computers.) Plug the DIN connector into the video-output connector on the Commodore 64.

Deciding how to connect the phono plugs will take a bit of experimentation, as the color codes differ between manufacturers. For a start, try connecting the white plug to the luminance input jack, the red plug to the chrominance input jack and the yellow plug to the audio-input jack on the back of the monitor. (The fourth plug is not used; you may safely leave it dangling.) Set the switch on the back of the monitor to the "rear" position. If this plug arrangement does not produce a sharp color image, try other plug arrangements.

Once you have found the correct plug arrangement, try loading a game that has lots of intricate graphics; then compare the pictures, using first the front and then the rear video-input jacks to the monitor. You'll be surprised at the difference using the split chrominance/luminance input jacks makes in the quality of the image.

Storage devices

Home computers are like stereo record players in one important way: the basic machine needs software to make it interesting. In the case of a stereo system, that software comes in the form of records and tapes. In the case of a computer, many of the programs come on tape cassettes, plug-in cartridges that have ROM built into them or disks. To play these programs you need the right kind of player — in the computer world, a drive. Cassette tapes are played on a tape drive, and disks are played on a disk drive. Like the tape deck on a stereo system, both tape and disk drives can record as well as play back program material.

The primary difference between a disk drive and a tape drive is the way they find the data you're looking for. With a tape drive, all you can do is start the tape and wait for the data you want to come along. Disk drives, on the other hand, are called random-access devices because the computer can instruct the drive to begin reading at any point on the disk. Both tapes and disks can store many different sets of data on a single piece of the medium, so the random-access capability of a disk drive can be a real time-saver.

Tape drives

The simplest device for storing microcomputer programs is a cassette-tape player/recorder, also called a tape drive. The Commodore C2N cassette drive (called the Datasette by Commodore) is designed especially for use with Commodore computers. Except for a control line that enables the computer to tell when a switch on the cassette unit has been pressed and a special connector that mates with the cassette port on the Commodore 64, the C2N drive is not materially different from the cassette recorders used for speech and music recording.

Indeed, adapters are available that permit the use of regular cassette recorders to record data. The CE1 cassette interface from Cardco, for example, plugs into the cassette port on the back of the Commodore 64 and into the input and output jacks on a cassette recorder. Although the CE1 interface can control the motors on cassette decks with motor-control jacks (most portable recorders have this feature), it cannot emulate the switch-sensing feature built into the Commodore C2N cassette unit. This fact makes saving and loading data more difficult with the CE1 than with the C2N.

Just as you can store more than one song on an audio cassette, you can store more than one data item on a single computer tape cassette. You can give each program on the tape a name when you record it. Later, when you wish to retrieve the program, you rewind the tape and then ask for the desired program by name, and the computer will handle the task of looking through whatever else may be on the tape to find the program you requested.

A word of warning about using cassette tape as a storage medium: Storing computer data is a demanding process that pushes the capabilities of the tape and the recorder close to their limits. It is, therefore, critically important to keep the recorder clean. In normal use, grease, dirt and a residue from the magnetic coating on the tape itself will accumulate on the recording head in the tape drive.

Cleaning the tape drive is not a difficult project, especially when you have the right equipment. You can buy tape-recorder head-cleaning kits at record stores and stereo-equipment shops. These kits are relatively inexpensive and include easy-to-follow instructions. You can also buy a similar kit at computer stores, specially labeled as a computer-tape-drive cleaning kit. The two kits work equally well (in fact, you may find the same kit in both places with the labels changed).

Commodore recommends that you clean the heads of your cassette recorder every 10 to 20 hours of operation. This time period means every 10 to 20 hours of running tape, not the amount of time the computer is turned on, or the approximate equivalent to loading or saving an average-size program 150 to 300 times.

Another maintenance procedure you should perform periodically on your recording head is called degaussing. Over time, the head will accumulate some level of residual magnetism. If this level becomes too high, it will begin to affect both the quality of recordings the drive is able to make and the tape drive's

ability to read previously recorded data. Degaussing, or demagnetizing, is the process of removing this residual magnetism.

Inexpensive tape-head degaussers are available at record stores and stereo shops, usually on the same shelf as the tape-head cleaning kits. In choosing one, be sure that it has a smooth, plastic covering on the end of the device that comes in contact with the recording head.

A tape-head degausser is easy to use. Turn off your computer before you attempt to degauss the head, and then follow the manufacturer's instructions. Generally, the process is one of plugging in the degausser, gently moving it over the surface of the tape head and then pulling the degausser slowly away from the head, by at least two feet, before you turn off the demagnetizing tool. You should demagnetize the head each time you clean it.

Floppy-disk drives

Although a cassette-tape drive provides an easy way to store programs and data, it is not especially fast. A medium-size program may take five or ten minutes to load: it will take much longer to load if it happens to be at the end of a tape full of other programs. Another recording device, the floppy-disk drive, has been developed to eliminate this problem. It is really a distant cousin of the tape recorder.

Instead of recording on the strip of tape, the disk drive records on a disk of plastic film about 5¼ inches in diameter. The film is made from Mylar, the material often used to make recording tape. The disk is coated with a metallic oxide material that is also like the material used to coat recording tape, although its surface is more polished than that found on tape. To protect this polished surface, the disk is enclosed in a flexible plastic jacket lined with a soft, fabriclike material especially engineered to trap dust and small particles of dirt.

Like the tape drive, the disk drive records and plays through a magnetic "head." This device is actually a small electromagnet that is brought close to the magnetic surface of the disk. If the disk drive is putting information onto the surface — an operation called writing — the controller sends pulses of electricity into the head. This magnetizes areas on the disk directly underneath the head. Those areas will remain magnetized for a long time. If the disk drive is getting information back from the disk — this procedure is called reading — no pulses are sent to the head. Instead, the head senses the tiny magnetic areas that it moves over. The disk controller interprets the presence or absence of magnetic areas just as a radio operator interprets Morse code. The interpreted version is then sent to the computer.

Because the whole disk and jacket assembly is somewhat flexible, it acquired the name "floppy" disk, to differentiate it from the larger and faster devices that use rigid disks of coated aluminum. Despite the name, you should never bend or fold a floppy, as a crease will ruin a disk.

The disk drive organizes the data on the disk's surface into a series of concentric circles called tracks. The Commodore 1541 disk drive divides the disk into 35 different tracks. The movement of the read/write head on a disk

drive is controlled by the computer so that it can quickly read or write any track on the disk. Each track is divided into units called sectors. Each sector holds 254 characters of data, as well as some information used by the system to keep track of the reading and writing process.

Because the tracks near the outer edge of the disk are longer than those near the center of the disk, the Commodore disk drive divides outer tracks into 21 sectors each and the inner tracks into 17 sectors each. There are also 18- and 19-sector tracks in the middle. Once the computer has positioned the read/write head over the desired track, the drive will wait for the index hole — a little hole next to the large one in the center of the disk — to indicate that the beginning of the track is under the head. The drive then begins reading the control information carried with each sector, moving from sector to sector until it locates the desired one.

The Commodore 1541 drive stores more than 165,000 characters on a single disk. Because of the track and sector organization of the disk, the Commodore 64 can find any program on a disk in only a few seconds instead of the minutes required to locate a specific program on a tape. After the computer has located the desired program, the disk drive can load it into memory about seven times faster than if the program were on tape. For example, a 24,000-character program will take 7½ minutes to load from tape, but the 1541 disk drive will load it in about 64 seconds.

The 1541 disk drive is slow as disk drives go. If you have only worked with cassettes-tape drives before, you won't understand what anyone is complaining about: the disk drive is amazingly quick compared to a tape drive. If you've worked with the disk drives on some other microcomputers, such as the IBM PC or Apple II, you'll probably notice that the Commodore 1541 disk drive takes much longer to load the same sorts of programs.

This sluggishness is caused by several factors. The major one is that all information is sent to the 1541 and received from the 1541 over a single wire, in serial form. Of the eight bits used to represent a typical character (such as a letter or numeral), only one can be sent at a time. Other disk schemes often use parallel transmission over eight wires. That means that all of the eight bits can be sent simultaneously. Parallel transmission is faster than serial, but it increases the cost of connecting cables. The electronics required to drive a cable, either serial or parallel, at high speed is also more expensive than lower-speed parts. An additional problem is that high-speed cables tend to radiate more radio and television interference than lower-speed cables. Commodore chose to produce a disk drive with a lower-speed interface to the computer and reap the benefits of lower cost, better reliability and less radio and TV interference.

As we mentioned earlier, approximately 80% of Commodore 64 owners buy a disk drive soon after they purchase their system. Because of the random-access organization described above, a disk drive operates much faster than does a tape drive. In fact, the only reason to buy a tape drive is if your finances forbid buying a disk drive. The tape drives typically cost about $65. The 1541 disk drive can be found in many stores for about $260. This disk-drive price

probably won't change much in the near future; it is already among the lowest for any disk drive for any microcomputer.

Don't be confused if you look in computer magazines and see disk drives listed at even lower prices. These prices are typically just for the disk drive itself. A computer also needs a disk-drive controller to use a disk drive. The controller is a special electronics board that tells the disk drive where to put and where to find information on the disk surface. The 1541 has a controller built into it — a controller that is especially designed to work with Commodore computers. Even if you do find a deal on some other disk drive with a controller, be sure that the advertisement states specifically that the drive can be used with the Commodore 64.

As soon as you can afford it, buy a disk drive. This device shouldn't even be considered a peripheral for any computer that will be used for anything more than simple games and BASIC programming. Applications such as file maintenance and word processing are only practical with a disk drive; and the combination of the Commodore 64 and the 1541 disk drive offers one of the least expensive complete systems on the market.

Dos and don'ts of handling floppy disks

- ☐ *Do* keep the floppy disk in its paper envelope when it is not in the disk drive. Disks do not take well to coffee spills, cigarette ashes or dabs of peanut butter.
- ☐ *Don't* expose a disk to strong magnetic fields such as those around electric motors, televisions or monitors, beneath ringing telephones or near tape-head degaussers.
- ☐ *Do* keep your disks at room temperature. Exposure to the high temperatures of a sunlit windowsill or a car trunk on a hot day can damage them.
- ☐ *Don't* touch the surface of the magnetic coating. Even the tiniest scratches or finger smudges can cause a loss of data.
- ☐ *Do* wrap a disk properly before mailing it. Two pieces of corrugated cardboard, one on each side, and a snug-fitting envelope will be ample protection if you don't have a special disk mailer.
- ☐ *Don't* write on the disk label with a pencil or ballpoint pen. This can grind bits of dust trapped by the liner into the surface of the disk. For best results, write on labels *before* they are applied to the disk.
- ☐ *Do* make a backup (duplicate) copy of important files and programs. The cost of an extra disk is low compared to the cost of reconstructing the data on a disk lost to mishandling.

All recorded data should be thoroughly backed up. That means making multiple copies frequently of all current stored information and keeping some of the copies separate from the main disks (or tapes). This sort of precaution is considered excessive by those who have recently begun to use computers; and it is true that data errors are fairly rare. One error, however, can be enough to destroy a disk so that none of the information on that disk can be read. With a

disk that can store approximately 170K of information, as 1541 disks do, that figure is equivalent to losing more than 80 pages of programs or data. Not only will you need a long time to develop that information again, but sometimes the data is nearly impossible to regenerate (for example, if you were keeping records whose paper documents had been discarded).

In business, such an information loss could be disastrous. Imagine a business losing all of its accounts-receivable records. The businesspeople could be forced to call each customer and ask how much that customer owed.

Even at home, a ruined disk can be catastrophic. Picture the look on the face of a student who must be told that her 55-page term paper just disappeared "accidentally."

You will not know when a disk is about to go bad. The first warning you'll have is when it stops working. So develop your own scheme of keeping backups of all disks, both program and data disks, and stick to that scheme.

Printers

Computer printers perform the same function as electronic typewriters; you need a printer if you want to transfer information onto paper. Printers come in a bewildering array of types and range in price from less than $100 to more than $5000.

Printers divide easily into two major types, dot-matrix printers and "letter-quality" printers. Dot-matrix printers form letters by placing an array of tiny dots onto paper. A printer can make these dots in several ways. Some printers use electromagnets to drive tiny wires up against a typewriter ribbon to print the dots that form the letters. Other designs use miniscule heating elements to cause specially treated paper to change color. Still others have tiny ink jets that squirt miniscule blobs of ink onto the paper.

Regardless of how they work, all dot-matrix printers form letters from a tightly spaced array of dots. Figure 1 shows an enlargement of the letter A as it would be formed on a typical dot-matrix printer.

Figure 1.　　　　　　　　　　　　　**A**

The "smoothness" of the printed character depends on the number of dots in the array, and this quality varies from one model of printer to another. The chief advantages of dot-matrix printers are speed, low cost and the ability to print several sizes of text.

One feature unique to dot-matrix printers is especially important to Commodore 64 owners. Most printers of this type can print individual dots as well as form many dots into characters. With this ability you can write software to transfer a graphics image from the screen of the Commodore 64 to the printer.

This process is called a screen dump, and one dot-matrix printer with this capability is the Commodore 1526 graphics printer. Many commercial software programs, such as 64 Panorama by Midwest Micro, are available for producing graphics on the Commodore 64 screen, and many of them include screen-dump programs that print the screen image onto the Commodore 1526 printer.

Letter-quality printers

Although the best of the dot-matrix printers available today are capable of producing typefaces of a quality suitable for printing letters, the term *letter-quality printer* has a more specific meaning. It commonly describes a printer that forms a letter by striking the paper with a "slug" shaped like the letter itself (the same way that most typewriters work). This slug may be mounted on a typeball, a multispoked wheel (referred to as a daisy-wheel because of its resemblance to the flower) or some other contrivance. For the best print quality, some of these printers use carbon-film ribbons that eliminate the texture of a cloth ribbon from the imprint of the letter. These printers are direct descendants of office typewriters, and some of the newer electronic typewriters even have a connector to permit them to be used as computer printers.

As a class, letter-quality printers are generally slower and more expensive than their dot-matrix counterparts. The less expensive versions run at 10 to 20 characters per second (cps) and the fastest are in the 50- to 100-cps range. Dot-matrix printers, on the other hand, can print from roughly 50 to more than 400 characters per second. Figure 2 shows an enlarged image of a dot-matrix character compared to a character produced by a letter-quality printer.

Figure 2.

Printers available from Commodore include the 1565 bidirectional dot-matrix impact printer, the 1526 graphics printer and the 1520 color printer/plotter. The latter uses ballpoint pens to draw each individual character, at an average speed of 14 characters per second, and can draw charts and graphs.

Interfacing issues

The manner in which printers connect to the Commodore 64 varies considerably. Most printers from manufacturers other than Commodore use one of the two industry-standard connection methods, called RS-232 serial or Centronics parallel; the Commodore 64 does not. With an appropriate adapter, the user port (the slot on the left rear of the Commodore 64) can supply the signals to drive either of these connections, or interfaces. Cord Ltd., Cardco, Alphacom, Data 20 and other manufacturers can supply these adapters to match the Commodore 64 to virtually any printer currently on the market. An RS-232 adapter that plugs into the user port can connect the Commodore 64 to more

than just printers. Many modems, plotters and other devices designed for other computers use the RS-232 connection standard.

Commodore printers use an interfacing approach that differs from that of most other printers. They use the same DIN connector that feeds the Commodore disk drives. The normal method of connection is to plug the disk drive into the Commodore 64 and then plug the Commodore printer into the second connector on the back of the disk drive. A significant advantage of this printer-connection method is that it leaves the user port available for use by a modem or other peripherals.

Other printer-interface manufacturers emulate Commodore's use of the serial-bus port as a printer-connection point in their designs. Again, the advantage of this approach is that the user port is free for use with modems or other devices.

Manipulators and pointers

The Commodore 64 is a superb game-playing machine. You can choose from a vast array of paddles, joysticks and other devices that you can plug directly into the machine. By manipulating these controls, you can point to places on the screen or move, under program control, images on the screen. You can also use some of the devices as sensors that detect phenomena outside the machine.

The connectors to which these manipulators connect are compatible with those used by the Atari VCS 2600 game system. More than 10 million of these units have been sold. Because of this vast number of installed game systems, many manufacturers produce joysticks and other manipulators for the Atari 2600 that will also work with the Commodore 64.

The joystick derives its name from the control sticks used in early airplanes. The joystick is composed of a base and a stick. The computer can sense movement of the stick in any of four directions — forward, backward, left or right. When you move the stick diagonally, the computer senses the motion as a combination of forward-back and side-to-side motions. Thus the stick can detect eight distinct directions of motion. A button, called the fire button, is also located somewhere on the device. In games that involve shooting at someone or something — and this is a large portion of the more popular ones — the player uses the fire button as a trigger.

There are at least a dozen variations on the basic joystick design. There are joysticks with the fire button mounted atop the stick as in World War II fighters, joysticks with two fire buttons, joysticks for left-handers, joysticks with molded handgrips, joysticks with automatic-repeat, machine-gun fire buttons and even one baseless joystick with gravity sensors that you can wave through the air in a computer-aided frenzy.

A company called WICO, which makes add-on joysticks, also makes a device known as a trackball. A trackball looks like a small plastic box with the top of a pool cue ball peeking out of a circular opening on the top. A player can indicate the direction in which he wants a screen image to move by spinning the

trackball with the palm of his hand. Because of its design, the trackball can transmit subtle movements better than a joystick. Like the joystick, a trackball designed for use on a Commodore 64 is equipped with a fire button.

Programmers have designed many graphics programs (some are mentioned in Chapter 4) for the Commodore 64 that promise anyone with a modicum of artistic talent the ability to draw veritable masterworks on the monitor screen with a joystick. These claims are slighty exaggerated — even in the hands of a competent artist, a joystick is no substitute for a brush. A trackball, however, is a tool that you can use with these programs.

The easiest drawing device to use is a light pen. Looking rather like a fat pen at the end of a cable, the light pen plugs into the #1 joystick port (the one near the front of the computer). A photocell in the tip of the pen detects the moving dot of light from the monitor screen and provides a timing signal to the Commodore 64 when the spot passes the point on the screen at which you have pointed the tip of the pen. Although light pens plug into the same game-port connector as the joystick, they use special circuitry inside the Commodore 64, so those light pens designed for use with the Commodore are not compatible with the Atari VCS 2600 game systems.

A touchpad is a device that provides a surface on which you can move a stylus, or even your finger, to indicate a location on the monitor screen. One such device, the KoalaPad, is about 5 × 7 inches and comes with a software package to support screen drawing and coloring. Other touchpads are available with surfaces as large as 12 × 24 inches. The Power Pad, from Chalk Board, includes preprinted overlays that permit its use as an input device, game board or teaching tool.

Modems

The word *modem* is a contraction for the words *modulator* and *demodulator.* As the name implies, a modem takes signals representing data from the Commodore 64 and converts them into modulated tones that can be sent over the telephone to another modem, which converts them back into signals that can be used by another computer.

The ability to connect your Commodore 64 to another computer means that you can exchange programs with a friend, send messages via electronic mail or explore the rapidly expanding world of bulletin-board systems and information utilities described in Chapter 4.

Modems come in a variety of types. Acoustically coupled modems have rubber "muffs" that hold the handset of a telephone. Direct-connect modems have plugs that connect the modem directly to the telephone line. Some inexpensive modems are designed to be connected in place of the handset on a modular telephone.

Some direct-connect modems have features called auto-dial and auto-answer. An auto-dial modem can dial a phone number upon instructions from the computer. If a modem is not auto-dial, you must manually dial the phone

number of the computer with which you wish to communicate before connecting the modem to the phone line. The auto-answer feature is useful if you want your computer to be able to answer an incoming call from another computer. This feature comes in handy for such projects as managing a computerized bulletin-board.

If you watch a Commodore 64 that is displaying information as it comes over the phone, you notice that the data appears at a slower pace than when a program simply prints the same text. This transmission-speed differential is due to limitations in the telephone line's ability to transmit data. The unit used to express the data-transfer speed of modems is the baud. At the computer end, a baud corresponds to approximately one bit per second. Normally, sending a character (such as a letter or numeral) requires sending ten bits, including start, stop and error-checking bits. A modem operating at 300 baud is, therefore, sending 30 characters per second; a 1200-baud modem is handling 120 characters per second.

Most 300-baud modems available for the Commodore 64 use an information-transfer protocol known as the Bell 103 standard (named after a Bell Telephone Model 103 modem). The faster 1200-baud modems use the Bell 212A protocol. The two protocols are incompatible, primarily because they use different tone frequencies for data transfer. The 212A modems can also operate in a 103 mode, however.

Exotic applications

Here are two of the other exotic applications of the Commodore 64.

Weather-forecasting sensors

An interesting peripheral for the Commodore 64 is available from Vaisala. Called HAWS, for home automated weather sensor, the device transmits the current temperature, humidity and barometric pressure to your Commodore 64 once every 15 seconds. These readings can then be used either to gather historical data or as an aid in predicting the weather. Priced at less than $200, the HAWS is a unique accessory for your Commodore 64 system.

Shortwave radio

Not all forms of intercomputer communication use the telephone system to link the computers. Kantronics, Microlog, Advanced Electronic Applications, MFJ Enterprises and Heath all manufacture devices called terminal units (TU for short) that connect shortwave receivers to a Commodore 64. With a TU, you can use your machine to receive radio-teletype signals. Special software provided with some of the TUs can also decode the Morse code used by amateur radio operators.

If you happen to be an amateur radio operator, you can also connect your transmitter to the TU and use your computer to send teletype or Morse messages to other amateurs. Using this method, you can swap programs with

another ham on the other side of the world. There are even amateur radio satellites you can use to relay your message from space.

The Radiotap TU from Kantronics not only "listens" to Morse code and normal radio-teletype, but it also changes the order of the bits used to make up each character of the radio-teletype signal. Changing the bit order is a common trick used by corporations and governments to gain some measure of security in their data transmissions. Although classified data and other truly sensitive material is usually encrypted and cannot be deciphered with the Radiotap, bit-order scrambling is often used to lock out the casual listener.

A word of caution on the sort of radio eavesdropping you can do with your Commodore 64, a shortwave receiver and a TU: Many of the signals such a combination of equipment can receive are not "broadcast" signals in the usual sense. These signals are considered "addressed communications" and are protected by law. Section 605 of the Communications Act of 1934 provides penalties for divulging the content of such a transmission to anyone who is not the intended recipient or for making use of such information for personal gain. If the signals originate with a state or local law-enforcement agency, there may also be local laws that limit what you can legally do.

If you want more information about using your Commodore 64 in conjunction with shortwave radio, start by reading the ads in a current copy of *73* magazine or one of the other amateur-radio magazines listed at the end of Appendix A.

Plugging it all together

Even after you've purchased your Commodore 64 and all the additional pieces, you still have to unpack them and plug them all together. Before you set up your computer, think about where to place it. Choose a quiet room with a desk or table that you can devote mostly to the computer. Avoid placing the display (TV or monitor) where there will be glare from a window or a lighting fixture.

If you plan to use the machine for long periods, you may find that raising the monitor a few inches above table height will make it easier to use. A shelf about six or eight inches above the surface of the table will do nicely; you can slide the computer into the space under the shelf when you are not using the machine. Computer stores offer shelves designed especially for this purpose.

Computer desks are also becoming popular items in home-furnishing stores. Some of these desks offer adjustable, multilevel surfaces to support your computer's components, drawers specially designed to hold floppy disks and even a slot in the tabletop to let printer paper flow smoothly from a box hidden beneath the table. Although some of these desks cost more than a "fully loaded" Commodore, many are quite elegant and can overcome domestic objections to "that ugly thing" cluttering up the living room.

Another item to consider is electrical power. Although the Commodore 64 uses less power than a 25-watt light bulb, a complete computer system has quite a few power cords. A typical system will have one for the computer and

one each for the printer, the monitor or TV and the disk drive. Add a desk lamp, and you will find yourself out of electrical outlets in a typical room. The best solution to this problem is a multiple-outlet power strip. An outlet strip with a switch makes a large system easier to control. Regardless of whether you get one with or without a switch, be sure to get one with grounded (3-wire) outlets, and be sure that you plug it into a grounded wall outlet.

Running your computer while it is plugged into an ungrounded (two-hole) socket can cause radio and television interference (static on the radio and blurry, snowy pictures on the television). Using an ungrounded socket can also disrupt your computing. If charges build up in the wrong places because they can't escape through the grounding circuit, you can lose data or programs that are in memory.

Chapter 4

SOFTWARE FOR THE COMMODORE 64

In this chapter we'll look at some software that lets you and your Commodore 64 perform a variety of tasks. Keep in mind, however, that the selection of programs discussed here is a sampling of the thousands of programs available for your machine. Software products are being released every day; just keeping track of new releases takes a lot of time.

How to buy software for a Commodore 64

One of the first considerations in selecting software for your Commodore 64 is whether or not it will run on your machine. Some programs are sold on tape cassettes, some on disks and still others on cartridges that contain read-only memory (ROM) chips. Many times you will find the same program available in more than one form, and occasionally you will find a program that requires the use of both a ROM cartridge and either tape or disk. Check that the medium is compatible with your system.

Programs in ROM cartridges are usually the easiest to use. Slipping a cartridge into the slot on the back of your Commodore 64 is the fastest way to load a program into memory. The Commodore 64's built-in cartridge slot makes cartridge-based software relatively inexpensive to use because you don't have the added expense of a tape player or disk drive.

Programs on cassette tape require a tape player-recorder (also called a tape drive). Less expensive than a disk drive, a tape drive can be agonizingly slow if you want to load large programs or save lots of data.

Floppy disks are the premium medium for Commodore 64 software. Many of the better products for your machine are available only on this medium. Although the Commodore 1541 disk drive for the Commodore 64 is quite slow in comparison to those of many other computers, it still loads programs and saves data substantially faster than a cassette-tape drive.

Which peripherals are required is another major consideration affecting whether or not a program will run on your machine. Sometimes it is not enough to simply have a given device. You must have a specific type or model. Printers are a good example of this problem. Although you can connect almost any printer to a Commodore 64, not all printers will work with all software products. For example, you can't use a daisy-wheel printer to print copies of the Commodore 64's screen graphics. Even some dot-matrix printers present problems because the code that Commodore uses for data transmission to the printer differs from the industry standard in some subtle ways.

If you have doubts about whether a given program will work with a specific peripheral device, ask to see it demonstrated with that device before you purchase the program. At the very least, get the store to agree to let you return the program if it does not work on your machine.

Will it do what I want it to do?

Deciding, before you buy it, whether a piece of software will perform the task you expect of it is a tougher problem than just checking to see if you have the correct hardware configuration. Computers can perform complex tasks, and sometimes the programmers who write complex programs don't always understand the subtleties of the tasks for which they are trying to program. Possibly the programmer simply prefers to handle some tasks in a manner that is different from the way you would handle them. Discovering such discrepancies after you have spent your hard-earned money on a program can be bitterly disappointing. About the only way to protect yourself is to follow the purchasing guidelines we established for buying a computer in Chapter 1. If you follow these suggestions, you will minimize your risk of encountering disappointments:

☐ Make a list of exactly what your needs are.
☐ Study products and tally up how well they meet those needs.
☐ Try to get a demonstration of how a product meets each need before you buy.
☐ Before you make a purchase, find out if training and support are available.

Where to buy software

Deciding where you should buy software can be difficult. Many diverse organizations — ranging from one-person shops operating out of a garage to Fortune 500 companies — are competing for your software dollar. You can usually

purchase any given product at several different places.

If you are purchasing a program that may require some level of support, then you are better off buying it from a computer dealer or a software store. These people depend on you to come back the next time you need software, so the salespeople are usually more than willing to help.

Department stores, discount stores, bookstores and even toy stores are also in the business of selling software. If you are buying a simple game or a product that you already know how to use, you may get a better price at one of these places. Just don't count on much in the way of knowledgeable salespeople.

Purchasing software via mail order is a perilous but occasionally rewarding undertaking. You have no way to check out a program before you buy. Mail-order houses have been known to take your money and run. Even companies with good intentions may not survive long enough to be there when you need support. Rest assured, however. There are reputable mail-order houses from which you can often purchase name-brand products at less-than-retail prices.

Eschewing mail-order buying altogether is safer, but you might miss some great programs. Some original, high-quality software is available only by mail order. Getting shelf space at the software stores is not easy, and some small companies will offer a product by direct mail while they are trying to get the attention of dealers. Publishers of some programs too specialized to interest dealers often have to resort to mail-order distribution, so if you need a program to deal with an unusual problem, you may find yourself with no other supplier. Keep an open mind about mail-order buying. Sometimes it's appropriate; other times, it's not.

What software to buy

Most available software falls into a few broad categories: game programs, educational programs, word-processing packages, spreadsheet programs, home accounting programs, data-base or filing programs, graphics packages and communications programs. What goes into your software library depends, of course, on your personal taste.

Games

The Commodore 64 is a terrific game machine. It offers game programmers many powerful and easily programmed features. These features include 16 colors, a surprisingly powerful sound synthesizer, redefinable characters, a bit-mapped screen option and eight sprites.

The sound synthesizer is actually built onto a single electronic chip, called the SID (sound interface device). This chip can make sounds ranging from a siren to a harpsichord. It works in the same way as does a professional synthesizer: by allowing a program to control the many variables of an electronic vibration. The ability this chip gives the Commodore 64 is beyond that of any other home computer.
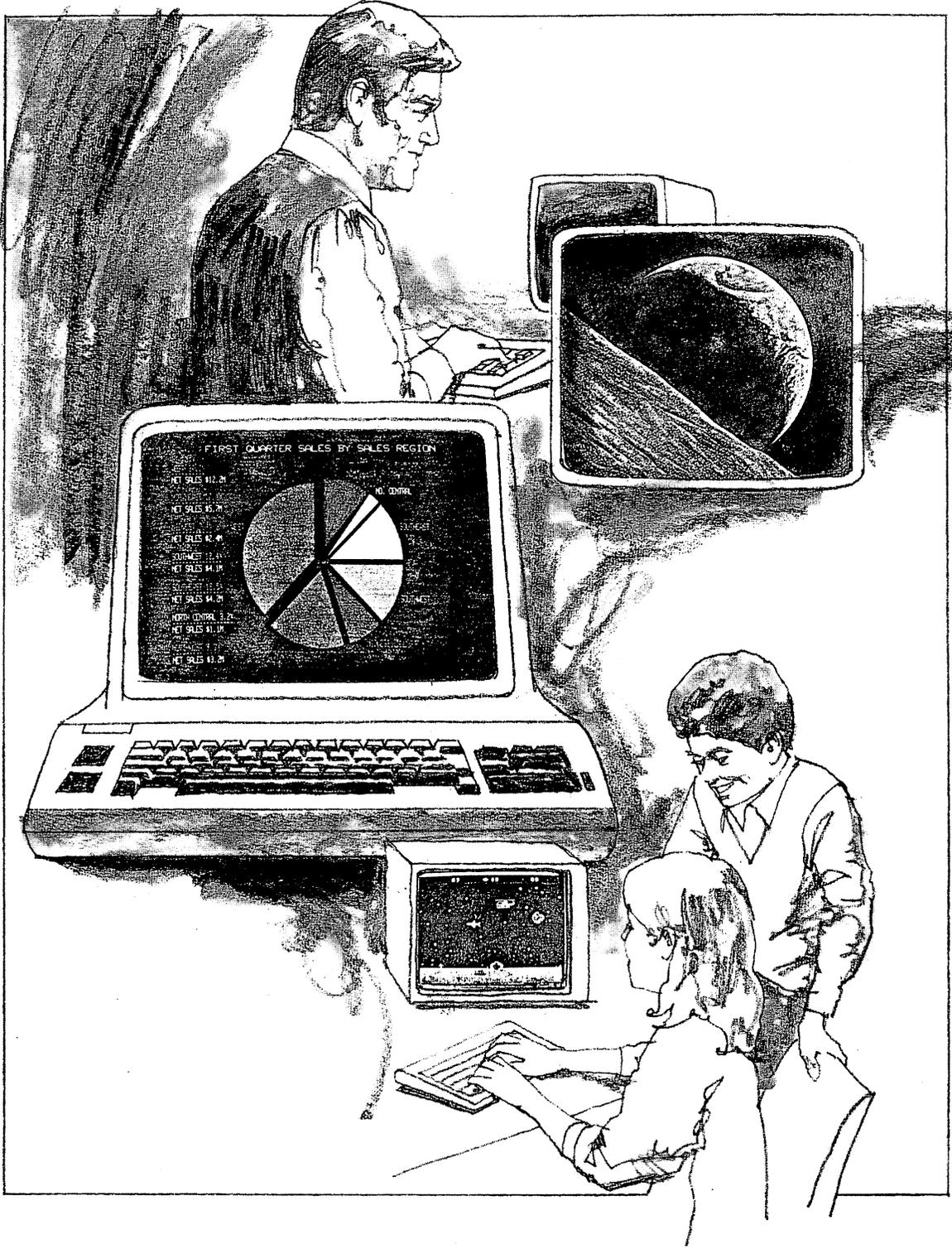
The letters that are printed on the screen by the Commodore 64 are built up out of single dots, in the same way that a dot-matrix printer prints characters. The patterns for these letters are stored in ROM within the Commodore 64. Programmers can also redefine the patterns, so they can have almost any shape printed to the scene. This feature aids in creating the background for games.

There are three basic ways to put images on a screen. One is to use characters (you can redefine them, as we discussed in the paragraph above). Another is to determine every single point individually on the screen; that technique is called bit-mapping. The third is to use sprites. The Commodore 64 offers all three possibilities.

Sprites are movable images. Games often use figures that move around throughout the game. Pac-Man, for instance, is named after the Pac-Man himself, but the game also uses several ghosts. In some computer systems, these sprites have to be built out of multiple characters. The trouble with this method occurs when the programmer has to make the image move. Every character in the image has to be told to move at the same time — in the same direction — and to keep its relationship to the other characters in the image. Such movement takes a lot of computer-processing time and even more programmer-thinking time. Sprites can appear right on top of whatever else is displayed. All a programmer has to do is define the shape and color of the sprite at the beginning of the program and then instruct the computer where to put the sprite. All the rest of the work of actually moving the sprite is done by the computer. Together these features make the Commodore 64 particularly appealing to game programmers.

Here are some of the games with the longest-lasting appeal.

Zork-I by Infocom
The games in the Zork series are text-based adventure games. In these games, you play the part of the hero in a story, and you interact with the computer by giving commands in English sentences. The degree to which these programs can "understand" plain text is nothing short of astounding. In fact, all of the games from Infocom are complex and intriguing. Not for the dabbler, Zork will provide many hours of enjoyment.

Flight Simulator II by Sublogic
This flight simulator provides an out-the-window simulation of a light plane in flight. You can practice take-offs and landings and even get into a World War I-style dogfight. Flight Simulator II makes crashes painless. True light-plane fanatics will also want IFR Flight Simulator by Academy Software. It lacks out-the-window graphics but simulates all of the instruments required for a full instruments-only landing at any of four fog-shrouded airports.

Sargon II by Hayden
This is the classic chess-playing program. A more challenging follow-up to the ground-breaking original Sargon, Sargon II can challenge all but very good human chess players — it plays very serious chess.

Pac-Man by Atarisoft

Atari, the manufacturer of computers that compete directly with the Commodore 64, is also producing software for the Commodore. If you are an arcade-game addict, this program may save you enough quarters to cover the cost of your Commodore 64. Other titles from Atari that should bring the hard-core game-players home include Donkey Kong, Centipede, Dig-Dug, Defender and Robotron:2084.

Educational programs

Teamed with the 1541 disk drive, the Commodore 64 makes an excellent learning computer. It has enough memory to handle most educational software; it has a full-size, complete keyboard; it has BASIC built in; and it is inexpensive.

Computers are exceptionally good at providing instruction. Although even a well-designed, computerized instruction program cannot provide the insight of a human teacher, the computer is always available and is a patient, if not downright stubborn, instructor, with the ability to provide student-paced, programmed instruction with built-in testing.

In this country, there is currently a headlong rush by many people in the educational establishment to place computers in every classroom at nearly every grade level. Although this rush is partially justified by the computer's capability to help with individualized instruction, much of it is ill conceived. Public-school systems are adding "computer literacy" courses to curricula beginning with kindergarten. In at least one California school district, the topic of "debugging" programs appears at the second-grade level. What the course planners fail to recognize is that only a small portion of the students need ever be concerned with programming a computer even though nearly everyone will need to use a computer at one time or another.

This confusion leads to curricula with misplaced emphases. This same California school system does not even offer a touch-typing course until the eighth grade. Pity the junior-high-school typing teachers a few years from now when legions of students hit the classroom with half a decade of two-finger typing experience!

Fortunately, the computer itself can provide a solution to this problem. Touch-typing instruction programs are available for the Commodore 64. Some, such as Master-Type, masquerade as games to seduce youngsters into learning good typing skills. Others, such as Typing Tutor, are more traditional in their approach. Typing Driller not only offers typing instruction but also gives a careful analysis of where students' weaknesses lie and how much progress they are making. If you are not a competent touch-typist, or if you have children in the house, you may want to acquire a program for your Commodore that will teach touch-typing skills. Touch-typing is the single most important skill required to make effective use of a computer.

Touch-Typing Instruction Programs for the Commodore 64

NAME	PUBLISHER	MEDIUM
Kids on Keys	Spinnaker Software	Cartridge
Letter Man	Behavioral Engineering	Disk
Master Type	Scarborough Systems, Inc.	Disk
Type Attack	Sirius Software, Inc.	Disk
Type 'n' Writer	Human Engineered Software	Cartridge
Typing Strategy	Behavioral Engineering	Disk
Typing Tutor + Word Invaders	Academy Software	Disk/Tape

Other educational programs for the Commodore 64 cover the gamut of educational topics. Programs for children include math, spelling and English drills, geography and science tutorials and, of course, a large number of learn-how-to-program courses. Some examples of these latter include the following programs.

Codepro-64, by Systems Management Associates, is a good example of a how-to-program course done on and for the Commodore 64. By the time you've finished this one, either you know how to use your Commodore or you never will.

Roman Numerals, from Creative Equipment, includes a teacher's handbook, student handouts, a cartridge for your Commodore LXIV and a disk for your Commodore MDXLI disk drive.

The Master Math Series, from PMI, is a series of math tutorials on such topics as logs and antilogs, algebra, set theory, areas and volumes. Both tutorial and test problem sets are available.

Language Tutor, from Digital Arts Corporation, offers three levels of instruction in either German or Spanish.

Constellation Quiz, by Gatos International, offers lessons and quizzes in astronomy. This is a good program to follow Commodore's Visible Solar System, which is more introductory in nature.

64-SAT, from Creative Equipment, is a preparation course aimed at improving students' performance on the College Entrance Examination Board's Scholastic Aptitude Test.

If you are a teacher, Easyquiz 64 by Commodore, Multiple Choice by Midwest Software and Quizmaster by the Raymack Software Group offer the ability to create and administer quizzes, either on the screen or on paper, for any subject you choose.

Perhaps the granddaddy of all collections of educational programs is a package rather ambiguously titled 64 Public Domain Software from Commodore. It consists of more than 600 programs on 52 disks. Intended primarily for schools, the collection was originally offered as a single set but is now becoming available in smaller packages from Commodore dealers. Topics include math, science, English and foreign languages, along with some software designed for demonstration and administrative purposes.

Some other companies offering collections of educational programs for the Commodore 64 include the following: Useful Software, of Scarsdale, New York; Micrograms, Inc., of Loves Park, Illinois; Microphys Programs, of Brooklyn, New York; Rees Software Laboratories, of Cucamonga, California; Programmer's Institute, of Chapel Hill, North Carolina; and Daybreak Software, of Baldwin, New York.

Grown-ups' educational programs

With the exception of the simple math-drill sorts of programs, many of the educational programs aimed at school-age users are equally well suited to adults. Another class of program is available, however. These could be broadly classed as "self-improvement" programs, such as foreign-language training or behavior modification. There are also some more esoteric offerings in this self-improvement category.

Psycom Software International of Cincinnati offers a pair of products aimed at self-analysis. The Personality Analyzer, designed to analyze personality type, career potential and behavior tendencies, attempts to predict the type of people with which the program's user is most "compatible." The Hypnotist is a behavior-modification program that uses a biofeedback device and software to attempt to effect changes in behavior patterns through what Psycom calls "computer hypnosis."

Stimutech offers a hardware and software combination that connects to a television set and your Commodore 64. It uses the computer and special hardware to insert subliminal messages into regular television programs or videotapes. According to Stimutech, these messages, indiscernible to your conscious mind, influence your behavior by interacting directly with your subconscious mind. Stimutech's subliminal "courses" concern weight control, smoking deterrence, stress control, positive thinking, memory improvement, better study habits and sexual confidence.

Practicorp International publishes a program called Total Health that monitors your food intake and exercise habits, analyzes changes and plots the effects of various eating and exercise programs. It even calculates an estimate of the number of days required to reach a given weight goal for any particular program.

Word processing

Editing text is a task that small computers can perform with aplomb. Most of the earliest text editors were designed by programmers for use in writing programs. Because computer programs don't look much like regular text, these text editors were often highly specialized and sometimes difficult to use.

Many people began to associate the words *text editor* with something arcane and difficult to master. When easy-to-use text editors became available, they were called word-processing programs to distinguish them from the editors designed for working on programs. With the addition of features such as special page formatting, page numbering and even spelling and grammar checking, the name became more appropriate.

If you own a printer for your Commodore 64, then a word-processing package is an absolute necessity. Be warned, however: Once you begin to use computer-based word processing, you will never again be satisfied with a mere typewriter. The ease with which you can rearrange words, sentences and even whole pages makes revisions almost fun. The speed with which you can reprint a letter or other document also means that you can afford to take the time to fix a typo that you would either ignore or fix with pen and ink rather than retype the whole document.

Because of the 40-character line length on the display screen, the Commodore is not ideally suited to be a full-time word-processing machine in an office, but it is completely satisfactory for personal and light business use. Hardware devices are available that will modify the operation of the Commodore 64 to produce 80-character lines. Unfortunately, the television sets and color monitors that are commonly used with a Commodore don't display 80 characters crisply. Using a monochrome monitor and an 80-column display adapter for word processing is an option.

Some clever software authors have designed word-processing software that can run on a Commodore 64 with no additional hardware. The Mirage Concepts Word Processor is an example of such a program. The Mirage system displays the text in either of two modes. First you use a normal 40-character-per-line display for entering text and performing most editing functions. By pressing the F8 key on the right side of the keyboard, you can reach a second mode where you can reformat and display the text in 80-character lines. Although the 80-column mode is only marginally readable on a color monitor and even less clear on a television set, it does provide you with a way to see how your page will look when it is printed.

The Mirage Word Processor uses some command codes to manipulate text that match those used by WordStar, a popular word processor for CP/M systems and IBM personal computers. If you use one of these systems at the office, the Mirage system is a good word-processing choice for use at home. You won't have different keystroke sequences to remember.

The EasyScript word-processing package from Commodore offers another approach to solving the line-length problem. This program scrolls the text

horizontally across the screen. The effect is somewhat like reading a book through a magnifying glass and takes a bit of getting used to.

Homeword, from Sierra On-Line, uses a novel, third method of showing you how your page will look. In one corner of the screen is a small cartoon image — an icon — of a typewritten page. Your text is displayed on this page as a series of lines. The program uses the 40-column-display mode to show you what you have typed and the cartoon to show you where it will be placed on the page. Both the full text and the cartoon are always visible. Homeword is also interesting because of its menu system, which lets you use a joystick or other pointing device to select program functions from a menu of cartoons.

How do you choose the "right" word processor? Much like choosing a computer, it is mostly a matter of listing your needs and then looking at what's available. When you make your list of needs, be sure to consider each of the following questions:

1. Do you need special text-formatting features such as two-column printing for newsletters?

2. Do you need a spelling checker?

3. Do you want to merge names from a mailing list to make form letters? (This is usually called a mail-merge feature.)

4. Do you already use a word processor at the office? If so, do you want to learn a different command set for use at home?

5. Do you have a disk drive for your Commodore 64 system? If not, do you want to add one just for word processing? Word processors that do not require a disk drive are available. If you select one, be sure it lets you save text files on disk in case you buy a disk drive later.

6. Will the word processor work with your printer? Most good word processors work with several different printers. Make sure your printer is on the list before you purchase your word processor. If you can, buy your word processor and your printer at the same time.

7. Will you want to exchange text files with anyone else? Keep in mind that text-file formats sometimes differ between word processors. You may not be able to edit a file written by someone using a different word processor.

8. How long is the average document you will write? If you plan to use your word processor mostly to dash off quick, half-page memos, it may take longer to load a large word-processing program from tape than it takes to write and print the memo. Consider a ROM-cartridge-based program for this kind of use.

On the other hand, if you are planning to write a book, your needs are different. In that case, make sure that the program you choose can string together several files — one for each chapter, perhaps — and then number the pages of the whole document when it prints. This feature is usually called file-linking or document-linking.

Word Processors for the Commodore 64

Although this is not an exhaustive list of the word processors that run on the Commodore 64, it does indicate the variety of word-processing products currently available.

NAME/PUBLISHER	MEDIUM	SPECIAL FEATURES
Bank Street Writer Broderbund Software	Disk	Links multiple documents
Blitztext Elcomp Publishing	Disk/Tape	Links files on multiple disks
EasyScript Commodore	Disk/Tape	Horizontal scrolling; add-on spelling checker
OmniWriter 64 Human Engineered Software	Disk	OmniSpell included
Homeword Sierra On-Line	Disk	Icon-based operation
Mirage Concepts WP Mirage Concepts	Disk	40/80-column display; add-on spelling checker and data-base software
PaperClip Batteries Included	Disk/Tape	Advanced editing capabilities
Script 64 Richvale Telecommunications	Disk	40/80-column display
Super-Text Muse Software	Disk	40/80-column display
Professional Bonus Pak TOTL Software, Inc.	Disk/Tape	Add-on mail-merge and spelling checker
Word Machine Commodore	Disk	Inexpensive mail-merge program
Word Manager Data 20 Corp.	Disk/Tape	Free with purchase of 80-column hardware
WordPro 3 Plus/64 Professional Software	Disk	Spelling checker included
WordPro 1 Plus/64 Professional Software	Tape	WordPro 3's little brother
Write Now Cardco	Cartridge	Arabic or Roman page numbers

Spreadsheets

If there is a personal computer anywhere that has never been used for word processing, the owner probably uses it exclusively to run a spreadsheet program. A spreadsheet program is the software replacement for the two-foot-wide columnar pads accountants use to keep track of everything. The spreadsheet program performs the same functions as the pad except that it can automatically add or subtract rows, columns or single entries on the sheet.

If you have ever had to make up a budget, submit an expense report, file a tax return or figure out how you managed to overdraw your checking account, a spreadsheet could prove a useful tool for you. The arithmetical counterpart to a word processor, spreadsheets are among the programs that are a fundamental part of many software libraries. If you own a Commodore 64 and don't have a spreadsheet program, you are ignoring one of the machine's most useful capabilities.

Like a word processor, the primary strength of a spreadsheet is its ability to make quick revisions of large amounts of data. Data in a spreadsheet is organized into areas called cells; each cell marks the intersection of a row and a column. In most spreadsheets, numbers designate rows and letters designate the columns. A number and a letter together identify each cell. Each cell displays a number (or perhaps a word or phrase). What is actually stored in the cell may be either the number or a formula for calculating the number that is displayed. Formulas may contain references to other cells. For example, an instruction on a tax form that reads "Add lines 3 through 7 and subtract from line 2. Put the result on line 8" could be represented by placing the following formula in cell B8:

$$B2 - (B3 + B4 + B5 + B6 + B7)$$

The result appears in cell B8, and any time you change the contents of cell B2 or any of the other cells referenced in the formula, the number displayed in cell B8 changes. (In this example, the numbers went into column B because column A will contain labels describing the contents of each line.)

This process of filling a spreadsheet with the formulas that define a problem and then adding the numbers later is called building a model.

Another name for a predefined spreadsheet form is "template." For example, an engineering-cost-estimate template will already have both the cost factors and the formulas that relate those factors to the final cost built into the spreadsheet. If you own the spreadsheet program, all you have to do is load the template, type in the particular values for your application and read the answer.

Although the number of spreadsheet programs available for the Commodore 64 is smaller than the number of word processors, making your selection isn't much easier. The questions on your needs list should include:

1. How large a model do you need? (Spreadsheets differ in the number of rows and columns you can put in a single model.)

2. Do you need to link together multiple models? (Only the most advanced spreadsheets for the Commodore 64 can perform this trick.)

3. Will the spreadsheet work with your printer? (If your printer can print in a condensed-print mode, you will probably want to use this feature when you print a large spreadsheet. Make sure that the spreadsheet program you select can take advantage of this feature on your printer.)

Spreadsheets for the Commodore 64

NAME/PUBLISHER	MEDIUM	SPECIAL FEATURES
Busicalc Skyles Electric Works	Disk	Three versions; optional graph and chart package
Calc Result Handic Software, Inc.	Cartridge/ Disk	Multiple spreadsheets
Easy Calc Commodore	Cartridge	Same program as Calc Result, Easy Version
Multiplan Human Engineered Software	Disk	Multiple spreadsheets; originated by Microsoft
OmniCalc Human Engineered Software	Disk	Includes graphing program
PractiCalc 64 Practicorp International	Disk/Tape	Searching and sorting
PS: Computer Software Associates	Disk	Programmable spreadsheet

Home accounting

Most home-accounting packages are based on the premise that you can run a household much as you run a business. You have accounts payable, in the form of monthly bills, and at least one account receivable, in the form of a paycheck. Most of the home-accounting packages offer more budgeting features than you find in typical business-accounting software. Some even attempt to provide summary data that will be of use when tax time rolls around each year.

Other programs keep your check records organized and balanced. There are even software packages to help you decide what sort of investment will bring you the most return.

Data-base/filing systems

The term *data base* is one that is widely misused in the world of microcomputer software. Originally a bit of jargon from the mainframe-computer industry, the

data base is a central filing system and access control mechanism that all of the programs running on a given computer use to fetch and store information. Owing to the rampant hyperbole that accompanies the mass marketing of technology, the term is now being applied to almost any program that manages files of data, particularly those that make even the merest pretense of being "general purpose."

The usefulness of data-base programs and file managers for the Commodore 64 is limited by the storage capacity of the diskette used in the Commodore 1541 disk drive. One diskette holds only about 170,000 characters. Although this sounds like a lot of space, it fills up rapidly when you start storing data.

For example, most Commodore 64 users only have a single disk drive, which means they must often keep both programs and data files (such as word-processing information) on the same disk. Just a few programs — for example, a word processor and a file manager — can take up 40-50K. Some programs, such as spelling-checker dictionaries, can fill 100K. Assume that you have assigned 50K of a disk to programs. That leaves about 120K. Most word-processing programs make both an active file and a backup-copy file on the same disk, which gives you some protection in case one of the files becomes unreadable. That means you can really only have 60K worth of active files on the disk. Even that is risky because disks are less reliable when you entirely fill the disk space. You might enter more text than can be stored in the remaining disk space. Unless your software provides a way for you to save your extra text on another disk, you may lose what you have written.

So, at this point, with programs, backups and safety margin accounted for, you may have only 50K in which to store text files. That 50K represents about 25 pages of text. A few letters, a memo and a short term paper would completely fill that area. If you were writing a 60-page paper, you might have to switch back and forth between three different disks.

Regardless of the Commodore 64's storage limitations, a file manager (a limited type of data base) is a useful tool for storing a large number of records (individual, structured chunks of information) that contain similar information. Individual systems differ somewhat in operation, but the typical file manager requires you to define a record format before you begin storing. A typical record in a Cub Scout pack roster might look like this:

Name: Johnny Doe
Address: 1234 Main Street
City/St: Anytown, Somestate 12345
Phone: 234-5678
Parents: John & Jane
Rank: Bear
Den: 3
Summer Camp: Yes

In setting up the system, you would have to specify the maximum length for data for each field of the record. (A field, in this example, is the same as a line.)

In a typical data-base system, you would have a record like this for each Cub Scout in the troop. You would then be able to use the report-generation portion of the data-base program to print lists of all of the scouts in each den or of all the Bears who are not planning to attend summer camp or any other selected subset of the pack.

Graphics packages

Because the Commodore 64 is designed to present colorful images on the screen, many software packages have sprung up to use this capability. Graphics packages for the Commodore 64 fall into two fairly distinct categories — business graphics and screen drawing.

Business-graphics packages are usually, but not always, accessories to spreadsheet programs. You use them to make bar graphs, line graphs and pie charts from the data in the spreadsheet model. Screen-drawing programs are like software sketchbooks for producing free-form graphics. With the typical screen-drawing program, you need a pointing device such as a joystick or a light pen to manipulate images on the screen. Many screen-drawing programs are sold with pointing-device hardware of one sort or another.

Commodore 64 Screen-Drawing Software

NAME/PUBLISHER	MEDIUM	POINTING DEVICE	FEATURES
64 Panorama Midwest Micro	Disk/Tape	Joystick	Preloaded pictures
Coloring Book Koala Technologies	Disk	KoalaPad	Predrawn designs
Flexidraw 3 Inkwell Systems	Disk	Light pen	Pen included
Paint Brush Human Engineered Software	Disk/Tape	Joystick	Fill feature included
Paint Magic Datamost	Disk	Joystick	Automatic circles
Scribbler Syntax Software	Tape	Joystick	Multicolor and Magnify modes

Communications

In addition to functioning as a capable home computer, the Commodore 64 can serve as your terminal in a worldwide, computer-based communications network. The resources of some of the nation's largest information-gathering organizations are at your disposal.

You can use your Commodore 64 to send messages directly to other computer owners, send mail to anyone in the country or send messages via the Western Union telex network to businesses anywhere in the world. In fact, with the communications capability of the Commodore 64, you can book travel reservations and buy various items without leaving your home.

What do you need to do all of these things? A modem and a bit of software. Modems, described in Chapter 3, are devices for connecting your computer to a telephone. The software you'll need is known generically as a terminal program. Terminal programs are available from several sources and vary considerably in capability.

A simple terminal program takes characters typed at the keyboard and sends them over the phone line to the computer at the other end. Characters arriving over the phone line from the other computer to your Commodore 64 are displayed on your screen. Terminal programs of this ilk are usually called dumb-terminal emulators. One or two of these often reside in every users' group or computer-club library. Most modems made specifically for Commodore computers come with at least a simple terminal program.

Smart-terminal emulators also handle the transfer of characters to and from the other computer, but they can perform several additional tasks as well. They can "buffer" characters; that is, they can capture characters as they come from the other computer and store them in the memory of the Commodore 64. Then, at your convenience, you can print, save to disk or tape or simply redisplay the "buffered" text on your screen.

Some of the packages emulate the control codes (part of the internal software) of terminals commonly used on larger computers. You can use these control codes for clearing the screen and positioning text at a particular spot on the screen. For instance, SuperTerm, from Midwest Micro, can use the same control codes as the popular DEC VT-100 terminal. This feature permits you to use your Commodore 64 as a terminal on large, commercial computer systems.

Information utilities

Information utilities are large computer systems that serve as storage locations for large amounts of information. These systems are connected to communications networks that permit hundreds of users to gain access to the stored information simultaneously. These networks have entry points (called nodes) scattered throughout the country. You connect your Commodore 64 to the network by calling the number of the local node and then connecting your modem to the phone line when the computer answers with a high-pitched tone.

Specific instructions for connection to each information utility are included with the package of instructions that you get when you sign on as a customer. Also included will be a list of the telephone numbers for that network's nodes. If you live in a metropolitan area, there is probably a node within your local-calling radius.

If there is, you need not pay for a long-distance telephone call, even though

ultimately you may be communicating with a computer located on the other side of the continent. You will, of course, be billed for the local call, as well as for the fees that the information utility charges for the use.

The utilities maintain large staffs who are responsible for editing and updating the information. Many of the utilities have access to the computer data files of big-city newspapers or wire services as well. Many small, specialized, information services are also available on the utilities.

Let's take a look at some specific information utilities and what they have to offer.

CompuServe

CompuServe was one of the first information utilities to offer services to the home-computer owner. CompuServe is of special interest to Commodore 64 owners because of a service called the Commodore SIG (special-interest group). The Commodore SIG permits owners of Commodore 64s to compare notes on technical problems, swap programs and exchange information of mutual interest. The Commodore SIG is especially significant because it provides direct access to technical experts who are employees of Commodore. This SIG provides one of the fastest ways to get accurate technical information about the Commodore 64.

Other services offered by CompuServe include news from the Associated Press, the *Washington Post* and the *St. Louis Post-Dispatch*, and stock-price information from Value-Line, MicroQuote and QuickQuote. With CompuServe you have access to commodities-trading information, worldwide weather forecasts, electronic banking, on-line purchasing from Comp-U-Store and Heathkit, complete airline schedules, airline ticketing, hotel reservations and hundreds of other services.

Getting started on CompuServe is as simple as buying any other accessory for your Commodore 64. Your computer dealer has a box labeled "CompuServe Starter Kit."

This kit contains an introductory manual with instructions for calling the system. A complete list of the telephone numbers used to access the utility and a sealed packet containing your user identification number and a temporary secret password are also enclosed in the kit.

Included with the starter kit are five hours of connect time — more than enough time to familiarize yourself with the utility. Once you have used the system a bit, you can sign up as a regular user and CompuServe will send you a permanent password.

CompuServe also offers an excellent terminal program called Vidtex that is specially tailored for the CompuServe system. It has facilities for transferring software from the CompuServe computer to your Commodore 64. The Commodore SIG contains hundreds of programs for your machine, including all of the example programs from the *Commodore 64 User's Manual* and the *Commodore 64 Programmer's Reference Guide*. You can order Vidtex from CompuServe online.

The Source

The Source is CompuServe's largest competitor. Services on The Source include the ability to send electronic-mail messages to other computer users who subscribe to The Source (even if they don't own Commodore 64s). You simply compose your message in the same way as you would if you were writing a letter on your Commodore 64.

Instead of printing the letter on paper, you instruct The Source's computer to send it to one or more other subscribers. The next time the person to whom you sent the message uses The Source, that person will get a message telling him he has mail waiting.

If you want to use your computer and The Source to send a message to someone who does not have a computer, you can send Western Union Mailgrams and Postal Service ECOM electronic first-class mail. These services let you send your message over the network to a city near the recipient. There it is printed on a special form and forwarded by first-class mail, usually arriving the next day.

News services on The Source include United Press International and *The U.S. News & World Report Washington Letter.* Financial news includes the *Raylux Financial Reports,* as well as daily trading activity and historic stock data.

All in all, The Source offers more than 800 different services, each only a phone call away. Like CompuServe, The Source offers a starter kit that you can purchase from most Commodore dealers.

Dow Jones Information Services

An information utility for serious investors, Dow Jones Information Services offers stock quotes (delayed 15 minutes) as well as in-depth news coverage from the data banks of *The Wall Street Journal.* Current stock quotes for common and preferred stocks and warrants, corporate and foreign bonds, mutual funds, U.S. Treasury issues and options are all available online.

Historical quotes are available for stocks with monthly and quarterly summaries going as far back as 1979. To aid in market-related research, some company reports and Securities and Exchange Commission filings are available online. This information service has detailed corporate financial information on more than 3200 companies as well as consensus-earnings forecasts for 2400 companies compiled from the research of more than 1000 analysts at 45 major brokerage firms.

News services include highlights of *The Wall Street Journal* and the ability to retrieve stories as recent as 90 seconds old and as old as 90 days. The results of weekly economic surveys compiled from more than 40 of the nation's largest financial institutions are available, as are transcripts of the PBS television series "Wall Street Week."

The Dow Jones Information Service also includes a number of nonfinancial offerings that are of interest to Commodore 64 owners. The most notable of these is the *American Academic Encyclopedia.* Consisting of more than

28,000 articles, this on-line encyclopedia is continually updated to ensure continuing accuracy. This feature is of particular interest to students and others who find that traditional printed encyclopedias are often of little value in researching current events and other topical data.

Bulletin boards

On-line information services are not limited to large commercial systems. Many individuals and clubs have microcomputers serving as small-scale information utilities. These systems are called bulletin boards. There are a large number of bulletin-board systems in the country. The last unofficial estimate put the count at something over 400 nationwide.

The computer stores in your area will know about at least a few of the local bulletin-board systems. Often by logging onto one of them, you can find information about others in the area. Computer clubs and users' groups often run computer bulletin-board systems. These bulletin boards are a good source of valuable technical information for beginning computerists. Some have a mechanism for leaving a question for one of the local microcomputer wizards, who can leave an answer for you to pick up the next time you call the system. There is normally no charge (other than the cost of a phone call) for using a bulletin board, although some are run on a members-only basis.

There are some basic rules of courtesy you should observe if you are planning to use a bulletin-board system. The first rule is to check out a new bulletin-board phone number during the day. If you call a new number, especially one acquired "through the grapevine," during a late-night computing session, you may wake some poor, unsuspecting person out of a sound sleep.

The second rule is to be absolutely sure that the computer you are calling is one intended for public use. In recent years, several incidents have come to light that involve young computerists invading the computer systems of private institutions and government agencies. Although most systems have some method of limiting unauthorized access, some of these security checks are absurdly easy to bypass. Be wary of a phone number acquired at a users' group meeting that is accompanied by a password.

The attention some of the more spectacular cases have attracted in the national media has prompted reaction from many state and federal legislators. Several states have hastily drawn up legislation. Some of these laws provide severe penalties for unauthorized use of a computer.

Don't let this situation keep you from exploring the multitude of bulletin-board systems, but if you call a new number and are asked for a password, you've stumbled upon a nonpublic system.

Free and almost free software

In addition to the overwhelming array of commercial software available for your Commodore, there is also a large body of what is known as public-domain

software — software you are legally allowed to copy and use. Such software is placed in the public domain by authors who choose to share their creations.

Some software is in the public domain because it was developed with public funds supplied by the federal government. Relatively little Commodore 64 software falls into this category, however. The category of "almost free" software includes software available on the commercial information networks that you can "download" into your computer from the networks' computers. CompuServe, for example, offers several hundred programs of this type for the Commodore 64. You pay only for the connect time, not for the program itself; software acquired in this manner can be remarkably cheap.

Another source of free, or nearly free, software is your local Commodore 64 users' group. Nearly every corner of the country has at least one such group, and most large cities have several. A users' group is nothing more than a group of people who all have similar computers and who meet on occasion to trade programs and technical information.

The dealer who sold you your Commodore 64 is almost sure to know of any local users' groups.

The software you will find at a users' group is usually written by the members of the group and contributed to a common library. This library is usually made available to members who then copy programs onto their own disks or tapes. Although some of the programs in these libraries are overly simple and amateurish, some programs are equal to or better than commercially available programs. This situation is especially true for programs that handle a highly specialized task that may not attract the attention of commercial software developers, who choose their projects with an eye toward the size of the potential market. Sometimes you can even find a prerelease copy of a forthcoming commercial product in a users' group library because a software author needs to test users' reactions to design ideas before the final design is chosen.

The drawback to sophisticated software from a users' group library is that it seldom comes with adequate documentation. If you can live with what little you get, though, you'll find some real gems in the average club's collection of programs. Don't dismiss the small simple programs in a users' group library. They often provide a keen insight into the operation of some obscure hardware or software function of the Commodore 64, or show you a novel way to use a feature that you already knew about.

WRITING
YOUR OWN
SOFTWARE

Sooner or later, you will get the urge to write your own software to perform some special task. Resist the urge. Few human activities can consume so much time, with so little apparent progress, as developing software. Software development is the domain of the mad. Those who are not daft when they begin are sure to be daft when they finish.

And why should you risk such a fate? Commercially developed software is cheap! Consider that a good-quality program that sells for $50 to $100 took perhaps 500 hours to write, 300 more to thoroughly test and debug and another hundred or two to document. This means that you can buy a packaged product for something like ten cents per hour of development time. Except for the Commodore 64 itself, there aren't many bargains like that left. Last but not least, when something in purchased software does fail, there is (usually) somebody to whom you can complain.

When you do write your own

Couldn't talk you out of it? Well, be warned. In addition to all of those other problems, programming computers is addictive. It's quite a feeling to see the last bug bite the dust and watch your creation perform the way you planned. Besides, there are some legitimate reasons for developing your own software:

1. The program you want isn't available commercially. This is perhaps the only valid reason for embarking upon such a time-consuming exercise as software development.

2. You have a unique approach to using a Commodore 64 for solving a common problem.

3. You intend to market the result and become rich and famous. Well, if reason 1 applies and you're absolutely sure about 2, then you might just make it — except for the rich and famous part.

4. You're just slightly mad and want to do it for the sheer joy of it. The next problem confronting you once you've made the decision to ignore all our sage advice about developing software is to choose a programming language. Just because the Commodore 64 comes with BASIC built into the machine doesn't mean that BASIC is your only choice.

5. You've copied everything you could find from your users' group library and want to contribute something in return.

Currently the predominant language in the microcomputer world, BASIC was developed in the 60s at Dartmouth College by Professors John Kemeny and Thomas Kurtz. The name is an acronym for beginner's all-purpose symbolic instruction code. BASIC is relatively easy to learn and offers sufficient power and flexibility to accomplish small- to medium-size tasks. Because most elementary and secondary schools with computers now teach BASIC, it probably will remain the dominant small-machine language for some time.

BASIC programs are organized into lines. These lines constitute simple lists of operations. One or more elementary operations are performed by each line of a program. Each line is numbered; you use these numbers to control the flow of the program.

You don't have to stick to the BASIC that is built into the Commodore 64. You can buy other BASICs, load them into your Commodore 64 and then write programs with them. They will be similar to Commodore BASIC, but they will often add more graphics and disk-control commands. Computer languages are actually just complicated computer programs. They accept "programs" that you type in, interpret those programs according to the language rules and then instruct the computer to follow the program's dictates. Anyone with enough experience can write a computer language. Just as you write any other program, you could write a BASIC. But it is far easier to *buy* a good language program and then use it to write whatever specialized application programs you need than to write your own language.

BASIC isn't the only language available for the Commodore 64. Others include Logo, PILOT, Pascal, C and Forth.

Logo

Developed by MIT Professor Seymour Papert, Logo is a language specially designed to teach children how to use computers. You build Logo programs by defining a simple task and then using the newly defined operation as a primitive element in a more complex task. This process makes Logo what is called an "extensible" language.

Logo features easy-to-use turtle graphics in which you instruct the image of a turtle (or a cursor called a turtle) to move about the screen, dragging his "tail" to leave marks in the phosphorescent sand. Also available are robot turtles — dome-shaped, wheeled robots that obey turtle-graphics commands. A robot turtle can scurry around the floor drawing on large sheets of paper with its computer-controlled tail. For a fascinating look at Papert's ideas about children, learning and computers, take the time to read his book *Mindstorms.* Commodore offers its own version of Logo for the Commodore 64.

PILOT

PILOT is a language specially designed for creating computer-aided instructions. It supports fast-paced, question-and-answer interaction between the program and the student. Versions of PILOT for the Commodore 64 are available from Tamarack Software as well as from Commodore.

Pascal

Pascal is a language developed specifically for teaching people how to program computers. Many universities have adopted it as the primary language for computer instruction. Learning Pascal, therefore, may be important to you if you wish to use your Commodore 64 to get an educational head start. The Scholastic Aptitude Test (SAT) advanced-placement test in computer science refers to Pascal exclusively. If you are a high-school student in a district where BASIC is the only computer language taught, a self-study program built around Pascal and the Commodore 64 may be the only way to score well on the test. Abacus Software has produced a Pascal compiler for the Commodore 64.

Forth

Forth is quite different from other languages available for the Commodore 64 home computer. Programming in Forth is a matter of defining words. The Forth language consists of a vocabulary of about 150 words. You use these words to define new words, which are added to the vocabulary. You can then use these newly defined words to define additional words. Eventually this successive-definition process results in a single word that is the finished program.

Just as the numbered line is the fundamental building block in BASIC, the word definitions (called colon definitions because each begins with a colon and ends with a semicolon) are the building blocks in Forth. Because there is no structural difference between a word that is an entire program and a word that is a simple operation, it is possible to incorporate entire programs as elements in other programs.

No fewer than six different versions of Forth are available for the Commodore 64. Most of these are based upon a Forth dialect known as FIG-Forth, developed by FIG, the Forth Interest Group, based near San Francisco.

COBOL

COBOL, an acronym for common business-oriented language, is the language used by large corporate and government data-processing departments on large computers. COBOL is designed explicitly for commercial data processing and is not commonly used on microcomputers such as the Commodore 64. Learning COBOL may be important, however, for someone considering a career in commercial data processing. A version named Nevada COBOL is suitable for instructional and demonstration purposes. Nevada COBOL runs on the Commodore 64 and is available from Commodore.

Assembly language

If you have to produce a program that will run as fast as possible in the smallest possible memory space, there is only one possible language in which to write it: machine language. Machine language is the string of ones and zeros that are actually understood by the 6502 microprocessor chip, which is the heart of the Commodore 64.

Because it is difficult for a human to write a program as a sequence of ones and zeros, a language called assembly language has been developed. In assembly language, the operations that the microprocessor is capable of performing directly (such as adding) are represented by easy-to-remember codes, called mnemonics. A program composed of a sequence of these mnemonics is "assembled" into the requisite sequence of ones and zeros by a program called an assembler.

Several assemblers are available for the Commodore. One of them, Develop-64, by a company with the improbable name of French Silk, is accompanied by a manual entitled *Inside the Commodore 64*, which not only explains how to use the assembler but also does a thorough job of explaining how to manipulate the internal elements of the computer.

A final note

Now that you've learned the jargon and know enough about hardware and software to defend yourself, you can begin your own adventures with your Commodore 64. Unless a store near you is offering a bargain package deal on an entire system, start with a simple computer configuration. A good initial setup is the Commodore 64, a 1541 disk drive and, if you can't commandeer the family television set, a monitor. Take a little time to get to know your machine, and then start adding more peripherals; a modem and printer are the next ones to consider. After that, the number of exotic peripherals and software packages you're likely to add to your Commodore 64 system will be limited only by your budget.

On the pages that follow are reviews of some hardware and software products for your Commodore 64. Remember, too, that new products arrive in the marketplace daily. If you carefully choose new software and hardware add-ons, your Commodore 64 system will remain current and useful for years to come.

Part 2

REVIEWS

InfoWorld *instituted its product-review process at the magazine's birth in early 1980. Since then,* InfoWorld *software and hardware reviews have gained a reputation as accurate, objective evaluations of microcomputer products. Products are evaluated by independent reviewers, who work closely with* InfoWorld. *A list of reviewers who wrote the product evaluations in this book follows these guidelines. To permit easy comparison of products, all product reviews follow a similar format. The format is based on a Report Card, which we print with each review.*

To help you understand our evaluation process, we're summarizing the criteria our reviewers use to evaluate products. We apply a different set of guidelines to software and hardware products, but our overall goal is to enable our readers to make informed decisions about buying hardware and software products.

The products reviewed in this book represent a sampling of the myriad products available for the Commodore 64.

Software-review guidelines

In reviewing software products, our reviewers consider the following areas:

Features.   *Reviewers describe what the product does and how it does it. They consider factual information about the product, then provide the information readers need to decide whether the product is appropriate to the task they have in mind.*

Performance.   *Here, reviewers assess how well a product performs its intended task. They determine who the intended user of the product is, what his or her needs are and how well the products fulfills those needs. Reviewers also measure the manufacturer's claims for the product against its actual performance. A product should perform its intended tasks in a reasonable amount of time, and reviewers assess the product's relative speed.*

Ease of use.   *Ease of use comprises three categories: ease of installation, ease of learning and ease of operation.*

Ease of installation deals with the degree of difficulty a user will encounter setting up a program for the first time.

Ease of learning examines the degree of difficulty inexperienced users of the program will encounter when they employ the product.

Ease of operation explores the general level of complexity involved in continued use of the product.

Reviewers consider these three categories to give an overall rating to the product in the Ease of Use category.

Error handling. *Any good program should be able to routinely handle incorrect input and other mistakes without damaging data or causing undue difficulty. Any time a user tries to make an irrevocable change, for example, the program should ask for confirmation of the change. In addition, the program should be set up to prevent or minimize loss of data in the event of a power failure or the failure of some piece of hardware. Reviewers assess how well the program prevents and deals with errors.*

Documentation. *Documentation for computer products has a reputation for being awful. Reviewers rate documentation based on its conciseness, clarity and readability. The primary consideration of a product manual's usefulness is whether it is written so that anyone can understand it. If appropriate, reviewers also evaluate the existence and effectiveness of a product's "on-line" documentation (information the program provides on the computer's screen). In any case, if you have to be a technician to comprehend the document, its value is minimal.*

Support. *Although this area does not receive a grade, reviewers note in the review what customers can expect for support from the company.*

You'll notice that we have grouped the products reviewed into general categories. Some products may appropriately fit into other categories, but we've tried to put each product into its most relevant area.

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Hardware-review guidelines

In reviewing peripherals, our reviewers consider the following areas:

Features. *Same as software.*

Setup. *Some equipment is more difficult than other equipment to set up. In any case, reviewers discuss what users have to do to set the product up for use. They evaluate the clarity of setup instructions and tell readers whether all the components for setup are present.*

Ease of use. *In this category, reviewers evaluate two categories of use. Are the controls on the product easy to learn and use? Is the product easy to use in sustained operation?*

Performance. *This is the primary evaluation category reviewers consider. Reviewers perform standard measurements of products (printer speed tests, for example), and they evaluate how well the product performs its intended use in the following categories:*

> *Abuse testing — what happens, for example, if you leave the product on for 48 straight hours?*
>
> *Environment testing — how well does the product work in its intended environment?*
>
> *Specification testing — if a manufacturer claims its printer produces 100 characters per second, does the printer really work this fast?*
>
> *Overall usefulness — does the product perform well continuously?*

Documentation. *Same as software.*

Serviceability. *Hardware will not function correctly forever. Reviewers assess the "after-the-sale support system" the manufacturer has developed or built into the product. Reviewers consider such factors as warranties and service contracts in this category.*

Grades. *Reviewers use the following grades to rate products in the categories listed above:*

Excellent. *The product clearly excels and has no deficiencies that affect use.*

Good. *The product has no significant shortcomings and should prove capable in day-to-day use.*

Fair. *The product has some significant shortcomings, but these can be circumvented, or they only affect some specialized use of the product.*

Poor. *The product cannot be recommended in this category because it has serious shortcomings.*

List of reviewers

Henry F. Beechhold
Michael Brown
James Calloway
Kevin Cheung
Phil Degnon
Ned Heite
Richard A. Milewski
M. A. Olds
Marty Petersen
Phillip Robinson
Stephen Robinson
Michael Wiesenberg

WORDS

The programs reviewed in this category work with words. They let you process, arrange, rearrange and organize words . . . something you could never do with a typewriter.

REVIEW

Magic Desk

Magic Desk I: Type and File, from Commodore Business Machines, makes the Commodore 64 "people literate." It is the first in a series that Commodore is promising — supposedly Magic Desk II will feature a spreadsheet and a calculator. Aimed at first-time computer users, Magic Desk I employs icons (of the sort popularized by the Apple Lisa) and a joystick to make file manipulation simple. We applaud the effort but must report that some Magic Desk I features are incomplete.

The high points of Magic Desk are easily summarized. The graphics are clear, effective and smooth. Filing is as simple as moving a joystick and pressing the "fire-button." The program's storage and retrieval of information is fairly prompt, limited mainly by the slow 1541 disk drive. Finally, you don't need to know anything about a disk drive to type in a letter, store it on a disk, bring it back later and print it out.

One problem with this program is the medium on which it comes: a cartridge. If Magic Desk I were sold on a disk, it would take longer to load and would require more effort from the user than to just "plug in the cartridge and turn on the power." It would also pressure the user to have a second disk drive (for data storage). Despite our appreciation of these factors, we are concerned about what will happen when the other Magic Desk products are available. Will you need a pile of cartridges on your desk? What will you do when you want to change from word processing to the calculator? Won't you have to turn off the power, extract the cartridge (putting stress on the cartridge slot), put in another cartridge, turn on the power, get your answer,

REVIEWS

InfoWorld
Report Card

Magic Desk

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	■	☐	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
Magic Desk, an icon-filled program on cartridge for the Commodore 64, is a typing and filing system. It is very easy to use but does not have the power of a word processor or data-base manager.

System Requirements
☐ *One disk drive*
☐ *Joystick*

Suggested list price: $49.95

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

switch back to the word-processing cartridge and so on. If these programs were on disks, they could be integrated and become that much easier to use.

To help explain Magic Desk, we'll give a quick description of its operation. Turn on the power to the Commodore 64, and you see on your monitor an office with a desk, filing cabinet and trash bin. On the desk are a telephone, a Rolodex, a typewriter and a calculator. On top of the filing cabinet is a digital clock. Floating above all this is a hand with a pointing finger.

You perform most actions by manipulating the joystick: pointing the hand-icon at the appropriate symbol in the office and then pressing the fire-button. You can set the time on the clock and then let it run. You can point at the phone, Rolodex, calculator or spreadsheet and nothing happens. Commodore presumably included this frustrating feature to whet your appetite for future Magic Desk software. You also cannot use the exit door in the background to wander out into some magic hallway.

At this point, you have to try the typewriter symbol to do anything useful. Or you can press the special Commodore key (C=) at the bottom left of the keyboard to call up a special Help menu. This call for help works at any point in the program and presents you with limited on-line documentation about the meaning and uses of the various icons. When you try the typewriter, you enter a new screen that contains different icons — the familiar typewriter and trash bin remain, but they are joined by a printer, a margin setter and a desk. You still perform most manipulations via the joystick, but to do any tabbing, you must use the Commodore 64's special-function keys. You enter text in the typical, albeit old-fashioned manner — you type it in.

We feel compelled to complain about

the task of text entry. Sure, we recognize Commodore's claim that the program functions as a typewriter and not as a word processor, but it's a real pain to only be able to enter or delete single letters. We just don't understand the design premise of making a typewriter out of a computer. If you have never tried a word processor before, you might be satisfied with Magic Desk, but we can't stand not being able to move blocks of text, erase and replace and generally fix up what we have done. If you want to make any major changes using Magic Desk, you have to do a complete retype. Although the graphics on the screen — of letters typing out — and the sound of the carriage return may be familiar and comforting to novices, we predict that those same novices will soon toss this package aside in favor of a more capable word processor.

Once you have finished typing, you have three choices: you can toss the document into the on-screen trash bin (accompanied by a dropped-bomb-type whistle); you can print it; or you can file it. To print it, you point at the printer symbol.

The error handling throughout this software is above reproach. As an example, if your printer isn't hooked up, the program displays a special error symbol (which is accompanied by an error noise).

To file a document, you move from the typing screen to the desk icon. There you'll see a sheet of paper floating above the desk to indicate that you are carrying something. You then go to the file cabinet, which contains three drawers, each holding ten folders. Each folder, in turn, holds ten sheets. You can label each folder and each sheet by selecting it with the joystick and then typing your chosen label. That is the capacity of a disk. You point to a drawer and wait for the disk drive to

find it (Magic Desk displays a picture of the drive at work on the screen). Then choose a folder, and finally, choose a particular sheet. At this point you can read what is currently on that sheet or replace it with what you are holding.

The program's documentation is minimal. A single six-page brochure lists the symbols it uses and describes their actions. This sort of package shouldn't need much documentation, but it does need more than this. Without the brochure, it's difficult to even get started. With the documentation provided, you get enough clues to be able to romp around with the joystick, but with the skimpy manual, you are bound to be confused about what sheet you are carrying on the screen, where to put it and how to get it back.

Magic Desk I: Type and File has a fine exterior with a flawed interior. Its price would be reasonable if it concealed more power within its gamelike simplicity, but it doesn't. Commodore spent too much time making Magic Desk easy to use and too little making it useful. We really question whether Commmodore's approach with Magic Desk is the best way to develop "people literacy."

—*Phillip Robinson*

REVIEW

EasyScript

The best thing about Commodore's EasyScript word processor for the Commodore 64 is its price — it has as many features as some word processors that cost ten times as much.

Unfortunately, though, EasyScript does not do as much as many other such programs.

The product is fairly easy to use for those familiar with other word processors, but, paradoxically, those same people may find it lacking in features. Even though the outside of the package claims, "If you have never used a computer or word processor before, you can be doing useful work within a few hours," we think that novices may have some trouble with this product. EasyScript is available on cassette, disk and plug-in cartridge.

EasyScript does a lot of things fast and well. You can produce many kinds of documents with it, and the program can control many of the features of many printers. Although it cannot hold a document longer than about eight pages in memory, you can link several documents. You can then print many more than eight pages and perform other operations on the linked set of documents.

You can erase by character, sentence or paragraph; erase from the cursor to the end of the text; or erase all the text in memory. You can also delete text a character or a line at a time or over a range you specify by moving the cursor. You can join paragraphs easily by deleting the carriage-return character.

You can easily set indents and tabs (though you don't see the effects of your actions on the screen). The program has several kinds of tabs: horizontal standard, horizontal decimal and vertical. You can tab quickly from left to right or down but not from right to left or up. EasyScript also has a somewhat limited hyphenation facility.

A word processor provides a view, called a window, into a document. You can "pull" the document vertically or horizontally past the window. Many word processors do not permit text

Summary
EasyScript is a word-processing program that has many good features. It works with most printers. Experts will not find enough features in it, though, and novices will have a difficult time learning to use the product.

System Requirements
☐ One disk drive or cassette recorder

Suggested list price: $54.95

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wider than the screen, which on the Commodore 64 is 40 characters. EasyScript lets you enter text that is up to 240 characters wide. To look at text wider than the screen, you scroll it horizontally. To look at text preceding or following that in the window, you scroll vertically.

EasyScript lets you move the cursor about the text quickly in several ways. You use the Go command to move the cursor instantly to a specified line or to the end of text. The cursor-control keys (arrows) move the cursor up and down, left and right. You press the Control key together with one other key to jump the cursor forward or backward a word at a time. It takes two keystrokes to display the next or the previous screen.

EasyScript has a facility called panning that many other word processors do not have. Although all keys repeat when you hold them down, panning moves the screen continuously without requiring you to hold down a key — you press the F1 key and then the appropriate cursor-control key to pan left or right or up or down. While panning is in progress, you can press the Shift key to speed up the motion. Pressing the space bar stops the motion until you press the bar again.

The program's search and replace operations work reasonably well. You must specify the text you want to replace exactly (with the precise combination of uppercase and lowercase letters). You can go forward from the cursor (not backward) or from the start of any of a series of linked files to the last of the files.

The best thing about the Search and Replace function is that it is fast. A Search and Replace through all memory takes but a second or two. This process slows down when the program is dealing with linked files, but that is due to the slow (serial) disk drive, not to EasyScript's disk-handling algorithms.

The top line of the screen displays the current mode and command, plus a continuous readout of the line-number and column-number position of the cursor. Error messages are also displayed in this status line. EasyScript has no on-line Help facility.

You specify the format you want by preceding commands with an inverse-star character that you generate by pressing the F3 key. You can specify the layout of a page, including the left and right margins, number of lines per page, the text of the headers and footers and their margins, placement of page numbers, number of blank lines to leave after each line of text and so on. You can also specify more exotic functions, such as numbering to the left of the margin; indented, hanging paragraphs; and special printer commands.

This last is one of the best features of EasyScript. You can customize output for almost any printer. You match printer specifications by answering several questions when you first load the program. If you have a dot-matrix printer plugged into the Commodore 64's serial port, you press Return three times (thus choosing what Commodore thinks is the most likely printer and disk configuration you will have) and immediately enter the Edit mode. It is at the appearance of this first menu, too, that you specify how wide you want the text to appear on the screen. This specification and how wide you print on the paper are not related; the latter is specified in one of the format commands embedded within the text of your document.

You can return to the program's main menu at any time, if, for example, you want to change printers and need a different set of specifications. If you have a printer that has an RS-232 serial port, you need to answer two more questions and then set the printer's switches as specified in an appendix of

the EasyScript manual.

We used EasyScript with three different printers: a Commodore MPS 801 dot-matrix printer connected directly to the serial port; a Gorilla Banana dot-matrix printer connected through a Cardco Cardprint +G graphics-printer interface to the cassette port; and a Diablo 620 daisy-wheel printer connected through an MSD RS-232 interface card to the user port. All three worked as promised.

EasyScript has no provisions for precision printers, which means that we could not use all the abilities of our Diablo. For example, we could not do proportional spacing or "true" boldface. EasyScript boldfaces by repeatedly overprinting the characters, but a precision printer boldfaces by printing a letter, moving the printhead a fraction — say 1/120 — of an inch to the left or right and then printing the letter again.

The program does permit you to define up to ten different escape sequences to be sent to the printer, however. For example, our Diablo expects to see a line-feed and carriage-return combination at the end of every line, but EasyScript sends just a carriage return. EasyScript let us define an escape sequence to be sent to the printer to redefine the meaning of every incoming carriage return. It's not hard to do this, but the documentation is unclear about the method.

You can preview your document on the screen before printing it. You can also switch back and forth easily between output to the printer and the screen. This provides a means for printing only selected pages.

EasyScript has a Mail Merge function. You write a boilerplate document with "holes" in it that you fill in with text from another file. The program offers a similar facility for filling in blocks in a table.

A Housekeeping facility is also available in EasyScript. You can list the contents of a disk, remove or rename files, format new disks, move files from one disk to another, merge files and so on.

EasyScript has another nice feature. You can use what the manual calls shorthand for filling in specifications that commands require, such as the name of a file to save or load. You press the F1 key, and the next group of characters within quotation marks appears in the status line. You place the name of the file at the top of your document within a nonprinting, nonexecuting format statement (a comment line), and then, when you save the file, instead of typing its name, you just press F2. You can use this facility for specifying the search or replace fields, too.

So far we have just talked about the good points of EasyScript. Unfortunately, we found many problems with the program. Its commands are neither logical nor self-evident. When you use a letter key to specify a command, sometimes that one letter means one thing and sometimes another. For example, after you type the command O, for output, a P means print. After you type a T (for tabs), a P means display tab positions on the status line.

You often have to use three or more keystrokes to specify a command. Sometimes the keystrokes that execute the command are followed by a carriage return, and sometimes they are not. On different occasions, even the same one-letter command sometimes requires a carriage return, and at other times it does not. For example, to set a horizontal tab, you type F1, T, H and carriage return. To remove all horizontal tabs, you type F1, Z and H; this command executes without a carriage return.

Here's an example of a multiple-keystroke command: to perform a search-and-replace operation, you type F1 followed by S to indicate Search. You then fill in what you want to search for, following that with a carriage return. Next, you are prompted for the replacement. After you fill that in and press Return, you might think that the operation would begin. It does not. You type F1 and then the @ key, and the status line displays "Search & Replace." Now you type M if you want to search the text currently in memory or L if you want to search a linked file. If you specify L, you are prompted for the name of the linked file. Only then does the operation commence. Hunting — that is, searching for a group of letters without making any replacement — requires that you press a minimum of six keys in a row.

EasyScript does not have wordwrap. You just type to the end of a line, and the cursor drops to the next line, often in the middle of a word. This makes the screen confusing to read.

For a program that bills itself as "one of the most powerful word processors on the market at any price," EasyScript does not have a very flexible Search and Replace facility. You cannot choose selectively whether to replace each occurrence of a group of characters: you must replace all or none. You can make all replacements within a group of linked files, or you can specify just those from the cursor position to the end of the file in memory, but it would be nice to be able to make a decision on each occurrence. This is what other word processors term *discretionary* search and replace.

EasyScript's Search and Replace and Hunt operations make no wild-card characters available. Many word processors permit you to specify a search for any word — for example, any word that begins with *a* and ends with *t.*

Others permit searches based specifically on one unspecified character or on one or more, and you can use a wild card to take the place of any alphanumeric or nonalphanumeric character. EasyScript allows none of that.

The program's documentation warns you about the consequences of specifying text replacements imprecisely. For example, if you want to replace all instances of *at* with *for* but do not want to affect the *at* in *cat*, the manual advises you to specify *at* as a search string surrounded with spaces. This does not find all occurrences, though — for example, it misses *at* followed by a period. It also misses adjacent occurrences of *at* (such as, *at at*). Be careful. EasyScript has no Undo command.

This program performs other potentially dangerous operations without warning you beforehand. For example, you type F1, E, A to erase all text. As soon as you type the A, all text in memory disappears. If you didn't save it, too bad; it's gone forever. A good word processor should warn you before it does something like that.

At other times, EasyScript does try to take care of you. If you attempt to overwrite an existing document on the disk, it first asks "Replace File?" If you do not respond with a Y, it does not continue. When you attempt to format a disk, EasyScript will ask, "Are you sure?"

As for EasyScript's difficulty of use, much of the fault lies in the manual. Many instructions are unclearly worded. Many are wrong. If you type in some instructions exactly as given, they don't work, and beginners would not know how to get them to work.

Early in the tutorial section of the manual, novices are told how to allow for the proper amount of space on a page:

"The text length is measured from the header line and includes the blank lines specified in the header command, the lines of text and the offset (vertical positioning) at the start of the page, if used. (Not covered in this Training Section. See Section 8.2.5.4.) The footer line and the line(s) between it and the bottom of the page are not counted within the text length parameter. The last line of the text should be calculated to end one or more lines above the footer line so that there is no overlapping. The difference between page length (pl) and text length (tl) must be at least the footer offset plus one." No example clarifies this complicated description. We pity the poor novice trying to set up a page with headers and footers.

Some commands just do not work as documented. For example, you are told, under Housekeeping, that the command to duplicate a disk is dddn=dsdn (destination equals source). Apart from the difficult notation of this command, it is incorrectly given. Experienced users would perhaps be able to figure out that the first d on the source side is extraneous, and they would understand the message "31,syntax error,00,00," but novices would have trouble figuring out why they got the message. As to the nomenclature, it certainly is not immediately apparent that the first d means duplicate, the second means destination and that dn stands for disk number, and that the three-letter combination ddn is to be replaced by one number, as is the three-letter combination sdn (source disk number). The correct specification to duplicate a disk from drive 0 to drive 1 becomes d1=0.

Instructions in the manual's training section sometimes do not coincide with the pictures of the screen that purport to illustrate what you are learning. You are told, for example, to format a document using the sp2 command, which the manual tells us means "leave two blank lines between each printed line." After printing the text, you are invited to "Compare your result with Figure 2-8." Figure 2-8 clearly shows a single-spaced document, something you would normally get by making no sp specification (or by specifying sp0).

Not until you are halfway through the manual do you find out that EasyScript has two kinds of capital locks. As you would expect, you are locked into all capitals by pressing Shift Lock. In this mode, you can type only the shifted version of every key. You can no longer type numbers; you get the shifted symbols of those keys instead. Pressing the space bar produces an inverse-video square. One of the exercises has you replace several instances of ES with EASY SCRIPT. If you follow instructions, you turn on capitals and get "<space>ES <space>" in the search field and "<space>EASY<space>SCRIPT <space>" in the replace field. Those spaces are in inverse video. Novices may be surprised when no replacements are made.

Much later, you find out that the program has another form of capital lock, which you obtain by pressing F5. This Capital Lock mode works the way the Shift Lock key does on most computers — that is, you get uppercase letters when you press letter keys, but you still must press the Shift key to get the shifted symbols.

Because EasyScript has so many confusing commands that require different actions from you — some require you to use a carriage return, some don't; some require you to use a colon, some a semicolon — and because several of the commands are not mnemonic (for example, FA is printer lines per inch), the documentation should include a table somewhere

listing all the commands, with syntax for each. It does not. Sometimes users have to search through the entire table of contents and index to find the command they need.

Although the manual has an index, it is not complete and not cross-referenced. For example, nothing in the index tells you that you can copy a block of text from one place to another. Even knowing the nonintuitive name of this operation (Again, specified with F1 plus A) doesn't help, because the index has no entry for "Again." Prior to making such a copy, you delimit a block of text by using the Range command, which does have an index entry. None of its subentries refer to either copying or Again, however.

EasyScript is copy-protected. The documentation states that the product comes with two disks, one of which you are to keep as your backup copy, but the version we reviewed had only one disk. The documentation further states that you can get a replacement disk, if you damage your original, by sending $5 and the damaged disk to Commodore.

We give EasyScript a mixed rating and conclude that it has many good features but probably not enough to suit experienced users of word-processing systems. It is hard for beginners to learn, both because of its confusing, inconsistent, nonmnemonic commands that often require too many keystrokes and because of a manual that has too many mistakes and unclear explanations.
—*Michael Wiesenberg*

EasySpell

For its price, Commodore's EasySpell spelling checker for use with its EasyScript word processor for the Commodore 64 does a reasonable job. Like EasyScript, it has good points and bad points.

A spelling checker is a program that you can use with a file produced by a word processor. It automatically checks the spelling of every word in a document you've created against every word in its one or more dictionaries. The spelling checker then gives you a way of correcting those mistakes. It also lets you add words to its dictionaries, so that you don't keep finding the same words every time you check a document.

EasySpell loads from EasyScript. You must have EasyScript to use EasySpell, and you can use the latter only on documents produced by the former. When EasySpell loads, it first asks if you have a single- or dual-disk drive. The program works more efficiently on a dual drive.

You can then perform several tasks. The first possibility, check text file, is the one you are most likely to use, and it is what you get if you just press the Return key. You type in the name of a document or press the F1 key to get a list of files on the directory. The file names appear one at a time, and you keep pressing F1 until the name of the document you want appears.

EasySpell reads the document into memory and displays statistics about your file: total number of words, number of unique words, number of sentences, number of paragraphs and average word length. It then checks the word list (all the unique words in your file) against its dictionaries and displays

those words that it cannot find. EasySpell comes with a 20,000-word dictionary. The manual states that you can purchase a 32,000-word dictionary from your dealer.

Once EasySpell has checked the word list, you edit your document. The program highlights each incorrect word, in order, through the document. When you see a highlighted word, you have three choices. You can correct the word, press the left arrow to add it to your user dictionary (the main dictionary is never altered) or press F1 and skip over the word. EasySpell adds whatever words you specify to the user dictionary. The program does not suggest replacements for supposedly incorrect words — you have to make all the changes yourself.

You can also do the preceding editing check along with a word-frequency check. This process works in about the same way as does the one we discussed above, but it also displays every word in the document together with the number of times it was found, in either alphabetic order or ascending or descending order of frequency.

You can also print the user dictionary, delete words from it, search the dictionaries for words or configure your printer to work properly with your computer and software.

EasySpell's Search facility is interesting because, unlike EasyScript's, it lets you specify wild cards. That is, you can use a *?* to specify one letter or an *** to specify one or more letters. For example you can type *?at** to find all words in the dictionary that begin with any letter whose second and third letters are *a* and *t*, followed by any number of letters. The program would then display such words as *eating, cats* and *matrimony* but not, as we expected, *cat* or *eat*. You can choose to search either dictionary, but you cannot search both simultaneously.

EasySpell, unfortunately, has several problems. One is that it is extremely slow. It took three minutes to load the contents of a one-paragraph file into its memory and check the words against its 20,000-word dictionary. It took us two minutes to correct the document, and EasySpell spent another minute adding the words we specified to the user dictionary. EasySpell took more than ten minutes to complete the entire process with a three-page document.

The program's slow performance might not be so bad if you could leave the room while EasySpell was working or read a book and just look up now and then to press Return when the screen filled with unrecognized words. Unfortunately, our version of the program kept failing and reporting strange errors. Sometimes it told us that it could not find a particular file. It did not say which file it could not find, and we presume the fault was not ours because when we ran the program again in exactly the same manner, the error did not occur. At other times, it told us a file was open but not which one, nor why.

Sometimes it gave us spurious Read or Write errors. Altogether, because we had to run EasySpell twice on a one-paragraph file, the checking procedure took well over 20 minutes. We could have looked up every word in the paragraph in a hard-copy dictionary (and memorized each definition while we were at it) in that time.

EasySpell failed four times while checking our three-page document. Checking the document's words took well over an hour. One of the runs produced a list of unrecognized words that included *do, down, does, dual, drive, duplicate* and a few other words beginning with *d*. EasySpell kindly added these words to our user dictionary and later crashed while

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EasySpell

	Poor	Fair	Good	Excellent
Performance	☐	■	☐	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	■	☐	☐	☐

Summary
EasySpell is a spelling checker that you can use with the EasyScript word processor on a Commodore 64. The program is inexpensive, but its operation is slow and fraught with unexplained errors.

System Requirements
☐ *One disk drive*
☐ *EasyScript word processor*

Suggested list price: $21.95

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trying, we thought, to write the updated document back to the disk. Later, we found all those words in the main dictionary, so something seemed to have gone temporarily wrong with the program's word-finding algorithm.

On another attempt, while EasySpell was trying to place the first unrecognized word in the user dictionary, the system just hung up in the middle of accessing the disk drive. We could do nothing to get it out of that mode; even taking the disk out of the drive was no help. The documentation states that you can get out of any EasySpell operation by pressing Run/Stop and Restore, but that didn't work. Finally, we had to turn off the computer.

Each time we got such an error, EasySpell got amnesia. It told us to press Return to get back to the main menu and had no memory of what it had just spent ten minutes compiling. No list of incorrect words appeared, no changes were kept in our original document and no words were added to the user dictionary. We had to start from the beginning each time.

The program beeps at strange times. For example, it can be disconcerting when you hear three loud beeps just at the point when EasySpell tells you that it is adding words to the user dictionary — you start to worry whether or not everything is all right. You can turn the sound off, though.

The manual, notebook-size and 27 typeset pages in length, is thorough and is clearly written, but it does not tell you what to do about errors. When you get one of the errors described earlier, this instruction accompanies the error message: "Refer to CBM disk manual for explanation," which is not helpful. Nor could the disk manual tell us why, for instance, EasySpell thought that it could not find the file with which we were working or even which file it

thought it could not find. Was it the original document? Was it one of the dictionaries? We never found out.

EasySpell, like EasyScript, is copy-protected. Its documentation states that the product comes with two disks — one to keep as your backup copy — but the version we reviewed had only one program disk. It also comes with a dictionary disk that is not copy-protected: you should copy it immediately.

The documentation further states that you can get a replacement disk, if you destroy your original, by sending $5 and the damaged disk to Commodore.

EasySpell doesn't cost much, and if it didn't have so many errors from which it could not recover, it might be a good spelling checker for the price. The problems we experienced, though, coupled with its slowness, make us wonder if its low price is even too much to pay.

—*Michael Wiesenberg*

REVIEW

Bank Street Writer

The task of word processing is perfectly suited for the home-computer applications. It is not a solution looking for a problem — people already process plenty of words at home, and computers just allow them to finish those same old chores with more ease than if they had used pencil, pen or typewriter.

What do you need to process words? You need a full-size, standard keyboard; a disk drive; a CPU; a readable screen; a printer; and word-processing software.

The Commodore 64 with a TV or monitor, a disk drive and a printer thus lacks only word-processing software to make it one of the cheapest word-processing packages around. Software developers recognize this fact and also realize that people who buy a $200 computer aren't likely to spend $400 for a fancy word-processing program. Besides, those expensive programs often take weeks to learn.

Bank Street Writer is a cheap and simple word-processing program for home computers. It isn't the cheapest such program for the Commodore 64, and it isn't as easy to use as it could be. Still, it is well suited to minor tasks such as typing letters, book reports and school papers, and it provides a fine introduction to word processing. It was put together by a team of educators, programmers and researchers at New York's Bank Street College of Education. It was first available for the Apple II; versions for the Atari and the Commodore were introduced later. Bank Street Writer works with the 40-column display of the Commodore.

This program is designed for people who haven't used a word processor before — if you have used one, you can probably get going in just a few minutes. If you learn word processing on Bank Street Writer and then watch someone else working with a professional system, such as WordStar or Perfect Writer, you'll have a hard time staying with this program because you will soon recognize that Bank Street Writer lacks some of their important features. If you don't write a lot, you won't miss those capabilities.

The features that a word processor must have are present in Bank Street Writer. The ability to edit, save, load and print files is the foundation of word processing, and Bank Street Writer does all of these things. Search and Replace, Block Move or Delete and Control Print

Margins are also important and are included features. Some other word-processing features — such as reading a file into another file, subscripting and superscripting, boldfacing and underlining, turning page numbering on and off, inserting headers and footers — were left out of this program in the simplification process.

Even features that the package does include, such as Search and Replace, are limited. Bank Street Writer's Search and Replace forces you to say "Yes" or "No" to each occurrence of the phrase you want. More powerful systems allow you to change all instances at once with a global Search and Replace.

Bank Street Writer has three modes: Write, Edit and Transfer. Notes at the top of the screen tell you what mode you are in and what commands are available. Wordwrap is automatic, which means that you don't have to press Return at the end of each line. The program's Edit mode lets you Search and Replace, Delete and Undelete text — the Undelete ability is particularly helpful for beginners. You use the Transfer mode for disk-drive and printer work. You can list the files on a disk, change filenames, erase files and use passwords with files.

One aspect of Bank Street Writer that we don't at all like is the separation of Write and Edit modes. Once the program is on the screen, the functions you can perform are shown at the top. A large box fills the center of the screen and waits for your text. Each screen, besides offering functions, offers you a chance to move to another mode. Strangely enough, the program considers writing and editing to be different animals — if you write so much as two words that you decide you don't care for, you can slowly delete them in the Write mode. or you can shift modes, change the action of the cursor keys, delete both words, change

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Bank Street Writer

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
Bank Street Writer is an easy-to-learn word-processing program. It doesn't have all the features of the more serious word-processing packages, but it handles small tasks nicely.

System Requirements
☐ _One disk drive_

Suggested list price: $69.95

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San Rafael, CA 94903
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modes again and resume writing. This is just too complicated for something that is supposed to be easy. Proliferation of modes can make the best software about as clear as Los Angeles air in summer.

Bank Street Writer offers you two printing options, Drafting and Final. Drafting prints the text just as it looks on the screen. Final uses whatever formatting commands you choose (the program asks you for size of page, number of lines and so on). It also lets you see where page breaks will occur, and you can adjust these before you commit your text to paper. Bank Street Writer does not allow you to embed formatting commands in the text.

Bank Street Writer comes with two other programs; all three are on one disk. One of the two "extras" is a Utility program for customizing Bank Street Writer; the other is a short Tutorial program, which is a series of progressive lessons that takes you through Bank Street Writer's keys and commands. You'll find both of these useful.

Some programmers would have a program ask you the same questions every time you start up, which makes things easy the first time and harder every time after that. The other tack is to assume that the first time you use a package, you will be slow — you need time to familiarize yourself with the program and learn how to customize it to suite your working needs. After that, you don't want to be slowed down by having to answer the same queries again and again. Bank Street Writer's Utility program offers the latter approach.

The Utility program lets you set the following parameters: data-disk device number, print-draft left margin, print-draft line spacing, print-draft page numbering, print-final left margin, total number of lines per page, number of lines for top margin, number of lines for bottom margin, line feed on carriage

return, form-feed character, keyclick, printer device number and screen colors. You can change some other parameters from within the program.

Bank Street Writer's error protection and error handling are complete. Warning messages appear when you do something wrong and tell you what you have done. Striking the wrong key seldom leads you into difficulties, and functions such as Unerase help you repair small damages.

A 35-page booklet, a Quick Start instruction summary card and the loading instruction on the disk label comprise the program's documentation. An index/glossary appears at the end of the booklet. The Quick Start card explains disk loading in detail on one side and cursor movements and the use of control keys on the other.

The booklet begins with a short table of contents. The introduction then tries to make you feel at home with the computer and with the idea of word processing. The introduction also claims that those with some computer and word-processing experience should be able to start using the progrm without first studying the manual. This is an overstatement; the menu isn't clear enough that it alone can direct you. The booklet also contains a few screen images: we'd like to see more liberal use of them. The booklet is complete, but it is too technical. To make this package truly easy to use, the book should contain more explanations and graphics.

Broderbund is Bank Street Writer's distributor, and it fully guarantees the program. If the disk ever fails to load and start the program, you can send it back to Broderbund for a free replacement. If the disk has been physically damaged, you have to pay $5 for a replacement disk.

This program isn't the cheapest home word-processing software package, but it is one of the best. It is

particularly easy to learn, but it is not intended to be a fully powered professional system. For beginners who have to write reports, letters and essays, it is a great program. Bank Street Writer is also fun to use. Seeing words spill onto the page, split and reform and disappear and reappear can be as much fun as playing any video game.
—*Phillip Robinson*

REVIEW

Homeword

With dozens of low-priced word-processing packages now available for the Commodore 64, a new product must have some special features to stand out from the rest. Such a product is Homeword from Sierra On-Line. Homeword's on-screen menus use icons, or pictures, rather than the lists of confusing control-character commands that are typical of most word processors.

Homeword graphically depicts familiar objects, such as file cabinets, a television set and an exit sign, to illustrate such options as storing and retrieving documents, seeing your document on your monitor before printing it or leaving the program. By using these icons and by supporting Homeword with first-rate documentation, Sierra On-Line has largely succeeded in what it obviously set out to do: to create a simple, reasonably powerful word processor for average users of the Commodore 64.

The documentation for Homeword includes a tutorial audio cassette that gets you started quickly, an uncluttered

and refreshingly readable manual and a quick-reference card that lists all the word-processing commands.

Within an hour of starting to use Homeword, we were able to do without the audio cassette and the manual and used only the reference card to locate the proper command to perform various word-processing tasks.

When we began using the program, we played around a great deal with the icon menus. At any point, you can jump into the menus by pressing the F1 key in the upper right-hand corner of the keyboard. Each menu has a set of pictures denoting several word-processing functions. You press the left/right cursor key to jump around from picture to picture.

When you press the F1 key, the program typically defaults to the picture that makes the most sense. For instance, when you have finished writing or editing a letter or document and press F1, you see a picture of a file cabinet with an open drawer and the word *file* underneath it. If you then press Return, the screen shifts to a picture of an open drawer that has the words *save document* below it. If you press Return again, the document is stored on your disk.

One word of caution here: Make sure you save your document on a formatted data disk. The Homeword disk contains a write-protect tab, so you can't save anything on it — if you try, you will lose your document. Homeword has a feature that enables you to create data disks easily, however, so this shouldn't present too much of a problem. Just make sure you have created a data disk before you start writing.

The icons, combined with the short explanation that appears below each one, make this word-processing program so easy to follow that you could use Homeword for years,

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R e p o r t   C a r d

Homeword

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
If you're looking for an inexpensive word processor for your Commodore 64, you won't find a better buy than Homeword. Its icon menus make it easy to use, and you can also circumvent many of these and use the Control or Commodore keys to execute commands more quickly. Before you purchase the program, however, make sure that your printer works with it.

System Requirements
☐ *One 1541 disk drive or equivalent*

Suggested list price: $69.95

Sierra On-Line, Inc.
P.O. Box 485
Coarsegold, CA 93614
(209) 683-6858

producing documents of all types, without ever having to familiarize yourself with its more powerful commands and abilities. Fortunately, however, Sierra On-Line chose not to force those who already know how to use word processors to jump around from menu to menu looking for the appropriate icon to get a job done, when a control command can perform the same function much more quickly.

Utilizing the Commodore key (the one on the lower left of the keyboard with the Commodore logo on it) in combination with various other keys, you can override the requirement to go to the various picture menus and can thus execute commands directly and much more quickly.

For example, let's say that you want to save a document or letter. Instead of pressing F1 to go to the File menu and then pressing the Return key to go to the Save Document picture (remember the picture of the open drawer?), you simply press the Commodore key and the S key simultaneously, thus achieving the same purpose in much less time.

Unlike many more expensive word processors, Homeword requires you to learn relatively few control commands. If you forget a particular control command, you can always go back to the picture menus. Additionally, at any time you can go to the Help menu — which describes all control, Commodore and cursor functions — by pressing the Commodore key plus the H key.

You make use of this word processor's editing commands by pressing the Control (CTRL) key. As with the Commodore-logo key, you use the Control key with other keys on the board to perform certain tasks.

The Homeword instruction for deleting a character is Control-D, which, once you are used to thinking of erasing

as deleting, is easy to remember. Similarly, you use Control-T to move to the top of a document, Control B to move to the bottom and so on.

Homeword does have some functions that you cannot override using the Control or Commodore keys. To print a document, for instance, you must go to the icon menu; there is no command that enables you to get around it. This does not present any problems or significant loss of time.

The Homeword program is at least as powerful as other word processors in its price range. It can perform such tasks as finding and replacing words and phrases, combining one document with another and inserting sections of text in a document stored on a data disk. Perhaps the best thing about Homeword is that it makes all such powerful word-processing techniques easy to comprehend and simple to use.

Like every software package we have ever used, however, this one is not without problems. The biggest problem we had was when we attempted to print a document using a serial-interface printer in conjunction with the Commodore RS-232 interface cartridge on the Commodore 64's user port. This setup generally works just fine; not with Homeword, however. We were unable to print anything until we borrowed a Commodore 1526 printer.

We called Sierra On-Line and asked a technical-support representative whether the problem might be with the serial-port printer or with the way in which it was set up. Although the representative expressed concern for our problem, she was unable to offer any advice. She promised to call back with a solution, but we never heard from her again.

Later, Sierra On-Line told us that Homeword works with the Commodore RS-232B interface cartridge, but because of baud-rate incompatibility,

it does not work with the Commodore RS-232C interface cartridge. Sierra On-Line is working on this incompatibility problem.

If you are not using a Commodore printer, we recommend that you try Homeword with your printer at your dealer's before you buy it; if that is not possible, phone or write to Sierra On-Line and confirm that your system is compatible with the Homeword package.

One other inconvenience with this word processor is that you can't make a copy of the program. Thus, if you remove the write-protect tab from the disk and accidentally erase the program, you are stuck with a nonworking disk and no backup copy. Sierra On-Line offers to send a backup copy at a cost of $10, but it would be far more convenient for users if Sierra On-Line included a backup disk in the first place and charged more for the package.

Homeword is indisputably a bargain, though. Its low price, combined with superb documentation and easy-to-use picture menus, makes Homeword one of the best buys available for the Commodore 64.
—*Michael Brown*

REVIEW

Super-Text

Commodore 64 owners who have discovered word processing have also probably discovered that a 40-column screen display soon grows wearisome. Until now, to make the Commodore 64 produce a professional-quality display, you needed to add a fairly expensive 80-

column circuit card to your system. Happily, with the Super-Text word-processing program, you can have an 80-column display without making any major hardware changes, though you do need a high-resolution monitor. Forget the TV — it just cannot resolve 80 columns of text into anything but lines of unreadable blobs. If you use Super-Text with a color monitor, you can change the default parameters for text, screen and border colors.

We tested Super-Text with a low-cost Zenith ZVM-121 green-display monitor. Although it is not the ultimate in high resolution, this monitor is more than adequate for Super-Text. We were delighted to see our old Commodore 64 game machine displaying 80 columns of text. With Super-Text you can hold your head up alongside those who boast about their "professional" word-processing systems.

If you prefer larger screen characters, you can use Super-Text to display text in a 40-column format. In fact, you can switch back and forth between screen formats as you write or edit, but each switch is slow because you have to load a separate, rather lengthy subprogram each time you change formats. Switching between formats does not result in your losing any text stored in memory.

After you load Super-Text into your computer (regardless of which display format you choose at the outset), you can begin your work by either selecting and loading an existing file (stored on a disk) or by creating a new file. In either case, you work in the Add mode, which you enter by pressing the F3 function key. When you use this mode, you simply type in your text just as you would on a typewriter.

To exit from the Add mode, you press F3 again. The computer then automatically shifts into the Cursor mode. This mode lets you edit your text.

InfoWorld
R e p o r t   C a r d

Super-Text

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
The Super-Text word-processing program has all the features of a professional word processor. Commodore 64 owners can now use an 80-column screen display, as well as the usual 40-column display, without having to modify their computers with additional hardware. You do need a high-resolution monitor and not a TV, though. With its Autolink subprogram, this is one of the best word processors we've seen for the Commodore 64.

System Requirements
☐ One disk drive

Suggested list price: $99

Muse Software, Inc.
347 North Charles Street
Baltimore, MD 21201
(301) 659-7212

You can move the cursor, change deleted words, move blocks of text, find-and-replace words and count words. The Cursor mode also allows you to edit on a split screen — that is, you can alternately edit two parts of the same document. Unfortunately, you cannot use Super-Text to edit two different files at the same time, as you can with some word-processing software.

You access Super-Text's many commands and functions by pressing function keys, single-character keys or combinations of the Control key and/or the Commodore key and single-character keys. For example, to find a word in your text, you type F when you are using the Cursor mode and respond to the prompt "Find" that appears at the bottom of the screen. If you want to move the cursor to the topmost line on the screen, you press the Commodore key and then Shift and Cursor Right keys.

The British pound-sign key is yours to define as you choose. When you press this key, it can insert as many as 30 of your preselected characters into the text at the cursor position. If you don't select characters for it, this key inserts *the* ; thus, Super-Text imaginatively calls it the "The Key." When we used Super-Text to write this review, we did not use this key when we wanted *the* and can't imagine that any touch typist would do so. On the other hand, a key that inserts custom character strings could be extremely helpful, even to touch typists.

When you use Super-Text's Print mode, you can customize the responses of eight keys to send control characters to your printer. These keys make it easier for you to take advantage of your printer's enhanced-printing capabilities, such as bold lettering, underlining, subscripting and superscripting and italicizing. You must use these definable keys in combination with the Control key. As you write, you position the cursor at the beginning of a section you want to enhance and press the printing-enhancement keys (Control key plus defined key). Next, you position the cursor at the end of the enhanced section and press the enhancement-off keys.

Super-Text can work with several popular printers, including the Epson MX-80, Okidata 92 and VIC 1525 printers. If your printer isn't on the compatible-printer list that is supplied with Super-Text, you can use the Change Print Params program to match your printer to Super-Text.

Since Super-Text gives you virtually total control over printing operations, it is not surprising that the program has all the popular page-formatting features: margin adjustment, justification, centering, heading insertion, footnote insertion, pagination, variable line spacing and automatic indentation. You insert format commands into your text by typing a special format line. This line begins with a Control-F followed by a string of up to nine formatting values. You must enter these values in a fixed order — you type the left-margin value, then the right-margin value, then the paragraph-indentation value and so on. Finally, you enter the number of times you want the printer to overprint when it prints boldface text. The advantage of this system is that you needn't enter groups of letters to format your text. The disadvantage is that you must remember the correct entry sequence. Some word processors use both letters and numbers and the entry-sequence order is irrelevant.

Previewing your text before you print it is more cumbersome with Super-Text than it is with the "what you see is what you get" type of word processor. When you enter text, Super-Text does not automatically display it as it will

look when it is printed, although you can press the ampersand (&) key to view the printed formatting. This option does not help you if you are using Super-Text in its 40-column mode, but in the 80-column mode, you can get a fair idea of what your document will look like.

Autolink is an impressive Super-Text feature; you rarely find anything like it in even the more costly word-processing programs. This trademarked subprogram of Super-Text lets you link multiple files for editing or printing. For example, if you want to find and replace a word in all the files on a given disk, Autolink can help you.

Super-Text's documentation consists of a 5½ × 8-inch spiral-bound manual and a sturdy, fanfold reference card. The 138-page manual contains ten chapters, and it has no index. Because the table of contents is fairly extensive, you can generally find what you want quickly — but not as quickly as you could with an index. The text could be more clearly written and could contain more detailed explanations. Since the documentation also lacks a tutorial, it may generate some frustration for word-processing novices. The manual isn't a disaster; but we feel that for its price Super-Text should offer newcomers more documentation.

One helpful section of the manual deals with common problems and their solutions. It tells you, for instance, how to recover your text if you accidentally reset the computer in the middle of a writing session. Other "save-the-day" hints help you overcome difficulties with printing, disk operation and editing.

Super-Text even offers a help-screen toggle. These screens appear at the top of the display in the manner of WordStar but are available only in the 80-column mode, Muse Software apparently assuming that this is the mode most users of Super-Text will

prefer. You can turn the four Help screens on and off at any time during your writing and editing sessions.

The Super-Text disk is copy-protected — this can be a disadvantage because you lose time waiting for a replacement if your disk is damaged. To get a replacement for a damaged disk, you must return the User Registration Card to Muse Software. The company will replace your disk at no cost regardless of how long you've been using the program.

Even though the price of Super-Text takes it outside the range of prices for most Commodore 64 software, it is still a bargain — especially in light of its 80-column text display and the convenience of Autolink. Since we've used several professional word-processing systems, we first smirked at Muse's claim that Super-Text was a "professional" program. Super-Text soon turned our smirk into a smile of pleasure. In spite of certain limitations of its manual, Super-Text strikes us as about as good a piece of text-handling software as one can buy for the Commodore 64.
—*Henry F. Beechhold*

REVIEW

PaperClip

PaperClip is a powerful word-processing program for the Commodore 64. Because it has many features usually found only in more expensive software, we think it is suitable for both professional users and home users who want to do more than just write letters.

PaperClip allows you to create, edit and rearrange text. You can compose

InfoWorld
Report Card

PaperClip

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐
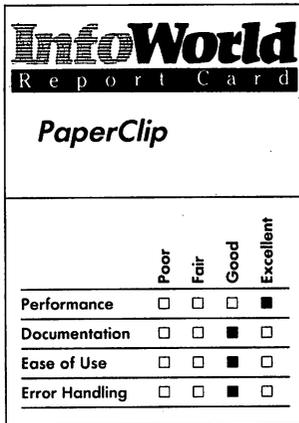
Summary
PaperClip is an impressive word-processing program for Commodore computers. It has several unusual and good features, such as the ability to create a chain of screen-format files and the ability to manipulate columns. Many of its commands and directives require an investment of time to learn, though, so PaperClip is best for those who are frequent, not occasional, word-processing users.

System Requirements
☐ *One disk drive or cassette recorder*

Suggested list price: $89.95

*Batteries Included
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Irvine, CA 92714
(714) 979-0920*

form letters that have variable entries and can sort columns of entries into alphabetical order. PaperClip can even do simple arithmetic for you.

This program gives you many formatting options for your printed copy. You can set headers, footers, margins and page length; and your document can be right-justified or centered. The program provides automatic page-numbering if you want, too.

PaperClip comes with an assortment of files that let you configure it for each of the most common printers. If none of these files corresponds to your printer, the PaperClip disk has a program that helps you make your own printer file.

The program provides a 40-column display, but if you have a compatible 80-column adapter for your Commodore, the program can also provide a full 80-column display. PaperClip allows you to preview a document in an 80-column format, even without an 80-column adapter.

PaperClip supports two types of files. One command stores text files in screen format, with PaperClip-specific formatting information. Another command stores text in sequential files, in standard PET ASCII. Sequential files can be stored on and read from cassette. You can also use these files with other programs, such as data bases.

PaperClip files are limited to about 500 40-character lines of text. You can, however, create a chain of screen-format files that will print out like one large file. This ability allows you to create larger documents than PaperClip can fit into its memory.

When you are using PaperClip, you work in a display area that is 40 characters wide and 25 lines long. Text lines that are longer than 40 characters wrap around onto the next display line. Unlike some word processors, PaperClip wraps around whenever it gets to the

fortieth character, even if this happens in the middle of a word.

The top line of the display gives you messages from the program. The second line gives the current status, including the current mode, and reports the line number and column number of the cursor. The file scrolls through the display area.

PaperClip allows you to specify the colors of the display, and you can set them using the function keys. The default colors are white text on a black background, with a red border. (We preferred dark-blue text on a light-gray background, with a medium-gray border.)

If you want to work on your document with its actual line width — that is, in the format in which it will be printed — PaperClip allows you to specify a width of up to 255 characters. You can then scroll the display to the left and right as well as up and down, which allows you to work on the whole text. This feature is particularly important if you want to include a table or chart in your text because it is nearly impossible to align columns when each text line appears on more than one display line.

PaperClip has two text-entry modes: Insert and Regular. In the Regular mode, the characters you type appear at the cursor's position as it moves across the screen. In the Insert mode, the characters you type are inserted into the text just before the cursor's position.

PaperClip allows you to position the cursor wherever you want. You can move the cursor up, down, to the left and to the right, by using the cursor-control keys. You can put the cursor at the top of the current display screen, or you can move it to the top or to the bottom of the file. Unlike many word-processing programs, PaperClip does not allow you to move the cursor to the beginning or end of a line using a single

keystroke. At first, it is somewhat annoying to have to move the cursor to the end of the line a character at a time, but you soon get used to it.

The program has a Rapid Scrolling option that allows you to race through the file at high speed, and it has some good editing features. The program allows you to search for and replace strings throughout an entire chain of files. You can move, copy or delete lines, sentences, phrases or words. The program even allows you to move blocks of text between files.

You can also manipulate columns, which is an unusual and useful feature. If you have ever tried to modify a document with columns manually, you will understand our excitement about this ability.

You can set tab stops in any column you want. PaperClip has text tabs, like those on a typewriter, and these tabs always move the cursor to the same column on the display.

You can also specify numeric tabs, which ignore embedded format characters when they compute which column to move the cursor to. This lets you make a column that will be aligned when it is printed. Numeric tabs also cause numbers you type to be right-aligned under the tab.

Most of PaperClip's editing and file-manipulation features are activated by control functions. Press the Control key, and the first line of the display asks which option you want. You specify the option with a single keystroke, either shifted or unshifted. If the program needs more information, it asks for it on line 1. For example, to print a file you press Control and then O (for output). PaperClip asks you whether you want continuous output or page-at-a-time output, whether the file has variable entries that need to be filled, how many copies you want, which page you want to start with and whether or not you

want a whole file chain printed. Each question appears with a default answer.

This command format makes the program more suited to frequent users than to occasional users because it takes some time to learn which letters stand for which functions. Once you learn the letters of the functions you use most often, however, this command scheme makes the word processor fast and easy to use.

Two of the control functions allow you to execute all the usual Commodore disk functions. One command allows you to give disk-wedge commands to rename a file, scratch a file, format a disk and so on. The second command loads the disk directory. The directory is displayed, but it does not affect the text in your file. If you want to load or save a file, you can copy the name out of the directory with a single keystroke.

PaperClip is a post-formatting word processor, which means that what you see on the screen is not exactly what will appear on the printed hard copy.

You specify formatting options for printing by putting directives in the file. Some formatting directives, such as left-and right-margin settings, appear on separate lines that start with a check-mark character.

Other options, such as turning underlining on or off, are specified by embedded format characters that appear in the text. These are represented by some of the Commodore's low-resolution graphics characters.

It is not always easy to remember which directive does what, but once you learn that an inverted L-shaped character means "turn on italic" and that "ln" means "print blank lines," for example, the formatting options are easy to use.

The PaperClip manual has three parts: a tutorial, a reference manual, and technical appendices. The manual is common to all Commodore versions of

PaperClip: PET, CBM and Commodore 64.

The well-designed tutorial takes you step by step through the most basic features of the word processor. If you learn just what is covered in the tutorial, you will be able to use PaperClip for most simple documents.

The reference section explains all the features of PaperClip, moving from simple to more complex abilities. This section is informative and easy to use. The descriptions of the advanced editing features, in particular, have excellent examples.

The appendices provide a variety of technical information outside the main flow of the manual. For example, one appendix explains how to create a printer file of your own; another describes the procedure for using PaperClip if you have only a cassette player. The appendices also contain most of the machine-specific information, such as how to install the PaperClip chip in PET and CBM machines. If you need this information, it is easy to find; if not, it won't get in your way.

The manual has two small problems. Because it documents all the Commodore versions of PaperClip, it has to accommodate the different key names. For example, every time the manual says "Press: CKMK," you have to remember that on the Commodore 64, this means the British pound-sign key. The front of the manual has a table that gives all these conversions, but it still is cumbersome.

Second, the documentation does not include a reference card. Appendices A, B and C give a quick reference to PaperClip's commands, directives and error messages, but they are not as easy to use as a separate card.

PaperClip handles errors well. If you try to do something impossible, PaperClip prints a message on the interaction line. For example, if you try to save an empty file, PaperClip reports "No text to save." We were unable to cause the program to fail. If you delete text by mistake, however, PaperClip has no way for you to recover it.

PaperClip comes on disk. It is not copy-protected, so you can make a backup copy if you want. You must have a special small key plugged into control port 1 to run PaperClip, however.

We called Batteries Included to ask several questions about the product, and the representatives we spoke to were unusually knowledgeable and helpful.

PaperClip is an excellent word processor for serious users. It has many advanced editing features and formatting capabilities, but if you are a casual or occasional user, you may find it difficult to get used to the commands and directives.

—*M. A. Olds*

REVIEW

Professional Word-Processing Bonus Pak

TOTL Software has published a package called the Professional Word-Processing Bonus Pak that contains three inexpensive, related word-handling programs for home use on a Commodore 64 with disk drives. The word processor, TOTL.Text 2.6, works with tape or disk; the spelling checker, TOTL.Speller 3.6, requires a disk; and the mailing-list manager, TOTL.Label 2.6, can use either disk or tape files.

Program disks are write-protected but not copy-protected. All the programs are heavily dependent upon menu selections that allow you access to the various subprograms.

Features of TOTL.Text are comprehensive. They include simple and direct screen editing, pagination, margin control, justification, paragraph formatting, tabulation, centered titles of several lines, footnotes, underlining, character-set controls, scrolling, centering and underlining.

Printing is normally continuous, but you can cause the system to stop at the top of each page for sheet feeding. You can also program the output to stop while you type an insertion from the keyboard.

The program operates in either 40-column or 80-column mode with column-expansion hardware. VIC printers work without program modification, or you can use parallel- or RS-232 serial-interface printers. Although the program is written in BASIC, it has a machine-language component called Chickspeed to hasten certain operations.

TOTL.Speller is a compiled program that compares your TOTL.Text file against a disk dictionary that can be expanded to about 24,000 words. It allows you to add about 150 words to the dictionary in each session.

TOTL.Label allows you to create a file of mailing labels and edit it. You can print out labels up to three wide on standard label stock, or you can insert the label copy in letters created by the word processor. You use a command in the word processor that automatically inserts the next block of label copy.

TOTL.Text is block-oriented. Text is divided into segments, or blocks, of 255 characters each. A block can be as short as a single character or completely filled with text. Empty space in a block is not printed.

If you want to insert copy in a full block, you must use a function key to rearrange the following blocks. You can isolate text in one or more blocks to move or delete it. While you are editing or entering text, the current block is displayed and highlighted in the center of the screen. You can use Commodore cursor-control and editing keys to change the file. TOTL Software has defined function keys so that you can position the cursor at the beginning or end of a block when you need to move or delete parts of blocks.

Allocation of copy to a block during input is handled by a buffer, which is a block of temporary memory. When you type, you experience a perceptible delay between your pressing the key and the appearance of a letter on the screen. This delay, called type-ahead, is most noticeable when you are creating or editing large files. Some users find it annoying because it interrupts hand-eye coordination.

Commands in TOTL.Text consist of two dollar signs and one or two characters, set off by spaces. For example, to end a paragraph, you must enter $$n1. A shorthand method that uses the Commodore logo key allows one-keystroke entry of these commands. Because it is written in BASIC, the program cannot accept the double quotation mark, so you must replace it with another character that instructs your printer to print double quotes.

On the screen, you see text displayed as a continuous block of copy with the control codes interwoven. To see the text as it will appear on hard copy, you must go to the menu, enter the print routine and send a print command that will divert output to the screen.

The margin-control settings are the most difficult feature to understand, since you must set both the line width and the right and left indentations. You

Info World
R e p o r t   C a r d

Professional Bonus Pak

	Poor	Fair	Good	Excellent
Performance	☐	■	☐	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	■	☐	☐
Error Handling	☐	☐	■	☐

Summary
These word-processing-related programs are intended for home, not business, use. TOTL.Text and TOTL.Label are also available on tape. Command structures are unwieldy, and the programs are slow, but their under-$50 price tags may prove alluring for those who don't mind such flaws. Documentation is good, as is error handling.

System Requirements
☐ *One disk drive*

Suggested list price: Bonus Pak (all 3), $79; TOTL.Text, $44; TOTL.Speller, $35; TOTL.Label, $24

*TOTL Software, Inc.
1555 Third Avenue
Walnut Creek, CA 94596
(415) 943-7877*

must compute the length of pages by using two or more commands. The beginning of any TOTL.Text file, therefore, consists of a long string of dollar-sign commands that might confuse users.

Although its features work reliably, the word processor's ease of use is degraded by its long commands, type-ahead and the lack of on-screen formatting. The block system takes some learning, especially if you are accustomed to the more common document-oriented word processors.

The spelling checker begins with a configuration menu that allows you to choose screen colors and output configuration; you can save the configuration file on your backup disk, together with your modified dictionary. The opening menu allows you to choose such options as loading or saving files, clearing memory, proofreading, verifying spelling, reviewing text, updating the dictionary or viewing the disk directory. For those of us who habitually forget filenames, the ability to view the disk directory during program execution is a distinct advantage.

You must initiate each step in the proofreading process by issuing a menu command. First you call up the file by its filename and proofread it. Then you may save the modified file and any dictionary changes. Using the Proofread option, you may direct the computer to scan any specified number of blocks for words and commands that do not match dictionary entries. Each suspect word or command is slowly, ever so slowly, displayed on the screen.

By pressing the appropriate function key, you can add the word to your temporary dictionary, correct the word or accept the word "as-is" without entering it into the dictionary. If you are in doubt, pressing a Help key will display similar words from the

dictionary; if there's no similar word, you get a "can't help" message.

A utility on the speller disk allows you to change the dictionary and reorganize the disk space through a Validate function.

TOTL.Label is a list-processing program that creates sequential files that are compatible with TOTL Software's data-base program. It is written in BASIC and has a machine-language I/O module. Each label may have a code line that won't print but that can contain data used for sorting or selecting. You can also suppress other lines in a label when you print a batch of labels.

When you begin to create a label file, you must choose the number of lines in each label. As you enter new labels, the system prompts for a specific line number. Whenever you add a label, you must select the Add option from the menu, to which you are returned when the label is complete.

You may choose to Browse the file if you want to scroll through all or part of it. The entire file must be small enough to fit in your computer's memory, though, and this is the program's most serious limitation. It is, therefore, important that you save the list after updating and before printing, because a program error could wipe all your editorial changes from memory. The program automatically maintains one generation of backup files.

TOTL Software's documentation consists of half-page booklets clearly printed on slick paper. They are logically organized and have a comprehensive table of contents. Each begins with an introduction that explains the program and procedures for backing up on disk or tape.

Each command is explained in tutorial fashion, and there are chapters on errors and equipment configurations. The spelling checker includes an on-line

Help feature that is absent from the other programs. The word-processor has a four-page, quick-reference card.

The few system error messages are clearly written in these programs. If you try to load a new file in the spelling checker without killing the old file, the system informs you that a file already exists in memory. The word processor lets you know when its input buffer has overflowed. Some glitches that might result from system problems are explained in layman's language in the documentation.

These are not business programs. The company's motto, "quality you can afford," is justified so far as home users are concerned. Support is provided by mail for a fee of $2 per inquiry. Free replacement of defective media is offered in the warranty, which is void if you have removed the write-protect feature.

Given the cumbersome command structures and slow operation of these programs, prospective buyers must determine if their low prices are a comfortable trade-off.

—*Ned Heite*

REVIEW

Mirage Concepts Word Processor

Mirage Concepts Word Processor (Professional Version) is a professional-power word-processing program for the Commodore 64. It is designed to accept information directly from the Mirage Concepts Database Manager so that you can produce form letters. Word Processor has more than 70 keystroke commands; most of these require that

you press either the Control or the Commodore key while also pressing another key that defines the command. For printer interfacing and other special circumstances, the program offers a macro implementation (a set of special programming symbols to use within the program itself) that allows you to modify many program details to meet your needs. A spelling checker is also included in the package.

The version of Word Processor that we reviewed was the Professional Version. Mirage Concepts also sells a less powerful and less expensive Personal Version.

This package is obviously designed to mimic the workings of a standard business program that runs on a desktop, office microcomputer. Its screen-display styles are similar, and with the exception of the Commodore key, the keys particular to the Commodore 64 — such as CLR/Home, Run/Stop and Restore — do not function. The keys that are used are those found on standard terminals. Word Processor's likeness to these business programs may prove advantageous to you if you already know, or will learn, how to use a business microcomputer such as the IBM PC.

The manual says that the people at Mirage Concepts worked through the first nine months of 1983 producing strong application software for the Commodore 64. Their guidelines were simply to make the programs "powerful, practical, easy to use and reasonably priced." We think they succeeded in their intention when they created this program.

Word Processor loads completely into memory. After loading the program, you remove the program disk from the disk drive. This limits wear on the program disk, and more important, it allows you to do your word

InfoWorld
Report Card

Mirage Concepts Word Processor

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
Word Processor from Mirage Concepts is designed to work like a business program for a desktop, office microcomputer. It offers power and documentation that are virtually unheard of in word processors for the Commodore 64. The spelling-checker program works too slowly to be of much use, but you'll find the rest of the package to be truly first rank.

System Requirements
☐ *One disk drive*

Suggested list price: $89.95

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processing with only one disk drive. Some systems require that the program disk stay in the drive, which means you need another disk drive for the data disk that will save your edited text.

This same feature, however, limits the space left for text, because the whole program remains in memory. Files cannot be long; you have only 16K of working memory within the program. You can put about 16,000 characters (including blanks) in a file. You can thus enter only 4½ pages of single-spaced text before running out of space. The program doesn't use virtual memory — a feature that allows a system to feed the text in and out of the computer memory from the disk without the user knowing about it. Virtual memory is often used on more expensive word-processing systems, and it allows them to work on files that are much larger than actual available memory would permit.

You do not lose information, though, if you try to enter too much text. A message appears to tell you that you are out of space, and then you are allowed to save the text you have completed. To build longer documents, you can chain files by using the Advanced Print option, which is listed in the main menu.

A fascinating feature of this program, and one that also appears in a few other word-processing packages, is your ability to choose either a 40- or an 80-column format — you can select the format through the software. It is this option that takes up so much memory and limits the text area. The implementation of 80 columns shows that the program's designers have recognized that the least professional aspect of the Commodore 64 is its 40-column display.

Word Processor is supplied on a copy-protected disk. The first load step takes about 15 seconds, and the main

loading step takes about 45 seconds more — pretty reasonable for a powerful program loading on the slow 1541 disk drive. The screen tells you that the computer is loading the program and asks you to "please wait."

The first screen display asks you to choose colors for background, character and highlighting. You can choose any of the 16 Commodore colors. The highlight color is the color of the line on which you will do all your editing. The manual suggests the best colors for monitor or television viewing.

You are next prompted to remove the program disk and insert the data disk (the latter should be formatted). If you want to reuse an old disk or format a new one, Word Processor lets you format a disk directly from the program itself; you don't have to leave the program and use the hard-to-remember disk commands.

Next, you see the main menu. Word Processor is a menu-driven program. Written entirely in machine language, it is fast. The main menu choices are Edit File, Save File, Load File, Merge Files, Delete File, Format Disk, Directory, Print File, Advanced Print and Quit.

You do all editing on a single line in the center of the page. When you move the cursor, what actually moves is the text in the background. You can see a nearly full screen of text. It scrolls by the narrow action window — also called the editing highlight line. The use of an editing line is supposed to simulate the action of a ball-element typewriter. The program even lets you add sounds that approximate those of keyclicks and margin bells.

In the Edit mode, you can choose the number of lines per page, characters per line and and spaces per indent. The default values (preset values that are stored within the program) — of 55, 65 and 5 for those variables — allow you to ignore all the complicated changes

offered by this program. You can choose from 1 to 255 lines per page, 1 to 255 characters per line and any number less than the number of characters per line for the indent spaces. These parameters remain in force even during printing unless you change them or quit Word Processor. They are not stored with the text file, though.

Seventeen lines of text show on the screen in the 40-column mode. The top of the screen is dedicated to a prompt area, or information block, that includes counters showing the page, line and character number you are on and whether Insert, Block and Column functions are on or off. The counters all apply to what will be printed and not to what appears on the screen, however. This results from the 40-column screen limitation. The automatic wordwrap (which moves words that would have extended off the right side of the screen down to the left side of the next line, automatically) keeps all words on the screen. We normally like to see our text as it will print, but the Commodore's 40-column display doesn't make this practicable.

Toggling (switching between) the 40- and 80-column displays is easy. Just press the F8 key, and the display disappears and then reappears in the other format. All the editing functions work the same way on the 80-column display as they do on the 40-column display. It takes a bit longer to use these functions in the 80-column display mode, though. The 80-column mode uses the Commodore's graphics to present characters that are only half the width of the originals. This compression doesn't show up too well on most television sets: you need a monitor or a high-quality TV to be able to read in this mode.

One strange bug in the program is that the counters don't keep up when you move backward through the text.

Once you move the cursor backward, you have to press the F1 key to reset the counters to their proper new values. This bug is noted in the manual.

When you are about to do something that could be catastrophic, the program always asks you if you really want to complete that action. For example, if you press Control-P, all text in a file is erased. You have to answer "Yes" to a further question before the program will begin erasing.

To return to the main menu from the Edit mode, just press Commodore-Q at any time. Do this when you want to save or print what you have entered.

The second choice on the main menu is the Save File option. This stores your text in a standard Commodore sequential-file format. Format parameters aren't saved; you have to reenter them when you next work on the file. Even after you've stored it, your file remains in the computer's active memory.

If you try to store a file with a name that is already on the disk, it won't store. You get an error-message number. Too bad the programmers didn't add a description of what was wrong. At least you don't actually hurt your old file.

Word Processor's manual does emphasize the importance of making backup copies of your file — one on the disk you're using and one on a backup disk.

The program allows you to make two types of cursor movements: destructive and nondestructive. Destructive cursor movements erase text as the cursor moves across it; nondestructive do not. Destructive commands use the Control key, and nondestructive commands use the Commodore key. Some of the destructive moves, such as word forward or back or line up or down, are annoyingly slow. Destructive moves are

basically just various deletion commands. Deleting a line isn't fast; it can take nearly five seconds. Deleting a full screen doesn't take much longer than that, however.

You can either insert or replace text — that is, you can put in new information, move the old or put in the new information and cover up the old.

Other standard word-processing features — such as line justification and search and replace — are included in this program. The program justifies text by adding spaces between words. When you use the Search and Replace option, you can choose to be prompted for each change or just have the program make the changes without prompting you. The program also asks if you want to ignore case (lowercase or uppercase letters). Again, this feature isn't fast: Word Processor takes about four seconds to find and replace a word or symbol. This is, however, faster than you could do it by hand.

A nice feature rarely seen in other programs lets you insert 40, 80 or 160 spaces with a single-key command. There is even a Tab Backward command. This program does not have a ruler line at the top of the screen, as do many other word processors, though. Instead, this word processor has a character counter.

Block manipulation is slow. Word Processor's block moves include copying, saving (to the block's own file), moving, deleting, inserting, indenting or printing. It even has block operations you won't find on well-known word processors — for instance, you can go directly to the beginning or end of whatever block you have marked. We wish you could redefine the beginning or end of a block after first defining that block, though. Unfortunately, you have to erase the block markers and start again after marking the block. This is true of the column operations, too.

The column moves are powerful: we don't know another Commodore 64 word-processing package that has them. In fact, even many professional systems don't have them. You set columns just as you would set blocks, by putting beginning and ending markers on the section with which you want to work. Column work can sometimes be confusing because the columns don't show on the screen as they will appear when printed.

You can move a column horizontally, or you can erase it. The column-format change does take a little time, though.

Word Processor is designed to accept information from other files and then to insert that information into the places you designate in text. You don't have to use sequential files from Mirage Concepts Database Manager — though the two programs are made to work together smoothly. You can use sequential files created in any way on a Commodore 64. In fact, Word Processor has its own routines to lead you through making a sequential file. There are some limitations: for example, you cannot use a file with more than nine fields per record directly, You must break it into subfiles.

When you are inserting information from a data base, you simply embed an up arrow and a number (for the number of the field, 1 through 9) in the text and save that file. Then, with the sequential file on the same disk, you execute a Merge function. You do this by using the Advanced Print function and just enter the name of your sequential file in the position labeled "Database file" on the screen. The files with inserted data are not saved on the disk; they are just printed.

The spelling checker is newer than the Word Processor. It comes with a 30,000-word dictionary on disk. With this program, you can check the

spelling in any sequential text files, not just those made using Word Processor, and you can use it to build your own specialized dictionaries. These dictionaries contain no definitions, only correct spellings. You can use the spelling checker on any file that is up to 20K long.

To use the speller, you need to exit from Word Processor and go back to the program disk. You load the speller as a separate program, and loading takes about 20 seconds. It works pretty much like Word Processor. The main spelling menu offers Check Spelling, Directory of Disk, Copy Dictionary and Quit.

First, we checked the directory on the disk, and we found a gaffe — on the Directory menu, *directory* is spelled "*direcotry.*"

This spelling checker is not easy to use. The first time you use it, you have to copy the dictionary from the program disk to a separate disk. The program takes you through the process, step by step, but you have to shuffle disks for a while (around 20 minutes) because the 30,000-word dictionary takes up memory space. Then, when you actually check spelling, you have to start the spelling-checker program, take that disk out and put the data disk back in, name the file you want to check, take that disk out and put the dictionary disk back in and wait for the program to check the words. This all takes a while.

For instance, the program took almost five minutes to check the spelling in a 27-word paragraph — this was just the time the program took to run, and it didn't include disk swapping.

When the spelling checker finishes, the text it has checked appears on the bottom part of the screen, and the top of the screen shows

*<F1>=Ignore — Proceed to next word

*<F3>=Replace word with new word

*<F5>=Add new word to dictionary

*<F6>=Look up spelling of a word

*<F7>=Exit

Each word, in turn, that the spelling checker hasn't found in its dictionary is highlighted in inverse video. You choose what to do with each word. You can press F6 to instruct the spelling checker to look through the dictionary for words that have a spelling that closely resembles that of the word you want to check. This process, too, is slow. The text disappears, and the possible words appear on the bottom of the screen. The program took more than four minutes to look up the word *stuf.* This is so slow as to be worthless. In addition, the program offered almost 50 possible words in exchange for *stuf.*

Finally, you can replace old text with new text, save new text under a new name or exit from the spelling checker without saving new text.

The documentation for Word Processor is impressive. A plastic binder contains more than 200 pages that cover the program from beginning to end. The binder contains an introduction (which includes notes about care of disks, program loading and much more), a quick-reference card for commands, a tutorial, a table of contents, an index, a thorough reference to commands, programmers' hints, a glossary, printer commands, printer-file structure and a short separate manual called the *Spelling Checker User's Manual.*

This level of documentation for a Commodore 64 program is almost unheard of. The material is thorough, professionally presented and well indexed. The 12-lesson tutorial is divided into two sections, beginning and advanced, and takes you progressively through everything you'll need to know

about the program.

The introduction begins with an outline of the features of Word Processor and then moves on to a description of the Commodore 64 keyboard. This is a good idea; many users of Word Processor will also be new to the Commodore 64.

Each of the tutorial lessons closes with a summary. These lessons are well written and well organized. For example, the description of the loading process, in tutorial lesson 1, is superb. The lesson steps you through all the actions of the disk drive and tells you how long each step takes. This makes life easy for beginners. The tutorial is illustrated with printed versions of the screen display. Tutorial lesson 11 in the manual shows you how to use Mirage Concepts Database Manager program with this word processor.

The quick-reference card is laminated. Except for complete on-line tutorial and reference, you can't do any better than this for documentation.

The program and its printer-driving software is completely compatible with the Commodore 64 printers (models 1525 and 1526). The documentation contains information both on the characteristics of some other popular printers (such as the Epson MX-80 and FX-80, the Gemini 10, the NEC Spinwriter and the Okidata Microline 82A and 92) and on how to use your printer's various printing modes.

When you move to the first printing menu, you see a few text-configuration choices; defaults are already entered, though, so you can ignore these details if you want.

While printing, you can press Commodore-Q to stop the printing and press it again to return to the main menu. You may have to hold the keys down for a while to execute the first command. You can even print a block from within the Edit mode.

There are a few odd bugs in the program. Because its file memory is so limited, when you try to insert a piece of text longer than it can hold, you see an Out of Memory message, and the part of the piece that did fit in memory is shifted to the end of the file, not where you tried to insert it.

Error handling is well done. For example, if you try to do something that cannot be done — if you try, say, to merge files on a disk that hasn't been formatted — the screen display informs you that an error has taken place. All you have to do to continue (this is spelled out on the screen) is press C, for continue. Unfortunately, the error messages are typically of the type "Disk Error: Error Number — 62."

The program isn't foolproof. Several times our complicated moves and commands had effects we didn't anticipate. For instance, if you try to delete a file that isn't on the disk, the program won't tell you that the file isn't there to delete. This is a fault of the 1541 disk drive, though, and not the program.

The commands are so complex — the on-screen image doesn't always match the printed-out version exactly (which doesn't help) — that you may not know what went wrong. We were always able to recover from our errors without losing any text, though.

On the back of the binder, and in the manual's introduction, Mirage Concepts informs you of its support and backup policy. The program is supposed to be used only by the original buyer and only on a single machine. This is a typical professional license agreement. The software and documentation are copyrighted, and the disk is copy-protected. The disk itself, which comes inside the binder, has a serial number printed on its label and is warranted to be free of defects. Removing or altering the serial number voids the warranty.

You'll need to know that number whenever you call the company.

If any defects appear within 90 days, you can get a free replacement from your dealer or from Mirage Concepts by sending the disk back with the purchase receipt. After the 90-day period, but within the first year, you can get a replacement by sending in the disk, the receipt and a replacement fee. If your warranty has run out, you'll need to pay $10 as a service charge to get the replacement.

If you need a backup copy, you can send $7 in the warranty registration envelope to Mirage Concepts. Only one backup is available for each package. If bugs are found in the program, you will be entitled to free program-update disks. If changes to the program are enhancements suggested by users, you'll have to pay a fee to get the newest version. To get any of this support, you have to send in the warranty registration card.

If you have any trouble with this program, you can call Mirage Concepts' customer-service department.

In many ways this package resembles some of the most popular professional systems for more expensive computers. Word Processor has many commands and keys to learn: on the flip side, you are given a powerful and flexible program with which to work. You only need to learn a few commands to get by.

Mirage Concepts Word Processor (Professional Version) is an excellent word-processing program. Its documentation is superb, and many of the commands are similar to those in more expensive programs such as WordStar. Its commands and menu structure are parallel to those of Mirage Concepts Database Manager.

The 80-column option is a welcome feature, if you have a monitor capable of resolving 80 columns, but the available

memory is too small. Also, although the spelling checker performs its tasks well, it is too slow to be worth using. This snail's pace is in large measure the fault of the Commodore's slow 1541 disk drive.

Don't let these criticisms keep you from considering this program, though. In some ways, we can say what is particularly wrong with this package only because so much is right with it. Too much Commodore software — even the packages that purport to be business applications — are written, work and are documented as though they were video games. This program is written, works and is documented like a professional piece of software for a much more expensive computer.
—*Phillip Robinson*

REVIEW

OmniWriter 64 and OmniSpell 64

The *Hes* in HesWare stands for Human Engineered Software, and when it comes to its newest product, a word processor called OmniWriter 64 on the same disk as a 30,000-word spelling checker called OmniSpell 64, HesWare lives up to its name.

Software for the Commodore 64 is not usually the most easy to use in the world. Unlike the Apple computer, with which you can just put a disk in the slot, turn the computer on and have a program running automatically in a matter of seconds, the Commodore computer requires you to make more effort. In the case of OmniWriter, which is typical of every Commodore program

InfoWorld
R e p o r t   C a r d

OmniWriter 64
OmniSpell 64

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
The OmniWriter 64 package consists of a screen-oriented word processor, OmniWriter 64, and a spelling checker, OmniSpell 64, on one copy-protected disk. OmniWriter is easy to use, makes good use of the Commodore 64's function keys and enables you to format text as you type it. OmniSpell is a nice bonus to a better-than-average program, but it is too slow to be a stand-alone program.

System Requirements
☐ *One disk drive*

Suggested list price: $59.95

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we've seen, you have to insert the disk, type "LOAD "*",8,1" and then wait 85 seconds for the program to load. (The fault lies with the abominably slow 1541 disk drive, which uses a serial rather than a parallel method for data transfer.) So when we say that OmniWriter is easy to use, we mean within the confines of the less-than-perfect Commodore environment with which HesWare and other publishers have to contend.

OmniWriter 64 is a screen-oriented editor, which means that the screen attempts to represent exactly what will appear on paper. This is not too difficult on computers that can display 80 columns, but the Commodore 64 is confined to 40 columns. OmniWriter solves this problem by giving you the option of simulating an 80-column display by scrolling sideways as well as up and down. As you type, when the cursor gets to the right edge of the screen, the whole page scrolls to the left so you can see the right-hand half. Conversely, when you move the cursor to the left edge, the screen scrolls to the right. If you want to see a whole screen instead of either half, you can opt to display only 40 columns.

The program uses the format-line concept, which is similar to the method that the Wang word processors use. It even uses the faint little dots (a Wang trademark) at each character position, which are handy when you're trying to count spaces on a line. At the top of the screen is a ruler (the format line) that displays the current locations of left and right margins and tab stops. The format line can also contain the control-code information that some printers require for special effects such as bold printing, underlining, superscripting and subscripting and font-style information. You can set the right margin out to as far as column 240. You can also specify decimal tab stops as well as normal

ones. As you type, the screen display adheres to the conditions you have set in the format line.

When or if you start a new paragraph that requires different format conditions, or indeed wherever you want to, you can establish a new format line. If you press Control and then F, OmniWriter copies a new format line that is a duplicate of the previous one and places it in the line above the cursor. You can then modify this format line to contain the new information you desire. For instance, you can pull the left and right margins in for a block-margin effect, or you can set decimal tab stops to type in a column of figures. If you go back to earlier text and modify an existing format line, the screen instantly updates to the new parameters.

The program makes good use of the Commodore keyboard's eight function keys. The OmniWriter 64 package includes an overlay that labels these keys and allows you to page forward and backward, display the previous and next screen, jump from one end of a line to the other and delete and insert text.

In addition to these function keys, the program uses the Commodore key effectively. If you press the Commodore key, followed by a single-letter designator, you have a variety of options. For instance, Commodore-C lets you (c)opy text from one part of a document to another. Commodore-F means (f)ind a phrase, Commodore-R equates to (r)eplace a phrase and so forth. The program's Replace function allows you to replace a maximum of 25 characters at a time, which we found restrictive.

One of the Commodore control keys that we like is T for (t)one — color tone, that is. This control lets you customize your screen text color, background color and border color — and *very* easily, we might add. When you invoke

the command, a line at the top of the screen lets you know that each time you press F1, the text color will change (and it automatically takes you through the entire palette of colors, one at a time). Each press of F3 brings you a different background color, and each press of F5 displays a new border color. If you get lost in the panoply of choices, you can always press F7 and return to the default arrangement (light blue on dark blue). An unexpected bonus is that the program saves the colors you choose to the disk when you save the document. You can thus color-code your documents and display different documents in different colors.

You can save a document as large as 34,000 characters, which is the limit of free space available in RAM after the program takes up its share. Pressing Commodore-spacebar at any time while you are editing tells you how much free space you have left. Since each page of text usually contains about 2-4K of characters, this means you have room for roughly 9 to 17 pages. Not to worry, however, since one of OmniWriter's features is a Merge capability. You can use this feature in two ways. You can end one document with a Merge command, which calls for the insertion of material from another document or another entire document. You can thus have several documents "chained" together, each one at its conclusion calling for the next one. The other and more usual use of the Merge feature is to create form letters. In this application, you can merge items from a work file (such as names and addresses) with information (the body of the letter, perhaps) in the main document. The program's Merge and Don't Merge commands control the flow of data from the work file.

When you are ready to print your document, you press Commodore-P, and OmniWriter displays a menu containing print options such as pitch setting, justification, header information and printer type. Once you have chosen print options, you press F1 to print your document. One observation we made about the page numbers that appear in the footer is that the program offers you no provision to put any blank lines between the footer and text.

After you have created, edited and printed your document to your satisfaction, you can save it on disk. At this point many of us murmur, "Oh, no! I forgot to initialize a data disk!" In most programs, when this occurs, you have to abort the program (losing all of your work, naturally) and go through the hassle of initializing a disk. Those of you who have ever initialized disks on the Commodore know that it's not easy. It's no problem when you use the OmniWriter program, though — if you have forgotten to initialize a disk, you can directly access DOS from within the program by typing Commodore-D (for DOS). The program responds with "What command?" If you enter "n:(diskname), (two-letter code)" and insert a blank disk in the slot, the computer then initializes the disk.

What you cannot do without preparation before you begin word processing, however, is use the spelling checker, OmniSpell 64, for the first time. You also cannot (nor should not) use the master copy of the spelling checker. One reason is that the disk is protected, and so you cannot write to it. The other reason is that a dictionary is a dynamic entity — after a while, the dictionary reflects you, as you add new words and delete unused ones. Before you can use OmniSpell, you must transfer the dictionary to an unprotected work disk (the OmniWriter package contains a utility program to do this). This takes a long time to do and involves several disk swaps.

Once you have made your spelling-

checker disk and inserted it in the Commodore's drive, you can call for a spelling check from within any editing session of a document by pressing Commodore-Shift (Run/Stop). The program first tells you how many words, sentences and paragraphs your document contains. It then produces an alphabetical list of all the words you have used and proceeds to check them against its dictionary.

Upon completion of the spelling check, the program returns you to your document and then proceeds to search through the text and highlight all questionable words. At this point you have the option of correcting the word, adding it to the dictionary or ignoring it. OmniSpell's limitations are that it is slow (a 95-word sample took four minutes to check), and, if you have a large document, you may have to break it into sections because the spelling checker takes up RAM space to function.

OmniWriter's manual is the typical small-size booklet that accompanies almost every Commodore product we've seen. The pages are glossy, which makes it somewhat difficult to read, and it has no index. Aside from that, the manual has a thorough table of contents, the layout of its material is in logical order and the instructions are clear. Besides adequate reference material, such as keystroke-command summaries not only in the appendices but also on a separate command-summary card, it contains a step-by-step tutorial that guides you through all the program's features.

We experienced little difficulty with errors. At one point we entered a wrong filename, and the program displayed an error message to that effect. When we pressed Run/Stop, however, OmniWriter reverted to its normal state.

The warranty that accompanies the product is for 90 days. OmniWriter and OmniSpell (both on one disk) are copy-protected. The manual mentions that you can purchase a backup copy but gives no price.

In summary, OmniWriter is better than most other word processors we have seen for the Commodore 64 because you can format text as you type it. Although OmniWriter's features are not complete, they are easy to use. OmniSpell is a nice bonus to include with the package, but, to be competitive as a stand-alone program, it needs to work faster and have in-text highlighting ability.
—*Marty Petersen*

REVIEW

WordPro 3 Plus/64 and SpellRight Plus/64

WordPro 3 Plus/64 is the latest version of Professional Software's full-featured word processor. WordPro has been available since 1980 for other Commodore machines, and files you create with the 64 version are compatible with the other versions. SpellRight Plus 64, a spelling checker developed by SpellMaster Systems Software, is packaged on the reverse side of the WordPro system disk.

Setting up WordPro is simple; when the system starts up, it asks a few questions about your printer, file size and disk-drive device number. This setup screen won't accept a wrong answer. If you perform the lessons in the manual, which takes a couple of hours, you should be able to do most ordinary tasks competently.

WordPro has no menu. Whenever

the program is running, a status line at the top of the screen displays the line and column numbers of the cursor and the status of any control commands that are operative. These control commands include Insert, Caps Lock, Numeric mode and Extra Text Insertion.

The cursor keys scroll the text up or down. Press the Home key, and the cursor goes to the upper-left corner of the screen. Press it again, and the cursor goes to the top of the file.

To change text you have already written, you use the cursor keys to move the cursor to the place where you want to make a change. By pressing the Insert/Delete key, you can delete characters at the cursor position; this key, shifted, inserts blanks. To insert text inside an already-written paragraph, the shifted Control key places you in Insert mode. The program then inserts anything you type, at the cursor position, and moves and reformats the rest of the file to accommodate it.

To insert large blocks of copy in a file, you can open a window of line spaces with the Insert/Delete key and then start typing. With another control function, you can designate a range of text lines to be moved, deleted or reproduced.

Each WordPro file can contain only as much text as can fit in memory, which is 329 lines of main text. Since you can link files, any document can be infinitely long, spanning many disks.

Certain commands are global to groups of linked files. For example, you might want to change one phrase that appears throughout a 500-page report. Using WordPro's global Search and Replace feature, you specify the old word or phrase and the one that is to replace it. The computer then loads each file, searches for the old text and replaces it with the new text. The program then automatically saves the changed files on the disk.

To save a file on a disk, you type the shifted Clear/Home key. The status line now reads "recall, memorize or insert." If you then press M, the program saves the file. If you have already saved a file under that name, the monitor beeps and the status line asks, "Replace?" If you want to overwrite the old file, you press Return. When you are typing text, you need to press the Return key only at the end of a paragraph.

WordPro can calculate column totals and can automatically format numeric columns so that decimal points are aligned. It can accept sequential files, such as name-and-address files created by a data base, for automatic insertion into form letters. Repetitive typing jobs can be produced without your intervention.

WordPro supports printer justification, which means that your lines can be right-justified and you can use proportional-space printwheels. Although WordPro supports most common printers' built-in command protocols, you can program nonstandard printer protocols and control codes. WordPro also allows you to store files in standard ASCII and transmit them by modem to a remote printer or computer.

By embedding commands in the text, you can set page length, right justification, margin settings, line spacing, printer pitch and other format features. You can change formats in the middle of a document by embedding a new command. No matter how many disks your work might occupy, you need format it only once. You can insert subscripts, superscripts, boldface and underlines by using a Control command.

When it is printing, the system automatically formats your lines without splitting words. If you wish to allow certain words to be hyphenated, you can embed phantom hyphens that

InfoWorld
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WordPro 3 Plus/64

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	■	☐	☐
Ease of Use	☐	☐	☐	■
Error Handling	☐	☐	☐	■

Summary
WordPro is an inexpensive, easy-to-use, professional-quality word processor that produces results comparable with those of dedicated word-processing machines. The program is handicapped by poor documentation, which although tutorial in style is poorly indexed and organized. As a bonus, though, the reverse side of the disk contains a spelling checker, SpellRight, which also performs well and has the advantage of better documentation.

System Requirements
☐ *One 1541 disk drive*

Suggested list price: $99.95

Professional Software, Inc.
51 Fremont Street
Needham, MA 02194
(617) 444-5224

the program uses only if the word falls at the end of a printer line.

WordPro can automatically number your pages and place the page number in any specified position at the top or bottom of the printed page, and it can print running header or footer lines at the top and/or bottom of each page. You can set or clear tabs anywhere across the page at any time, and you can change the screen colors at will.

WordPro displays system error messages, such as "disk full," on the status line and does not cause you to lose your data. You can't accidentally erase a file by a one-key error or by writing past the end of the file. The Erase command requires two distinct keystrokes with a pause between them. Common typing mistakes, such as trying to tab with no tabs set, generate a message on the status line and have no ill effects.

If you have a printer problem in the middle of output, you can stop and restart at the top of the page that was interrupted. If a disk drive or disk fails in the middle of a session, you can make the repair, change disks or even change drives, without losing your work in memory.

Our biggest complaint about WordPro is that it does not have wordwrap on the screen. When the program comes to the end of a 40-character line, it displays the next character on the next line, regardless of where it happens to fall in the word. This feature makes it difficult to proofread the screen.

You can, however, use the SpellRight spelling checker to survey your word-processor text and compare it against any of a dozen dictionaries of properly spelled words. These dictionaries include one that you can compile yourself. When you load the program, a main menu displays all the program options. If you find the menu

confusing, you have the option of calling a Help screen that explains the major commands. Throughout the program's operation, a two-line display at the top of the screen tells you what is happening and tells you what to do next.

Once you have loaded your file, SpellRight compares it with each of its dictionaries. At midscreen, it displays the number of words in the text and the number that it has not found in a dictionary. Each time it loads a new dictionary, the number of suspect words falls. The alphabet scrolls in a three-character window of the status block to reassure you that the program is working.

After it has checked its dictionaries, SpellRight displays your text, and highlights all the words that it did not find in the dictionaries — these will include unusual words, technical jargon and proper names, along with misspellings. If the highlighted word is OK, you can press the Return key and pass to the next suspect word. If it is misspelled, you can correct it using the Commodore editing keys. If you want to add a commonly used word to your own dictionary, you press the up-arrow key instead of the Return key. You cannot correct textual errors that the system has not spotted; editing is restricted to the highlighted words.

When you have reviewed the file, SpellRight displays a list of all the new words and gives you a chance to decide against saving them — normally, it adds them to the dictionary. The system then rewrites your text file with the corrections.

A built-in function, available from the main menu, allows you to write the user dictionary to a word-processing file for review. Another function allows you to delete words from your dictionary, which is useful when it reaches its capacity (about 1500 words).

SpellRight's performance is smooth and logical. You are never left hanging, and you can always return to the menu and abort an operation by pressing the @ key. Because it reads a disk full of dictionary files, text-file review takes time.

You can choose to fast-track through a file, though. In Fast mode, the system checks only its initial dictionaries, which contain the commonest words in the language. This option means that you must approve more suspect words manually, but it can save time.

SpellRight helps you avoid annoying errors by always requiring you to confirm commands that might be difficult to correct. For example, you must confirm dictionary additions or the replacement of a file. If you overfill the dictionary buffer or load a file that is too long, or if a computer I/O error occurs, a clear explanation on page 23 of the program's manual lists a "normal response" to such problems.

WordPro 64's manual is nearly the same typewritten document that Professional Software has been shipping with all versions, but the company has made some changes for this machine. It consists of 12 sections, each with separate page numbers. The index is sparse and vague, consisting of only one page for about 150 pages of text. The manual's style is tutorial and so thoroughly covers the system that few questions are left unanswered. As a reference book it is cumbersome, because certain functions are spread among several lessons and it has no topical index. It does, however, contain appendices with the major commands and error messages in tabular form. At the back of the manual, notes by author Steve Punter describe file structure and patches for various adaptations.

Because the program has about a dozen commonly used control functions, users need a ready-reference guide, which is provided only as an appendix to the manual. Earlier versions of WordPro came with a reference folder and stickers that you could tape to your computer's keys. These features are sorely missed, even by experienced WordPro users.

After using WordPro for three years, we are still discovering and learning new techniques beyond those necessary for routine operation, but the poor organization of the manual complicates the process of adapting to new situations.

SpellRight's documentation consists of comprehensive on-screen prompts and helps, as well as a 25-page manual reproduced from typewritten copy. It also is arranged in tutorial fashion, so that you can step through your first session with the manual open. It has no index, but the table of contents and chapter headings are clear and logical. Overall, this manual is superior to the accompanying WordPro manual.

SpellRight requires a Commodore 1541 disk drive. Other drives will not work with the program because SpellRight uses DOS routines peculiar to the 1541. WordPro, on the other hand, works with the 2031 or other drives connected through the user port. On a single-disk system, WordPro has most of the capabilities of a dual-disk system on other computers. Single disks are practical with WordPro because you do not need to leave a program or system disk in the drive during the operation. Most common printers and the Commodore 1540 series disk drives work without modification.

To use Commodore dual drives or other IEEE-488 devices, you must use an interface cartridge. We tested one made by MSD and one by Richvale Telecommunications. Both require you to load a Relocator program that moves their interface programs out of the

space that WordPro occupies. Using the Richvale device, we were unable to rewrite files and were forced to save each update under a new name. This problem did not exist with the MSD linker using the program "Rev 2 CIE Patch." With the patched MSD linker, however, we were unable to use the built-in WordPro Disk Formatting utility or load the program with the Commodore wild card (Load "*",8) command.

Although the WordPro side of the disk is write-protected, you must write on the SpellRight side of the disk to create your dictionary. You can buy replacement or backup disks from Professional Software — replacements cost $12 and second copies are $15. Professional Software's staff has always been helpful and knowledgeable when we have called them.

WordPro, in spite of its relatively low price, performs professionally. Its machine-language functions operate instantly and flawlessly, and it produces results comparable to those of dedicated word-processing machines.

SpellRight is easy to use, even the first time. You must read the manual and let it step you through your first session; but thereafter the Help menu and on-screen prompts are sufficient reinforcement. A minor annoyance is that you must turn off your computer before and after you use SpellRight — the program changes the 64's operating system so radically that normal disk operations are impossible without a cold start. This is a useful program, though, even for users who smugly claim to be excellent spellers.

—*Ned Heite*

NUMBERS

The programs in this category help take the headache out of dealing with numbers. For example, they calculate spreadsheets and do budgets and bookkeeping.

REVIEW

Easy Calc

Easy Calc is a spreadsheet program for the Commodore 64. It was created in Sweden by Handic Software, but it is distributed in the United States both by Handic (under the name Calc Result, Easy and Advanced Versions) and by Commodore (as Easy Calc). For this review, we evaluated three packages: Easy Calc and both versions of Calc Result.

Spreadsheets allow you to make repetitive calculations automatically. This ability can be useful in many tasks, whether you want to set up a family budget or calculate the profit margins on complex stock purchases.

A spreadsheet provides a computerized grid for entry of text and numbers. Generally, you use text to label the various numeric entries, and numbers relate to one another through equations. For instance, you could use a spreadsheet to calculate what effect interest rates have on mortgage payments for your home. You might use the first column to show interest rates. The second column would have the same entry, the house price, in every cell, or row and column intersection. A third column could then show monthly payments. The program calculates these payments by plugging the values from the first two columns into the equation you provide. If you then press a single key, the spreadsheet could calculate all the possible monthly payments, for as many as 254 different interest rates.

Using a spreadsheet doesn't eliminate all the work that you have to do in this type of calculation — you still have to find the proper equation — but you don't have to make the same calculation over and over. In fact, once you've set up the spreadsheet, you can change any detail, such as the price of

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R e p o r t C a r d

Easy Calc

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐
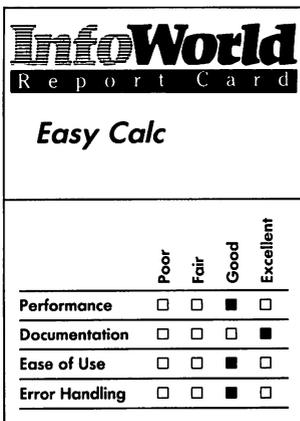
Summary
Easy Calc and Calc Result, Easy Version, are two names for the same spreadsheet. Calc Result also comes in an Advanced Version. You can handle home finances with any version; the Advanced Version is suitable for small-business use. Excellent documentation makes these spreadsheets easy to use.

System Requirements
☐ *One disk drive or cassette recorder*

Suggested list price: Easy Calc or Calc Result, Easy Version, $49.95; Calc Result, Advanced Version, $99.95

Easy Calc:
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

Calc Result:
Handic Software, Inc.
Fellowship Business Center
520 Fellowship Road
Suite B206
Mount Laurel, NJ 08054
(609) 866-1001

the house, and by pressing another key, instruct the spreadsheet to recalculate the monthly payments.

As far as we could tell, Calc Result, Easy Version, and Easy Calc are identical. Perhaps the only difference — besides a few minor differences between the two accompanying booklets — is in the quality of the cartridge. The Easy Calc cartridge is better made and easier to plug into the Commodore 64's slot than is the Calc Result cartridge.

Easy Calc (when we say Easy Calc, we also refer to Calc Result, Easy Version) contains all the features of a standard spreadsheet. It allows you to enter text or numbers, save and load from disk or tape, define formulas, adjust column width, copy columns and format cells, rows or columns. It also includes matrix arithmetic, row or column delete or insertion and controlled recalculation functions that aren't present in plain-vanilla spreadsheets.

In addition, Easy Calc includes a graph-generating routine that can turn your calculated results into bar graphs. The Advanced Version of Calc Result has some special features, such as split screens and windows, that are usually found in high-powered spreadsheets such as Multiplan.

Easy Calc is an excellent spreadsheet for small projects, such as those associated with home financial planning. Calc Result Advanced is suited to small-business applications.

Almost immediately after you turn on your computer, the Easy Calc spreadsheet appears on the screen. If you have a color screen, the cursor bar appears in black, the spreadsheet outline is dark blue and the interior area of the spreadsheet is light blue. You will notice later that errors are indicated both by an error message and by the screen flashing red.

The rows of the Easy Calc

spreadsheet are numbered from 1 through 254, and 21 of them fit on the screen at a time. The columns are lettered from A through BK, and four of them fit on the screen at a time. Above the area formed by these rows and columns is an information display. The top-left corner of this display shows the cursor's position (the initial position is A1). The top-right corner shows some status information about the active calculation mode. Beneath these is a space of two lines that is used to show either command codes or typed entries.

Initially, no codes show. At this point, anything you type appears at the beginning of the command-codes area. You can then enter that typed information — either a number or a label — into the cell that the cursor is positioned upon.

If you want to use and see commands, you need only press function key F7. Two lines of command information then appear at the top of the screen. A string of letters represents the major commands, as follows: B for blanking a cell, E for changing to the list of editing commands, F for changing to the list of formatting commands, G for changing to the global-command choices, L for leaving the spreadsheet, O for setting the order of recalculation, T for changing the list of transport commands (for saving and loading the spreadsheet), R for executing a recalculation and - (hyphen) for automatic repetition of characters

To perform any of these commands, you just need to press the single letter. When you press E, F, G or T, a new list of commands appears — each key is associated with a different list. These lists concern the details of the operations the spreadsheet can perform. Again you choose a list item simply by pressing a single key. You press E (for Edit) from the original menu, for instance, to bring up a list that contains

C for copying a data area, D for deleting a row or column, G for graphics in the form of a bar chart, I for inserting a row or column, M for moving a data area, P for printing a worksheet or user-defined format, R for replicating a data area to other areas and T for protection of a title column. The other special lists follow a similar pattern.

Easy Calc's abilities are limited when you want to save and load functions — you can only save or load on disk or cassette. The program makes no provision for you to see a list of what is on the disk or tape (that is, view a directory), to format a disk or to erase old spreadsheets. Because only nine spreadsheets can fit on a disk, that last ability is particularly important.

Calc Result Advanced, however, offers a whole new set of disk commands: B for automatic backup from drive 0 to drive 1; C for a directory of what is on the disk; D for saving and loading DIF files (a standard type of microcomputer spreadsheet file); E for erasing files; I for formatting disks on both drives; L for loading a file; N for formatting a disk in one drive; S for saving the spreadsheet; and U for saving particular information for help screens, type of printer and paper format.

Calc Result Advanced comes as both a cartridge and a disk. The disk holds information used in help screens, as well as foreign-language files and system-configuration data. The configuration data allows you to customize such program aspects as display color and printer control to your needs.

Easy Calc provides as many as 32 spreadsheet pages. It allows you to use windows and split screens to see as many as four pages on the screen at once. Help screens aid in documenting the use of the program.

Because Easy Calc comes on a cartridge, you need only one storage device to make complete use of the program; you don't have to keep one disk or cassette drive busy with the program itself. You can use either a disk drive or a cassette recorder/player to store your spreadsheets, although a disk drive is more efficient.

If you have any problem with the program, the manual invites you to write to Commodore. Because the software is provided as a cartridge — which doesn't wear out as a disk would — you don't have to worry about making backups.

Easy Calc is documented by a well-written 76-page manual. Calc Result, Easy Version, comes with essentially the same manual, although it does have a few awkward sentences — possibly because it's translated from Swedish. The manual uses photographs of the screen to help explain functions. The photographs in Calc Result's manual are in color; those in the Easy Calc manual are black and white. The manual has a table of contents, a thorough index and a short error-message appendix. It begins with a short section describing the Commodore keyboard (it focuses on the keys that you use a lot with Easy Calc) and the uses of a spreadsheet.

The manual continues with a tutorial that occupies almost two-thirds of the pages. A section that lists and briefly describes all of the commands and functions follows. Finally, the manual tells you how to print out your finished spreadsheets. Additional information, such as that concerning proper backup of data disks, helps make this a complete and useful manual.

Easy Calc is both easy to use and hard to crash. We didn't find any notable bugs in the program, although the lack of a directory command (which would tell you what spreadsheets are stored on what disks) is serious enough to be termed a bug.

Except for the extended list of disk

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Report Card

Easy Finance

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
The Easy Finance series of five programs enables you to perform financial analyses. The programs are easy to use, come with excellent documentation and are capable of advanced operations.

System Requirements
☐ *One disk drive*

Suggested list price: $21.95 each

*Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100*

commands available in Calc Result Advanced, there is little reason to buy the Advanced Version rather than standard Easy Calc. If, however, you need a package that can work in several languages, you should look into the Advanced version.

Easy Calc's repertoire of features is complete; it should suffice for all but the most advanced spreadsheet uses. Because the commands are simple (and you can easily look them up in the well-written manual), you should be able to construct a simple spreadsheet after working through just a few pages of the tutorial. To really grasp the power of some features, however, you'll have to complete the tutorial and practice with the package.
—*Phillip Robinson*

REVIEW

Easy Finance

Eagle Software's Easy Finance series of five programs, distributed by Commodore, helps you perform financial analyses. The series consists of one loan-analysis disk, two investment-analysis disks, one management disk and one statistics and forecasting disk. The combinations of functions on the various disks are logically organized, and you have the option to print out your results in both tabular and graphic format.

When you first load a program, you are given an opportunity to choose character, background and border colors by pressing function keys. Once you have the colors you like, you see a menu. By pressing the appropriate

number key, you can transfer to the module you desire. One selection on each menu is the Help screen, which provides a quick on-line summary of the program's functions.

Because each Easy Finance disk contains nine or more functions, two menus are necessary; the last item on each menu allows you to view the other menu. Whenever you finish using a program, you can return to the menu, which has an Exit option.

On-screen graphs, where appropriate, help you analyze the results of calculations. The programs ask you to enter your data through prompted input statements, which are consistent throughout the package. When you ask for a graph, each program displays it promptly, with a scale appropriate to the size of your data. Regardless of the number of elements in the graph or the size of the scale, the graph fills the screen. Each graph is appropriately designed for the function you are graphing.

During operation, each program displays a status line at the top of the screen that tells you which module is running and what operation it is performing. At the bottom, the program sets an area aside for prompted input. The "action" takes place in the center of the screen.

The programs are big, taking most of the available RAM in a Commodore 64. Much of the program space is apparently consumed by the Help screens and extensive graphics that make the programs pleasant to use.

The programs are not copy-protected, but some files are apparently hidden from copying. You can copy the main program, but the Help screens and some other data are stored on files that do not appear in the disk directory. You can't copy these hidden files with the straight Copy command, but the system calls them during the program

operation. The copyright notice in the front of the manual specifically prohibits copying, and it makes no mention of availability of backup copies of the programs.

With their Help screens and well-written screen prompts and documentation, anyone who knows the rudiments of finance and management can use most of these programs, although some of the management modules assume a fair degree of knowledge of the principles that they involve. Beyond loading them with the standard wild-card "*" command, you need do no other installation.

The programs' data-entry routines trap obvious keyboard errors nicely and require that your entries fall within the expected limits. We weren't able to make any of the modules crash. Nothing, of course, stops you from making ridiculous conclusions from garbage data. When you make an inappropriate entry, a banner flashes next to the input space and you are asked to reenter your data. A "DATA ERROR" banner flashes if you give inappropriate input; the same banner appears during calculations if the program finds data that does not fit its formula. If such an error occurs, you are able to recover.

Commodore publishes the usual disclaimer of any responsibility for errors in the system, so it's up to you to verify the system's accuracy. We put some test data into some of the modules, and they reproduced the results we achieved using other programs.

Each program comes with a typeset booklet, from 31 to 83 pages long, explaining its operation. The booklets begin with an explanation of the program and how to set it up. Screen menus are illustrated and explained, and each module is explained in detail. Throughout the manuals, you are told

exactly what each program will ask and what input it expects — there are no surprises. Each manual contains a glossary of the technical terms used in its programs. An appendix in each book describes the output formats and options available. Another appendix, in three of the volumes, contains the formulas upon which the programs are based.

Although the Easy Finance box label proclaims that the programs require the 1541 disk drive, we had no trouble using the IEEE-488 Commodore drive with an interface device.

For a fraction of the cost of these packages, you can get similar analytical software, much of which is in the public domain or published in books, but you would not get packages that are so easy to use and so thoroughly debugged. You could also perform many of these operations on spreadsheets, but it would take a lot of work. These are professional tools, capable of advanced operations.

—Ned Heite

REVIEW

TOTL.Business

For most small businesses, bookkeeping is a secondary function of the proprietor, who is probably not an accountant. TOTL Software has produced a package designed for such businesspeople, who probably aren't computer experts either. Called TOTL.Business 3.6, the package runs on a Commodore 64 with a printer and up to three disk-drive units. Thus, as your business grows, you can expand

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R e p o r t   C a r d

TOTL.Business

	Poor	Fair	Good	Excellent
Performance	□	□	■	□
Documentation	□	□	□	■
Ease of Use	□	□	■	□
Error Handling	□	■	□	□

Summary
Owners of small businesses will appreciate the simplicity of TOTL.Business 3.6, a bookkeeping software package that operates on the Commodore 64. It is a transaction processing system that has enough flexibility to meet the needs of most small businesses, although it should not be confused with a more complex general-ledger accounting system. Its repetitive operating procedures may be annoying, but these same features serve to diminish the risk of losing stored information.

System Requirements
□ *One disk drive*

Suggested list price: $94.95

TOTL Software, Inc.
1555 Third Avenue
Walnut Creek, CA 94596
(415) 943-7877

your system from one that has a single drive to one that uses three drives without altering the program. (TOTL Software has released an update but we did not receive it in time for this review.)

The system tracks each month's transactions and then makes month-end reports. You can back up each month's data disks to preserve a transaction record. Each month, you begin a new set of files, with balances carried forward from the previous month's files. Audit trails are provided for all transactions in both magnetic and hard-copy form. The system is written in BASIC and has a machine-language routine for disk operations.

Its common bookkeeping functions include a check register, receivables, payables, account aging, invoices, monthly statements of account, expense tracking by category, purchase order control, mailing labels, automatic posting of finance charges and inventory.

Payroll, frequently a part of business-software packages, is absent from this one. Because the system's prospective users operate small businesses, payroll functions are not considered essential.

The software writes statements, invoices and purchase orders using a single, standard continuous form. You can replace this "universal" form, which is merely a layout of tint blocks, by plain paper if you prefer. Long documents are automatically continued onto additional pages. You can use a standard, short invoice form, or you can specify a longer form when you enter the program.

This system formats data disks with its own disk-organization scheme. A data disk will appear to be empty if you try to call its directory by the standard Commodore routine; you must use the directory feature of the TB.UTILITY program. A useful feature of this system

is its ability to back up files even if you have only one disk drive. You must shuffle the disks physically, but the system can keep track of the copying procedure and swap files into memory and onto a new disk.

The program remembers the next document number from one session to another by storing it in a miscellaneous data file that it reads at the beginning of each session. At the end of a session, it updates the appropriate permanent files from a daily, temporary transaction file.

When you use multiple drives, you don't need to remember which file is on which disk; the system can search automatically from unit to unit. In fact, you do not need to remember any filenames except the program names.

Capacity is measured in disk blocks available. On a disk by itself, a receivable file is supposed to hold up to 100 customer names, with 315 transactions per month, if you have 10 products in inventory. If you have 500 products, you can have up to 100 customers and 225 transactions per month.

This is not a full-featured general-ledger system; it is a transaction-processing system that has a rudimentary file structure. TOTL advertises a general ledger that is supposed to be compatible with TOTL.Business.

TOTL.Business is a taskmaster. It requires you to go through a menu for each transaction and enter the name, address, terms and other details. For those of us who are lazy about paperwork, this is probably good discipline. For the program to function as intended, you must plan in advance and set up inventory, payable, receivable and other files, with codes and formats. You are expected to use vendor codes and customer numbers and to assign expenses to categories.

TOTL.Business is also forgiving; it

lets you print an invoice, proofread it and then print out a corrected version with the same number before it enters the data into the daily transaction file. You can lose data without warning if you try to write an invoice to a customer who has no account or write a check without first creating a check-register file. If you follow the setup procedures, this should not happen.

During print routines you will notice some lengthy pauses between lines, indicating that the system is doing some operations while it is printing. This is the only time the screen blanks. During disk operations, it displays messages to let you know what is happening. The disk operations seem tedious, but several files are opened, read or written and then closed, every time you post a transaction. Because the files are closed promptly, there are few opportunities to lose data if the system goes down during a session. What appears to be tedium is actually a safety feature that is not present in some other bookkeeping programs.

You can use the system without some of its features, such as inventory, if you don't want them. You may lose data, however, if you do not create the necessary files; don't second-guess the program. Empty files do not seem to create significant disk-space overhead, and unneeded features can be ignored without penalty.

The one significant irritation about using this package is that every time you switch to a new module, you must redefine the screen color scheme, printer output, date and disk-drive configuration. If you are using multiple drives, you must run a program that renumbers the drives, or you must have a dealer reset the device numbers in hardware.

Don't try to clear up several days' bookkeeping backlog in one sitting. At the beginning of each session, the system asks you for the date, which automatically appears on each transaction. For each day to appear in sequential order, you must exit from the program and then restart each time. Maybe the programmer is trying to tell us to keep our postings up to date — bookkeepers have been telling us that for years.

The manual by Juliane Appel is 118 pages long, and it has a comprehensive five-page table of contents but no index. Instead, a two-page "quickguide" at the back summarizes the sequence of program operations and refers to the pages where the operations are covered. In the opening pages, the manual provides a clear overview of the system — its requirements, its capacities and its capabilities.

Although it is not an accounting manual, anyone who has a smattering of bookkeeping knowledge can follow the instructions for moving books to a computer. The manual pays special attention to the pitfalls of using a computer for accounting. For example, it tells you when you should back up your files and gives instructions for correcting mistakes without interfering with the audit trail. The author carefully distinguishes between operations that affect files and those that are merely notes.

The manual takes you logically through seven units: introduction, file setup, everyday use, printing reports, aging accounts, backing up disks and creating labels.

Before using any software that might affect your relationship with tax authorities, it is good business practice to consult your accountant. Documentation packed with the TOTL system probably is enough to give an accountant an idea of its ability to meet your particular legal and operational needs, but this is not a decision most people should make on their own.

Computer-system errors and program error messages are explained in an appendix. TOTL has added additional error messages, such as "update incomplete," that appear after a disk error occurs. One nice touch is a list of program statement numbers, along with the meanings of errors that might cause the program to crash at those points.

If you should try to reach a file that does not exist, the program does not crash; instead, you get a File Not Found message, with the filename and directions to press the Return key. The program then returns you to the appropriate menu. You get no message, however, when you lose data because you failed to write to a valid transaction record. The system does not police your negligence here.

Support by mail is offered for a fee of $2 per inquiry. TOTL's 30-day warranty only guarantees that the software will load. After the warranty period, there is a $5 replacement charge. You are the ultimate judge of this program's accuracy and its applicability to your business. When you begin to use any accounting software, good business practice dictates that you run your old (manual) system in parallel with the new system for at least a month, if not longer. Bookkeeping software is so complex, and the results of a glitch can be so catastrophic, that you will sleep better if you have given the system a thorough test.

Customization is probably out of the question. Even if you don't charge sales tax or give discounts, the program asks you for these items whenever you write an invoice. It's a minor irritation to touch the Return key when these items appear on the menu. If you try to change programs on the distribution disk, you void the warranty. Disks are not copy-protected; you are encouraged to make working copies for everyday use.

TOTL.Business 3.6, designed for small businesses, appears to fill a niche at the low end of the business-software market. Its inflexibility is a minor irritation in some respects, but in others, it is an asset.
—*Ned Heite*

REVIEW

Multiplan

Microsoft's Multiplan spreadsheet, which Human Engineered Software (HES) markets for use with the Commodore 64, is one of the newer generation of tools for business and professional applications. Statisticians and others who deal with large bodies of related numerical data will find Multiplan useful, particularly because of its linking and locking features.

As with other spreadsheets, you can enter data and make calculations on Multiplan by moving the data around on an imaginary page. With Multiplan, you can display several areas of the sheet simultaneously, although the Commodore 64's 40-column screen restricts your use of this feature. Muliplan allows users to designate an area of the spreadsheet and then call it up in future computations. Parallel scrolling of different areas is also possible, and you can link segments of two different spreadsheets so that when you make changes on one sheet, the other will automatically update. You can "lock" area contents or formulas to ensure that you don't accidentally alter a spreadsheet's format.

You can sort your spreadsheet at any time and alter the width of a column or format words so that titles appear centered, flush right or flush left. Multiplan can also insert dollar signs and commas in numerical columns.

The program displays command options constantly (at the bottom of the screen) in words, rather than in initials as did earlier spreadsheet programs. To use the functions, you move the cursor until it highlights the word you want and then press the Return key. Clearly written questions displayed on the screen below the spreadsheet lead users through the process of creating command sequences that are sometimes complex.

You may use the Commodore function keys for some common operations such as delete and move a word or character left or right. HES provides a card that fits over the original function keys to indicate their operations.

If you make mistakes, instead of just printing "Error" as some simpler spreadsheets do, Multiplan displays an explanatory message from its extensive library of error messages. Sometimes it even generates and displays a suggested solution.

Multiplan normally stores spreadsheets in its own format, but you can also choose to work with files in the data-interchange format (DIF, made popular by VisiCalc) or with formatted print files. You can use the latter as text insertions in word-processor files or as input data for other programs.

Multiplan's performance is generally good, especially for making calculations. The system seems to take forever to load from a Commodore 1541 disk drive, however, and it is also slow when it saves and loads data. This general sloth is due to two factors. One, the 1541 is a slow disk drive; and two, Multiplan, with all its messages and

power, is a large program that nearly overwhelms the slow disk drive. Another performance handicap is that after you exit from the program, Multiplan leaves the computer's operating system crippled. To use the disk drive again, you must turn off the computer and the drive.

The master program disk is copy-protected, but you can move two frequently used system files to one data disk. If you have not taken this action, you must shuffle disks into and out of a single drive system. Each registered user may buy one backup disk by mail from HES for $10.

Multiplan users must use the 1541 drive, but you can use two drives simultaneously if you change the device number of the second one. You may not use other disk drives, such as model 2031 drives or other IEEE-488 devices that connect through adapters on the expansion port. Also, your printer must be compatible with the Commodore VIC series printer. This lack of flexibility may restrict business users of Multiplan who want to use the faster Commodore drives or more advanced printers.

Multiplan's documentation is on several levels. Most important is its extensive on-line Help facility, which is available at any time if you press the ? key. The screen automatically displays the instructions for any function that is currently in use, or you can ask for any Help text. This Help file is easier to use than the cumbersome 422-page manual. Although it's well written, well organized and exhaustive, the manual's sheer bulk is intimidating. It is essentially two documents — the first half a tutorial and the second half a reference manual — with a five-page index serving both parts. After you have ploughed through nearly 200 pages of tutorial, you encounter a section entitled "Learning More About Multiplan," which directs you to still

InfoWorld
Report Card

Multiplan

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	■	☐	☐
Error Handling	☐	☐	☐	■

Summary
Human Engineered Software's Multiplan for the Commodore 64 is a low-cost version of Microsoft's popular spreadsheet program, which was designed for business and professional applications. This program is not for everyone who needs spreadsheet software — its dazzling array of options and massive documentation are more likely to confuse than to help average users.

System Requirements
☐ *One 1541 disk drive*

Suggested list price: $99.95

*Human Engineered Software
150 North Hill Drive
Brisbane, CA 94005
(415) 468-4111*

InfoWorld
Report Card

PractiCalc 64

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
PractiCalc 64 is a useful spreadsheet program with advanced data-handling features and rudimentary graphics. With the help of its good documentation, new users should be able to master this program in a single sitting. Experienced users should beware of superficial similarities to VisiCalc.

System Requirements
☐ *One disk drive or cassette recorder*

*Suggested list price: .
disk, $54.95; cassette, $49.95*

*Practicorp International
44 Oak Street
The Silk Mill
Newton Upper Falls, MA 02164
(617) 965-9870*

more advanced features that are explained in the reference manual.

The manual has a master table of contents, and each chapter has its own table as well. Nine pages of detailed text document error messages, and an appendix for experienced VisiCalc users explains the points of difference and similarity between Multiplan and VisiCalc. The documentation also features a quick-reference card.

Support for Multiplan, like that for other HES products, is excellent. The company has a hot line that is staffed by knowledgeable people.

Multiplan is not easy for casual users. Its many advanced features and sometimes byzantine command structure require considerable practice for you to do any but the simplest operations. Spreadsheets that have fewer capabilities are available — and they are easier to use and adequate for most applications.
—*Ned Heite*

REVIEW

PractiCalc 64

PractiCalc 64 from Practicorp International is a spreadsheet program for the Commodore 64 and is available on disk or cassette tape. It descends from the original VisiCalc spreadsheet, with which it shares some features and operating procedures. Like most spreadsheets, PractiCalc 64 has a status line and cells that are designated by number-letter coordinates. You can store a formula, a label or a number in any cell.

Down the left side of the screen, the

program displays a column 0, intended for labels. PractiCalc's math functions include Count, which returns the number of numeric entries in a column. Using built-in functions, you can determine the maximum, minimum and average values of the numbers in a column or row. For any numeric cell, you can calculate the logarithm, square root, sine, cosine, tangent and arc tangent. PractiCalc can also insert random numbers in specified cells.

You must instruct the program to perform calculations — PractiCalc does not automatically calculate upon entry, as do some spreadsheets. By eliminating the wait for recalculation after each entry, PractiCalc's author has hastened the data-entry process.

After you type your entry on the status line, you can enter it by moving the cursor or pressing Return or pressing the Home key. The Home key returns the cursor to cell A0.

Instead of using VisiCalc's backslash to access the Command menu, with PractiCalc you use function key F3. To insert a formula in a cell, you must first press the F1 key. Among PractiCalc's commands are the familiar Blank, Clear, Delete, Format, Insert, Load and Print commands. You can also search for a particular string or make one column a different width from the others. You can replicate formulas or data cells by using the F5 key.

You must set the dimensions of your spreadsheet when you start using PractiCalc. Thereafter, the system does not allow you to move the cursor past the boundaries you have set. On a Commodore 64, PractiCalc can accommodate 2000 cells of data; when you configure the spreadsheet at startup, it does not permit you to specify a configuration that exceeds this limit. You can "fix" rows or columns as titles, but once you have fixed them, the cursor will not move into them. You can

therefore restrict the cursor to the area in which calculations will take place. You can reach the title cells by homing the cursor to A0 or by unlocking the title area.

When you move the cursor around in the spreadsheet, the top and left column labels follow it. The appropriate labels are therefore always adjacent to the cursor position. PractiCalc scrolls by rewriting the screen each time you move the cursor off the screen boundaries; this operation produces a flickering effect on the screen.

PractiCalc's Sort feature works virtually instantly. You can sort the whole spreadsheet according to any column, numerically or alphabetically, in ascending or descending order.

PractiCalc's reformatting commands, such as I for Insert, operate instantly. You can set the format of one cell, a row, a column or all cells to dollars and cents format with a single command.

The program's manual is a saddle-stitched, 84-page, typeset booklet with a comprehensive index and a table of contents. It begins with simple loading instructions and proceeds through a tutorial and detailed descriptions of all the program's functions. The back of the manual contains a command summary and a list of error messages. Once you have read the manual carefully, the command summary suffices as a guide to ordinary commands.

Although the system automatically runs on the VIC printer, you can interface other printers by following the directions at the back of the manual.

PractiCalc greets attempts to use illegal commands by "*ERROR*" in the offending cell; documented errors are division by zero, square root of a negative number, syntax errors and references to a nonexistent cell. If you try to clear the screen with the C

command, the status line asks "CLEAR Y?" If you confirm by pressing the Y key, the contents of the screen are erased.

Registered owners can obtain upgrades from cassette to disk for a $10 exchange fee. Backup tape or disk copies also cost $10 each.

The manual invites users to call the publisher during business hours for help. We called with a fairly complex interfacing problem and were asked to send the question in writing.

With the help of the manual, new users should be able to master PractiCalc in a single sitting. Experienced spreadsheet users may be lulled by the system's many similarities to VisiCalc, since the two systems are superficially similar — such experienced users will require some retraining and study.

PractiCalc is a useful spreadsheet program with advanced data-handling features and rudimentary graphics. Its sorting and adjustable-column-width features are a definite improvement over earlier spreadsheets. The labels that the program constantly displays opposite the cursor are particularly helpful.
—*Ned Heite*

The Money Manager

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	■	☐	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
The Money Manager budget-analysis program for the Commodore 64 is easy to use. The program compares your budget with your expenditure and can display and print this data in bar-chart form. It enables you to monitor up to 16 budget categories for a 12-month period, although you may consider its monthly rather than weekly format to be a drawback.

System Requirements
☐ *One disk drive*

Suggested list price: $24.95

Timeworks, Inc.
444 Lake Cook Road
Deerfield, IL 60015
(312) 948-9200

REVIEW

The Money Manager

The Money Manager from Timeworks is a simple budget-analysis program for the Commodore 64. With it you can enter 16 categories of budget and expense information for a 12-month period. If you have used a companion program, The Electronic Checkbook, to

create data files that contain expense information, The Money Manager can accept these files directly, which saves you from having to retype information.

When you have entered your data, the program then compares your budget with your expenses and reports the percentage in two ways. One way is a comparison of the actual expense to the budget expense, and the other is a comparison of the actual expense to the total expense. The program can display the report for budget versus actual in bar-chart form for any category, where side-by-side bars for each month compare actual versus budget expense. You can also print each screen of information if you so wish.

As far as it goes, the program works well. After all, there is a certain beauty in simplicity. We usually expect programs to be complicated and are prepared to spend hours deciphering a manual of instructions — we want to get our money's worth in education from the program, if nothing else. You may thus feel cheated, almost, when you spend money on a program such as this that works so effortlessly that you hardly even get a chance to peruse the manual.

One major disadvantage of The Money Manager is that it operates only on a monthly level, and most people in the target group for purchase of this program would be interested in a weekly budget. The screen-size limitation, we're sure, is the reason why the program was designed to handle monthly budgets only. Its printing routine is also limited because it can only print screen displays. Even though a weekly budget wouldn't fit on one screen, multiple paging could produce a weekly reporting scheme on the screen, and a conventional print routine that does not utilize screen displays could produce weekly reports on a printer.

The Money Manager is easy to use.

After you load the program, it presents you with a nine-item menu. The order in which you would naturally select the menu items, though, is not necessarily the order in which they appear.

One menu item lets you define the names of the 16 budget categories. If you change your mind, you can always go back and rename a category. You can even swap category names, but you can't swap data associated with those categories except by erasing the data and reentering it.

"View budget/actual for an item" is the menu choice that you would probably use most often. After selecting this menu item and after deciding whether you want to compare percents of total or percents by month, you may then select any budget category and view the data. The data that the program presents on the screen shows, for each of the 12 months, the budget amount, the actual amount, the difference amount (with a negative sign if your expenses are under budget) and the percentage of either the total or of the month, depending on what you requested. If you press P at this point, you can print a hard copy of the data displayed on the screen. If you desire, the program can present the same data in bar-chart form if you choose the appropriate menu option.

The manual, a small 12-page booklet, we rate Fair. One of the problems with most Commodore software is that it usually comes in two versions — on tape and on disk. The manual, in an effort to be economical, contains instructions for both media, forcing users to play leapfrog over the inapplicable sections. We also suppose that the authors believe that, because the program operates so simply, the manual need not go into too much detail. It would be nice, though, if the manual gave you a few pointers on how to set up a budget.

The Money Manager comes with a
single disk. Neither the package nor the
manual contains any information about
a product warranty or what the terms of
the license agreement are between
Timeworks and the program's owner.
The Money Manager's error trapping is
good. The program won't let you enter
a wrong keystroke.

Although the program cannot
produce a weekly budget analysis, we
are certain that many of you will like
The Money Manager and will find it
useful. It is easy to operate and, if your
demands are not complicated, it
produces satisfactory results.
—*Marty Petersen*

DATA

The programs reviewed in this category keep track of data bases, a fancy term for lots of information.

REVIEW

TOTL.Infomaster

TOTL Software has introduced TOTL.Infomaster 3.6, a keyed or indexed sequential data-base system that has many of the features of larger and more advanced systems. It is distributed in Europe by Thorn EMI, and it runs on the Commodore 64.

Depending upon disk capacity, the system is advertised as being capable of handling 100 fields per record, up to 245 characters per field, up to 2500 characters per record and up to ten files per disk.

Two features set this data base apart from most others. Within limits, you can add fields during input, after a file has been defined. You can also define certain fields as "repeating" fields that contain, in effect, lists within the larger lists.

Files can be password-protected, and files in a single-disk system can be backed up on a second disk.

TOTL.Infomaster 3.6 can read data created by other TOTL programs but files created by TOTL's bookkeeping package cannot be altered.

You must define each record by a unique name that becomes the designated key-field identification. The key field resides in a separate key file, which contains pointers to the record itself. Even though they are in different files, the key and record contents can be manipulated together. In practice, you are not aware of the difference.

TOTL.Infomaster allows you to format and select records to produce printed reports. You can select the placement of the page numbers, up to 16 lines of headings, subtotals, multiple lines in a record or label formats.

Sorts can be five fields deep, and you can print five levels of subtotals as well. You can browse through the entire file,

or you can browse through only those records that have certain attributes. You can display the selected records on the screen, or you can print them in a rudimentary list format; you don't need to set up a report just to retrieve raw data.

The system supports VIC RS-232- and parallel-interface printers. You can also use 80-column screen displays in any color combination you choose. Each data disk contains a configuration file that has such information. This file is automatically loaded whenever a program goes to that disk, so you don't need to reconfigure your system each time you start up.

Performance overall is satisfactory. The system is entirely menu-driven, and the menus are clearly written. If you issue a command that could delete or damage data, you are asked to confirm your action by giving a "Y" response.

Each time you begin to write a new record to a file, the system asks you to enter the key field, which is the unique name by which the record is known in the system. After you enter this information, the system pauses and looks for that record on the disk. If it does not find it, you are given the opportunity to create it. This means that, while you are doing the initial entry for the data base, you must wait during each record's input while the system searches for a nonexistent record.

When you are updating an old file, however, this feature guards against duplication of key fields and allows you to retrieve records that you know exist.

This is an easy program to use, even if you are not familiar with data-base systems. The menus and the documentation are well-conceived and bomb-proof.

The package is a collection of several related programs. When you switch from the Data Entry module to the Printing program, you lose all the variables that are in memory. The system must be told which file to use and must reload the configuration. This lack of automatic chaining between modules is a drawback. On the plus side, however, you can call another program from a menu, without having to load it from BASIC.

All the menu selections have defaults for the most common choice, which means that you can save time. If you dislike menus, you'll hate this system because even the simplest operations require you to answer detailed interrogations, but in a system designed for beginners, this is to be expected and welcomed.

Setting up formatted reports is made easy by the system's heavy reliance upon menus. For each field, you are given a variety of possible configuration options. The system can allocate spaces across the page for you and can display a screen that contains the report format blocked out. At the top is a ruler, showing the exact column position of each field. By allowing you to scroll sideways, this feature accommodates reports that are wider than the screen display.

Printer speed could be improved, because the printer pauses between lines, probably waiting for the computer to look up the next record. As the printer is working, the screen display blanks and then reappears for each line.

TOTL.Infomaster's 75-page manual by Roy Reyes is duplicated from typewritten copy, but it is well executed. It has no index, but the table of contents is complete.

Organization of the manual is tutorial; as you follow the instructions, you create a data base and manipulate it using program features from the simplest to the most complicated. For further practice, the program disk contains canned data bases. Every step

InfoWorld
Report Card

TOTL.Infomaster

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
TOTL Software's Infomaster 3.6 is a menu-driven data-base system for use with the Commodore 64. The system can read data produced by other TOTL programs, and it offers many of the features of larger, more complex systems. Overall, TOTL.Infomaster 3.6 is a well-designed package that is especially helpful for users who are not already familiar with data-base systems. The system is easy to use, and the documentation is clearly written.

System Requirements
☐ One disk drive

Suggested list price: $49.95

TOTL Software, Inc.
1555 Third Avenue
Walnut Creek, CA 94596
(415) 943-7877

in the creation and use of a data base is illustrated, using the example data base. At important points, the screen is illustrated, and you are told exactly which key to press.

Input errors are trapped by a system that allows you to define the field during setup. You can decree that a field accept only all capital letters, a mixture of uppercase and lowercase letters or numerical values. Once you have defined the field, a prompt appears on the input screen to tell you which type of data to enter. Moreover, the system won't accept improperly entered data.

If you make a mistake when you are entering data into a record, you are given a chance, by menu choice, to revise the record before the system saves it to disk. You can also change an existing record by calling it and retyping the erroneous field.

The system disk is copy-protected, but you can buy a backup copy if you enclose $5 with the warranty card and return it to TOTL. TOTL will replace defective disks at no charge during the warranty period or for $5 after the 30-day period expires.

In spite of its slow execution speed, this is a well-designed and relatively bug-free system. Beginners will find it particularly comfortable to use.
—*Ned Heite*

REVIEW

Database Manager

Database Manager from Mirage Concepts, a well-documented and powerful data-base program for the Commodore 64, enables you to create and manipulate forms. This program is written in machine language, which means it runs much faster than data-base programs written in BASIC.

A data-base manager lets you write, store, organize and retrieve information that is contained in forms. Each form has labeled blanks, called fields, that you can fill with information. When you have entered information into all the fields on a form and stored that version of the form, it is then called a record. A group of records that are based on the same form and are stored together is called a file. You can sort the records in a file into new files, and you can sort any fields you choose in numerical or alphabetical order. In addition, you can print random or sorted lists, forms, reports and labels from the information you have stored in a file.

Mirage Concepts has designed Database Manager specifically to work with its Word Processor program. If you use both programs, you can, for instance, make form letters with the word processor and then automatically insert addresses and names from Database Manager's files into those letters. Database Manager also has an option that allows you to convert your Database Manager files into standard, sequential disk files that almost any Commodore 64 word-processing program can read.

Database Manager allows free-form design and input, unlike some data-base managers that force you to use forms that are already rigidly defined. You can

sort on any field and any level, and you can set up calculated fields.

The limits of the data base are easily broad enough to meet most home and small-business needs. You can have a maximum of 65,535 records per file with a record size of 2000 characters; 200 fields per record with a maximum field size of 250 characters; and a maximum form length of 2500 characters.

Because formatting and file-organizational information takes up some disk space, the program is limited to storing about 150,000 characters of information on a floppy disk.

The program's documentation consists of a 170-page loose-leaf book in a plastic binder. It contains an introduction, table of contents, beginning tutorial, advanced tutorial, reference section, appendices, an index and a quick-reference card that tells you how to back up your data disk.

The manual is well written and begins with an explanation of what a data base is and what it is good for. For example, when you begin the first tutorial and have to load the program, the manual gives you typeset images of the screen to show you what to expect, estimates of how long each stage of loading will take and even descriptions of what to do if things don't work. Few manuals are this explicit, clear or realistic. This is a powerful program that has many options, so it will take you some time to work through both tutorials.

The reference section explains all of Database Manager's functions. It is intended as both a quick guide and a refresher. You get more than just a dry recitation of the program's functions, though. The pages are sprinkled with real-world hints, such as the admonition to keep your records as small as possible to create the largest, and most easily sorted, data base. The manual

includes information about inserting disks, taking care of disks and using the printer.

Database Manager stores all information on the data disk, not on the program disk. You can format a data disk directly from Database Manager. This is a fine feature that we would like to see in more application programs.

Ergonomic program-design considerations, such as having function keys that do the same basic job on every menu, have been consistently employed and make the package easy to use. For example, the F7 key is always Exit or Quit, and the manual states, in bold letters, "IN THE HIGHLY UNLIKELY CASE THAT YOU GET HOPELESSLY LOST WITHIN THE PROGRAM, JUST KEEP PRESSING THE F7 FUNCTION KEY."

Mirage Concepts Database Manager is entirely menu-oriented. The main menu offers (1) Select File, (2) Append File, (3) Review/Edit, (4) Sort Records, (5) Print Records, (6) Create New Form, (7) File Commands and (8) Quit. This menu is divided into two columns at the top of the screen and each item has a number. Underneath the menu is the phrase "Enter the Number of the Command." When you enter a number, the menu changes instantaneously; a new menu appears.

When you are creating a new form, the top of the screen shows you this list of commands:

Create New Form
*Type Field Name (if any)
*F1 = Underline for Field Length
*F5 = Finished creating form
*F7 = Exit (do not save new form)

You can type the name of a field anywhere on the lower part of the screen. You use the underline to mark off the information area and press F5 when you are satisfied with the complete form. It's simple to do, and you have a flexible format to work with.

InfoWorld
Report Card

Database Manager

	Poor	Fair	Good	Excellent
Performance	□	□	■	□
Documentation	□	□	□	■
Ease of Use	□	□	■	□
Error Handling	□	□	■	□

Summary
Database Manager from Mirage Concepts is a powerful package that you can use to create and manipulate forms. It is designed to work with Mirage Concepts Word Processor, although you can convert Database Manager's files into standard sequential files that can be read by most Commodore word-processing programs. We think you'll appreciate the many features and fine documentation of this package.

System Requirements
□ One disk drive

Suggested list price: $89.95

Mirage Concepts, Inc.
4055 West Shaw Avenue
Suite 108
Fresno, CA 93711
(209) 227-8369

The screen then asks whether you want to enter any calculated fields. If you don't, you are asked to name the form and store it; you are then returned to the main menu. If you choose to enter any calculated fields, each field is highlighted in turn, and you are asked to enter an equation for each field or move to another field. This calculating ability isn't present in some inexpensive data bases, and although you probably won't use it in your first few experiments, it's handy later on.

A bug does exist in the Calculated Fields routine. As you move down the form to fields that didn't show in the original lines — in other words, when the form has to scroll up — the character set is affected, with some of the characters showing as graphics characters. You can solve this problem sometimes by pressing the Shift and Commodore keys simultaneously. Once when we tried to move to another field by pressing function keys, however, the form seized up, and the program wouldn't respond to any keyboard manipulation short of the Run/Stop and Restore commands. When we pressed Run/Stop and Restore, the screen asked if we wanted any calculated fields to reappear. We answered "No" to this question and so got a chance to name and store the form and then return to the main menu. Another time, the keyboard froze so completely that even pressing Run/Stop and Restore had no effect.

Once you have created and stored a form, you are ready to make a file. The form is stored at the head of an empty file. The first thing you do is select a file, which brings up the blank form. You then choose Append File from the main menu to add a record to the file. This moves the cursor down onto the blank form, so you can enter the data for the record.

Here again, a menu appears:

Append File
*Enter the data you wish to add
*F1 = Previous *F2 = First
*F3 = Next *F4 = Last
*F5 = Save *F7 = Exit

All these commands refer to a field. You can move from field to field and type in the information. You must type Return after you've entered data into a field — not F3 for next field. This is made clear in the manual but isn't stated on the screen.

If you have entered too many fields in one formula, when you press Return, the screen reads, "Syntax Error — Return to Continue 1." You have to press Return again to get to the next field. This is a strange inconsistency that hurts the appearance of the program and makes it more difficult to learn, although it doesn't harm its performance.

Finally, when you have finished a record, you store it by pressing F5. The blank form appears again for you to create a new record. You use F7 to exit from the Append File option when you have finished making records.

You can also choose options from the main menu to edit records and files. When you decide to edit an individual record, you have to choose the file and the field you want to use to search for that record. You then enter the particular value to search for. Searching is fairly quick, though the speed depends on the size of your records and file. Searching is also quicker if you have a sorted file.

You can search by using wild cards (code symbols that can stand for any character). Another option is conditional sorting, which allows you to specify several conditions that the searched-for record must meet. If you choose to delete a whole record, the screen asks you if you are sure you want to delete — a nice protection. You can sort on any field, and multiple sorts

are supported. You can print forms, lists, reports or mailing labels. The system is set up for use with a Commodore 1525 printer and all printers with compatible interfaces.

The uses of conditional sorting and calculated fields are explained in the advanced tutorial. These features make Database Manager useful for more than just home or hobby; they expand it to small-business ability, particularly when you add to these features the various printing options.

You can create subfiles, merge files, pack files and create sequential files to use with other word processors. You can replace fields or delete them.

The backup guide — at the end of the manual — tells you how to make a backup copy of your data disk to protect your information. This is absolutely necessary, and we're glad to see it isn't left just to those who have deciphered the 1541 disk-drive manual.

On one disk drive, the backup procedure unfortunately takes 20 to 25 minutes. You must exit from Database Manager to do this (the backup procedure is performed by a different program on the program disk). Read the instructions before you do — you can't just follow the menus. You have to wait for the disk drive to stop working at each step before you pull out the disk and put in another.

The backup procedure basically consists of the computer telling you when to replace the data disk with the backup disk or vice versa. The computer formats the backup disk and then loads as many files as it can from the data disk at one time. It then asks you to swap disks, puts that information on the backup disk, asks you to swap disks again and starts loading again. Make sure the disks are clearly marked, or, with all the swapping, you could put the wrong disk in at the wrong time. If you want to do serious work with a data

base of any size, you'll soon want a second disk drive.

The outside of the software binder contains a software license agreement that has the warranty information. Inside the binder is a warranty registration card that you must send in to activate the warranty. The disk on which the program is recorded is supposed to be free from defects for 90 days. If a defect appears, you must return the disk and a copy of the receipt to the dealer or directly to Mirage Concepts to get a free replacement. After 90 days, and before a year, you can send the disk and a replacement fee to the company for a replacement disk.

The Database Manager disk is copy-protected. For $7 you can get another copy. The disk also has a serial number that you must use whenever calling Mirage Concepts.

If you register your warranty, the company will send you program-update information. Updates that correct bugs are free; enhancements cost you something.

Database Manager takes care of most errors and does so with unusually clear error messages. Also, it is built with questions that make sure you have to try hard to erase a complete file: this means your work won't suffer if you press the wrong key accidentally.

If, for example, you try to save a form that has a field of more than 250 characters, the screen shows:

*Error — field size is too large

*Max = 250

*Press Return when ready

This sort of fully explained message is rare. Other software packages often have error messages such as "error 47" or simply no message at all.

This program doesn't have all the power of a data base created for a computer such as the IBM PC. It does, however, have all the basics — excellent documentation and clear

menus and structures — to make it comparatively easy to use. Data-base managers as flexibile as this one is are never a snap to learn. Predefined data-base managers, such as checkbook managers and the like, are easier to learn, but they are less powerful.

Having a fully implemented data-base manager, such as the Mirage Concepts package, is like having another language for your computer. You can build many of your own application programs simply by setting up your own files and data bases with calculated fields and multiple sorts. If you buy only two programs for your Commodore (other than a few great games), get a word processor and a data-base manager. You won't find many better than Mirage Concepts' pair.
—*Phillip Robinson*

REVIEW

Research Assistant

It's relatively easy to put down orderly research notes on index cards, but sorting them is a different matter. As a body of notes gets larger, details and relationships tend to get lost in the fog of paper. Research Assistant Version 2.0, from TOTL Software, is a program that lets you use your Commodore 64 to sort notes while you are taking them. The system is available in tape and disk versions; however, certain file-handling features do require a disk.

Research Assistant is two programs: a file builder and a cross-indexer. The file builder, RA.BUILD, creates a sequential file on disk or tape. For each new source that you want to document,

such as a book, you enter a source record, which contains the standard bibliographic citations. These records are free form, so you can choose the bibliographic style you want.

Each source has a user-assigned number: this number is used in indexing. After you've entered the information required for the source record, you are asked to enter reference records, which are typically single statements. The system automatically assigns numbers to references within a source, and it allows you to have a maximum of 9999 references.

For each reference, you enter the source page number and the text of your note, in any format. The system then asks you to type keywords and key dates for that reference. The keyword and date entries are structured — they are used for cross-reference purposes. Before it saves an entry, the system gives you an opportunity to proofread it, save it or delete it.

As you make your entries, the system creates a sequential file on tape or disk. If you have a disk drive, you can add entries to an existing file or combine short files into a longer one. The system updates a file by reading the file from disk or tape and then rewriting it to disk or tape with changes, as a new file; you can't write from tape to tape.

During execution of the program, you can change the I/O devices. This allows you to merge tape and disk files into a disk file.

To update the contents of a file, you must specify which record you want to change or where you want to add references to a source. The system then reads the old file and rewrites it into the new file, stopping when it reaches the point you have specified. You can make your update and have the rewriting process continue to the next specified breakpoint.

Once you have created a source-note

file using RA.BUILD, it's time to create a cross-reference table. This is accomplished with the RA.XREF.BUILD module.

Using the opening menu of this module, you can choose to specify up to 20 date ranges to be cross-referenced separately. The system then asks you to load the first file to be analyzed. The file is read, and a cross-reference file is created in memory. The cross-reference file is organized by "slots" that hold up to five references for each keyword. Until you run out of slots, you can add source files to a single cross-reference file. After it has indexed a note file, the system tells you how many slots are still free.

If you are using tape, you can create several short files and cross-index them in one indexed file using the RA.XREF.BUILD program. Because you supply the source numbers, there is little chance that several sources in different files will have the same number.

Once you have built a cross-index, you can save it to tape or disk under a filename that begins with the prefix RAX. You can enlarge these fields by reloading them from tape or disk.

Printouts are available only when you use the RA.BUILD program, which allows you to print the source-note file(s) and the cross-reference file.

You can use a Commodore printer without any problems. The system has a built-in option for interfacing with RS-232 printers. The manual contains instructions that tell you how to adapt the system to use it with other printers and also how to change the program so it can accommodate 80-column screens (the Commdore 64 has a 40-column screen) and wider printers. The BASIC code of this program is so convoluted, however, that we cannot recommend that you try to make any changes other than the ones we've mentioned.

Source-note files are printed with side heads for reference, comments, keywords and key dates. Cross-reference files are printed in tabular form. Under each keyword is the source and the reference number in decimal form, followed by the number of the date range specified for that reference.

Within the limits imposed by its structure, Research Assistant performs well. The process of writing a new file whenever you want to update a source-note file is tedious at best, however. If you need to take notes from diverse sources, Research Assistant does a good job of indexing them. It's not, however, a substitute for a random-access file structure.

Research Assistant is easy to learn and easy to use. It contains a considerable number of on-screen prompts. Once your research notes become volumnious, Research Assistant's advantages over card systems will become evident. Documentation consists of a well-organized, 21-page booklet that has a detailed table of contents but does not have an index.

Error conditions can occur when you try to build a cross-reference file that is too big for memory or when you run out of tape when writing to the tape. If you run out of tape when you are creating a cross-reference file, you can look in the manual to learn the method for recommencing the Write routine. If you run out of tape while you are writing a note file, you lose your notes. If you run out of memory while building a cross-reference file, you must start all over again.

Instead of providing error-trapping and recovery routines, the program's authors have chosen to document the conditions and suggest ways to avoid them.

This is a rudimentary data-handling program that allows users to organize

Summary
Research Assistant is designed to help you organize research notes for various projects. The program does a good job of indexing notes, but its file-update procedure is not particularly efficient and its method of handling errors is totally insufficient. We can recommend the program's use only for some small- to medium-size projects.

their data. For medium-size projects — for example, writing term papers — it should perform adequately.
—*Ned Heite*

REVIEW

Superbase 64

Superbase 64, a product of an English company called Precision Software Limited, may set a new standard in DBMS (data-base-management systems) software not only for the Commodore 64 but for all computers of all classes.

People often unwittingly compare each new DBMS to dBASE II because dBASE II has a useful feature: you can write programs in an English-like language. Stand aside dBASE II, because Superbase 64 also lets you write programs in an English-like language, but that language is BASIC, which many microcomputer users know. Superbase adds 50 commands that, combined with BASIC, give you tremendous flexibility. Its many commands include the powerful IF . . . THEN, which is glaringly absent in other DBMS programs.

Using Superbase you can create as many data bases as your available disk space will allow. Each data base can have as many as 15 files, so this is truly a relational data-base manager. You can write any number of programs to store with each data base. Each program can use any of the 15 files in its data base. You can list selected records from one file and perform calculations with information from one or more other files. Keep in mind one point, however — a cumbersome feature of both

dBASE II and Superbase 64 is that you can use only two files (called primary and secondary files) at one time. True, you can have more files in your data base, but you can use only two at a time. Other programs, such as Open Access, let you work with five files at a time. Superbase 64 is like dBASE II in that you can link only two files at a time. This restriction makes programming more difficult. Unlike dBASE II, however, which lets you write programs of unlimited length, Superbase has room in its on-line program buffer for only 4K of instruction. This does not limit most programs, as the language is compact, and you can chain programs together to accommodate long programs. The number of key lists that you can maintain in each data base is unlimited. (Key lists are lists of records in a file that match chosen criteria or keys.)

One useful aspect of the data base is its Memo feature. Data bases can be either structured or unstructured. When you use structured data bases, you define field names, field lengths and data types for each record in the file and can, therefore, quickly and precisely retrieve information that you have coded to key fields. In unstructured data bases, you keep information at random in narrative style so that you are not locked into a confining structure, but finding the information you want is not easy. Superbase's Memo feature gives you the best of both worlds. You set up a normal structured data-base by defining field names, field lengths and so on, but when you come to the end, Superbase asks you if you have any memo information pertaining to this record. If you do, you add the information in any form you choose. The information becomes a separate record that you can use when you use each main record. For instance, if you have a customer file and John Doe calls

you and asks for information about your product, you can search his file when you talk to him on the phone, recall his memo and perhaps read, "John Doe has a wife, Lucy, and nine children and likes to play golf." This information may give you the familiarity you need to sell him your product. The maximum length of a memo file is 23 screen lines and, as with key lists, you may associate an unlimited number of memo files with any data base.

The number of records that you can associate with each file is limited only by the amount of disk space you have available. Each record can have up to 127 fields, can contain as many as 1108 characters and can occupy up to four screens. Each record can have only one key field (up to 30 characters long); you can classify it as either unique or nonunique. A text field can be 255 characters long. A numeric field can accommodate up to nine digits to the left of the decimal point, four to the right and one sign (positive or negative) character.

The fields can also accommodate date and calendar fields, giving you some interesting features. You can leave space at the end of a date or calendar field, and the program automatically tells you the day of the week if you provide the date. You may use European date format (24MAR84) or American format (MAR2484). The final output format is determined by the last input format used.

In another feature associated with the date and calendar fields, when you give the computer two dates, it calculates the number of days between the two. More important, given a date and a time period, such as 90 days, the computer determines which records are inside or outside the 90-day limit.

In addition to Constant fields that contain repetitive information (and save you the trouble of retyping the same

information in each record), Superbase has Result fields, which are numeric fields that carry the results of calculations. As an example, if your record contains a Result field, "totalpaid," and a Numeric field, "lastpaid," and you want to update the record, the lines of your program might look like this:
300 calc [totalpaid] + [totalpaid]
    + [lastpaid]
310 store the record

Superbase is easy to use. It combines the best features of both menu-driven and command-driven programs. Menu-driven programs have the advantage of simplicity, a plus for beginning users, but they are cumbersome and slow down the advanced users who don't want to waste time stepping through menu choices. Superbase displays a main menu that lets you press a function key to make a choice. If you know what choice you want to make, however, you merely start typing the commands. As you type the first character of the command, the menu disappears and a command line appears that accepts your direct input. When you press Return, the program executes your command. If you want to repeat that command, you don't have to retype it. You can just press the left-arrow key in the upper left-hand corner of the keyboard, and the program repeats the previous command, which is still stored in its temporary command buffer. If your command sequence becomes too long or complicated, you can easily write a program and save it for repeated use. You press F7 on the keyboard to execute the program. Operating the system is as easy or as complicated as you make it.

Superbase 64 performs impressively when you create new data files and define fields. To do this, you start with a blank screen and the cursor in the home position. When you begin pressing

InfoWorld Report Card

Superbase 64

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
Superbase 64 is a flexible database-management program that enables you to generate reports by programming in BASIC. It is both menu- and command-driven, making it suitable for both novice and expert programmers. This is a fine program that manages to overcome Commodore 64's operational limitations.

System Requirements
☐ *One disk drive*

Suggested list price: $99

*Precision Software, Inc.
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Fourth Floor
Stamford, CT 06905
(203) 326-8649*

keys, you quickly realize that you have the full power of a text editor at your disposal. All the keys do what you expect them to do. You just move the cursor to any position on the screen and type in a field name. You then press F1 followed by a field-type designator, such as T for text, K for key and N for numeric. You move the cursor-right key to the length you want the field to be. You don't have to count, because the screen displays how many characters you have. When you get to the end, you press Return, and the field is defined. You repeat this operation for as many fields as you want — and remember that you have four pages to use if you run out of room on the first page.

When you've finished and before you exit from the program, you have one other delightful option if you have a color monitor. As you hold down the Control key and press 1 the text cycles through 16 colors for each press of the 1 key. You press 2 to go through all 16 background colors and press 3 to see the border colors. In this way, you can quickly instruct Superbase to display your data file in your favorite color combination, and the computer remembers this color combination when you save the file. You can thus color-code types of records, for instance. Also, you can invert (display like a photo negative) individual fields to highlight them, or you can invert the entire text/background-color combination.

Another nice aspect of Superbase, which you don't appreciate until you've used the program for a while, is its Start-up feature. The master disk includes a program called *start.p*, which you can copy onto your work disk. You can use it "as is" or edit it with the program editor. When the program boots, it searches for this start-up file and, if it finds it, executes its instructions. These instructions can be anything from displaying help screens

containing your personalized menu options to setting printer parameters, such as margins, line feeds and page lengths.

Superbase's Help Screen feature is not the best available. In normal operation, you use the master-program disk only to boot the program. Once the program is booted, you remove the program disk and insert and work your data disk. If you want to invoke Help screens you must copy them onto your data disk before you remove the program disk. The disadvantage of having the Help screens on your data disk is that they reduce the disk's record-storage capacity.

The documentation, a black, bland-looking two-ring binder that holds 6 × 9-inch loose-leaf pages, will never win any beauty awards, but it has all the essential elements of a good manual. Separate sections contain tutorial lessons, reference information, programming information and technical appendices. Each section has a table of contents, although all are located in the front of the book and not at the beginning of each section. The index at the end of the manual is thorough, but it's not complete. If you start at the beginning of the tutorial and follow every step, you can learn a lot about the program. If you get antsy, however, and want to skip the tutorial in favor of experimenting on your own, the information in the reference section is adequate for most queries. The items in the reference section are not arranged alphabetically, though, so you may have to fish around a bit. The manual's programming section is good, but it could be better — for instance, some examples use terms, such as *hlist*, that are not directly explained in the manual.

Two uncopyable disks come with the program; one is a backup to the other. Superbase has a 30-day disk warranty; after the warranty period, you can

return defective disks to Precision Software's New York office, along with $7.50, to get a replacement.

If errors occur during normal operation of the program, they are expressed in plain English on the screen. If you enter 3/24/84 instead of 24MAR84 or MAR2484, for example, you see the message "invalid date." An appendix at the back of the manual explains the meaning of each error message and tells you what to do about it. The program does not stop if an error occurs. Instead, it waits for you to enter the correct response.

Superbase 64 is a fine program. It is a pleasure to find a program as good as this for a machine such as the Commodore 64, with its disk-operation and operating-language limitations.
—*Marty Petersen*

REVIEW

FlexFile

You can replace a word processor with a pencil, but a data-base manager such as Michael Riley's FlexFile would be replaced only by clutter. FlexFile can keep books, prepare client statements, maintain inventories, keep notes, compile bibliographies and prepare mailing lists.

FlexFile first came out in 1981, and each new release since then has improved on earlier ones — Version 2.2 is no exception. It can run on any combination of Commodore computers and peripherals, configuring itself to the peculiarities and memory capacity of each unit.

FlexFile is a series of programs on a single disk. You keep your files on another disk. If you have a single-drive system, you can still use FlexFile, though with a bit of disk shuffling.

FlexFile program disks are not copy-protected so you can make as many copies as you need.

When you first load FlexFile, it asks you to configure your system. Some questions about your computer, printer and disk drives flash on the screen, and the program stores your answers in a special configuration file on the system disk. Thereafter, the computer "knows" your system whenever you turn it on, although you can change the specifications at will.

FlexFile is menu-driven, rather than command-driven, so you don't need to remember commands or mnemonics. When you turn it on, FlexFile displays its main menu, and for each operation the screen displays a series of options. You then press the first letter of the option that you want the program to perform. For example, using the main menu, you type C if you want to customize the system after the first setup session. Typing B takes you into a backup routine that lets you make a security copy of a disk without leaving the program. Typing V allows you to page through a sequential file that is stored on a disk.

The W option allows you to transfer to the word processor of your choice; you can copy your favorite word processor onto the FlexFile disk. This feature is useful when you are creating address files for use in word-processed mailings. FlexFile can produce insertions for automatic inclusion in forms or customer bills.

Before you can do anything, you must start a new file, with the S option. When you type S, the system asks you a series of questions about the file you want to create and steps you through the process. The program then flashes a

InfoWorld
Report Card

FlexFile

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	☐	■
Error Handling	☐	■	☐	☐

Summary
FlexFile is a menu-driven data-base-management system comprising several programs on a single disk. We recommend this program for its simplicity and considerable flexibility and have yet to see a system for Commodore computers that offers comparable value.

System Requirements
☐ *One disk drive*

Suggested list price: $60

Webber Software
P.O. Box 9
Southeastern, PA 19399
(215) 687-5607

list of fields and asks by which fields you wish to sort. Sorting fields are called keys. In FlexFile you can nest your sorts — that is, you can sort by year and then by name within the year. You can sort either alphabetically or numerically. It's important to plan your file carefully in advance, although the program contains routines that allow you to restructure a file.

Once you have designed a file, FlexFile tells you how many blocks the file will occupy on the disk and the amount of computer memory it will need. If a file would be too big for your equipment, you have a chance to make changes. FlexFile keeps the keys in main memory while it is working on a file, so you have constant access to the records in any sorted sequence you desire.

When you have created the new file, you again see the main menu. Now you have a file and can type O to open the newly created "old" (but empty) file. Specify the same filename, and you see the File Maintenance menu. When you type V, using this menu, FlexFile displays the disk directory.

The Direct or D option on the File Maintenance menu takes you to another menu, where you have the choice of adding, deleting, changing or viewing records. Using this menu, you can view records individually or you can browse through a particular field in all the records. Typing B, for batch entry, is a quick way to enter a lot of records. Using batch entry, you can enter records or pieces of records to a batch file. This is fast, but it doesn't add the records to the data base. In Direct mode, the A, for add, option lets you input and update the disk file and the keys. When you type M for merge, the computer reads the batch file into the main file and updates all the keys in the process. This merge operation is slow, though.

The Mail Labels and Report Writer options are two methods for producing FlexFile output. In each case, the system leads you through a design process much like the File Designing menu. Mail Labels is, naturally, simpler than Report Writer.

When you choose Report Writer, FlexFile asks you to design a report, with header lines, columns and selection criteria. You specify which field goes into which column. You can decide how many places are printed to the right of the decimal point, how wide the column will be and any arithmetic operations you want to perform on columns. If you wish to select only certain records, you fill in a selection statement from a menu — you can enter several conditions in the same line for multiple-selection criteria. Report Writer lets you save a report format for later use or recall an existing format. You can print sample pages and reformat the report by making menu selections. When you're ready to print, the computer gives you the option of continuous printing or pausing after each page, depending on whether or not you are using pin-feed paper. You can also write a report to a disk.

FlexFile can perform calculations directly on a file, too. You can use any of the built-in functions of Commodore BASIC in a file calculation, including tangent, cosine, sine or random. The program's File Calculations routine draws bars for graphs, using a function called Bar. If a quantity is too large for the space available, the Bar function prints the numbers instead.

You have the option of letting the system print subtotals — in fact, it can print several levels of subtotals if you wish. It starts a new page after each subtotal or skips a space, depending upon your instructions.

Our only complaint about FlexFile is the relatively slow operation of the Direct File Maintenance option when

you add one record at a time. Each time you change an entry, the system updates the disk files, which takes time, especially if the file is long. You can overcome this slowness somewhat, though, if you use the Batch Entry routine. We don't want to complain too loudly about the program's slow disk-handling, since this feature also helps to protect you against loss of data due to system crashes or power failures.

If you are adventuresome, FlexFile's author has provided a space for you to write your own subroutines. Using the File Maintenance menu, you can type U, which takes you to a blank space where you can insert your subroutine. FlexFile then executes a routine in this space as if the routine were part of the main program. The documentation includes the necessary programming information for adding your own routines.

The program's manual is an offset-printed typescript, 121 pages long, with a separate chapter for each of the many operations. Its organization and explanations are adequate. Since the system is menu-driven and prompted throughout, no more documentation is necessary.

FlexFile does not contain facilities for trapping bad data on input. You can put letters in a numeric field, but the system then neither crashes nor prints properly. If a bad record hangs up report output, the system crashes. You must then go back and delete the offending record from the Direct File Maintenance routine. This deletion routine is new with the current version and considerably speeds up the process.

If a power failure occurs while you are adding records, you will wipe out the current list of sorting keys, so you should make frequent backups. Since FlexFile allows you to create sequential files of your data with only a few keystrokes, this is not a problem.

FlexFile can draw graphs, keep

accounts, track note files, fill in form letters and make labels. Its most endearing feature, though, is its simplicity and ease of use. It gives you the advantages of indexed sequential files and considerable flexibility. We have yet to see a system for the Commodore that offers comparable value.

—Ned Heite

REVIEW

Mini Jini

Commodore owners are probably familiar with the Jinsam data-base-management system, an expensive piece of software that has been revised and enhanced many times. From this heritage comes Mini Jini, an inexpensive, serviceable and easy to-use file-management system that can help your Commodore 64 earn its keep.

Mini Jini can handle most of the file operations that home-computer users are likely to need: mailing lists, simple accounting, inventories, club records and the like. The program's main menu tells the story — you can choose options such as Create, Look Thru, Order (sort), Search, Fix (edit), Print, Write a File and Read a File. The menu also lists Mathpack, a utility that offers you nine options for simple arithmetic calculations, such as multiplying two fields or dividing by a constant.

Each choice you make from the main menu puts you into a secondary menu. Because Mini Jini is a ROM-based program — it comes on a ROM cartridge that you plug into the game slot of your computer — all operations

Info World
Report Card

Mini Jini

	Poor	Fair	Good	Excellent
Performance	□	□	□	■
Documentation	□	■	□	□
Ease of Use	□	□	□	■
Error Handling	□	□	□	■

Summary
Mini Jini is a low-cost, serviceable and easy-to-use record keeper. If you combine it with several application templates that are available to work with it, it can provide you with features akin to those of more advanced data-base-management systems. Its documentation is adequate.

System Requirements
□ *No additional requirements*

Suggested list price: disk, $14.95; cassette, $9.95; 26 application disks, $89.95

*Jini Micro-Systems, Inc.
P.O. Box 274
Kingsbridge Station
Riverdale, NY 10463
(212) 796-6200*

that depend on the program itself or on data stored in memory execute quickly. If your Commodore 64 goes into its "garbage collection" routine, however, you can expect delays of up to 10 seconds. This is a computer peculiarity and not a weakness in Mini Jini. You can use either a disk or a cassette for storing data when you use this program. Nevertheless, the Commodore 1541 disk system, although faster than the cassette system, is slow. Thus, when you read from and write to disks with Mini Jini (or any other program), you must be prepared for a period of thumb twiddling.

On a 64, Mini Jini allows you to create up to 500 records containing a maximum 45 characters each in a file that has four fields or less. Alternatively, you can create up to 250 records containing a maximum of 100 characters each in a file that has six to ten fields. Compared with most "full-service" data-base managers, Mini Jini is modest, but you cannot attempt to match the capabilities of elaborate systems on a machine such as the 64. You should also remember that although the 64 comes with 64K of memory, only about half that is available for you to use (after I/O, operating system and BASIC occupy the rest).

Sorting is one of the most useful things that an electronic filing system can do. When you want to sort using Mini Jini, you select Order from the main menu, and in response to the program's request for a field, you type the number of the field that you want to alphabetize or order numerically. For example, if you want to organize your file in alphabetical order according to state, you then choose the field number for State.

In its current configuration, Mini Jini can only sort fields that contain one type of element. You can buy a cartridge called Deep Sort and Change that enhances Mini Jini and enables you to sort on multiple keys — for example, by book title and publication date. This enhancement also allows you to restructure files automatically — you can add more fields, alter field lengths and so on. Although Deep Sort and Change involves you in additional cost, it enables you to perform complex file manipulations. We have not tested Deep Sort and Change because it was not included in our test software.

The formats that Mini Jini generates are predetermined, and you cannot change them. You can, however, buy another utility cartridge, Report Forms Writer, that allows you to create forms in formats of your choice. Again, we were unable to test the Report Forms Writer.

At this writing, Jinsam support for Mini Jini also includes 26 application disks or cassettes. These applications are templates that cover such topics as Club Records, Ham Radio Operations, Medical Plan, Quality Control, Real Estate and School Administration. We tested the Ham Radio application and found it to be well thought out and useful. Along with the software, you receive a packet of printed templates, each of which duplicates the content of the relevant disk. Among the templates are Ham Magazines, Hamlog Hispanic, Ham Mail List and various Ham contests, logs and inventories. The application disks give you a good idea of how to set up your own applications — you could use the printed templates as tutorials in Mini Jini file structure.

Once you have set up a file — either on your own or by using a store-bought template — you can now easily find information from you records if you select Search on Mini Jini's main menu. You type S — all menu choices require you to type single letters only — and the program prompts you to choose

either a Global search or a Field search. When it makes a Global search, the program searches the entire file for some value that you enter — for example, it finds all the records that contain a certain number or a combination of letters. Alternatively if you want to search for a specific field in each record, you select Field and enter the name of the field and the item you require — for example, ZIP Code and 20003.

One interesting capability of Mini Jini's Write function is that you can write to a modem. Commonly, you'd write to tape, disk or a printer, but if you wish to send your file to another computer via a modem, Mini Jini lets you. You can, however, read only from tape or disk and not from a modem.

For disk users, Mini Jini offers a menu of utilities: Directory, Initialize, New and Scratch. You can also convert Jinsam files to Mini Jini files and vice versa; create a new file from an existing one in order to delete unwanted records; and change records in one or more fields. Some of these operations are a bit cumbersome to perform, but they do work well.

If you use Mini Jini with a color TV or color monitor, the program lets you change the border and screen colors — you need only press the F1 and F3 keys until you get a combination that you like.

Mini Jini is not prone to crashes. Of course, power or equipment failures can send the program into never-never land, but otherwise, it is most forgiving. You can even recover data in memory if you inadvertently try to write data to a disk drive, cassette, printer or modem that you haven't turned on. Should you try to type in symbols that Mini Jini cannot accept (commas, for example), the program does not accept them and waits patiently until you enter the material it expects.

We rate Mini Jini's documentation as Fair, even though the manual does take you through the operations of the program in a reasonable way. It begins with a standard tutorial and also contains a section called "Hints & Kinks," which offers advice on a variety of Mini Jini topics, such as changing records and file conversion. Its index is brief, but the manual is only 39 pages long. The section called "Definition of Terms," is a glossary, and it offers little of value. For example, it defines *disk* as a "flat mylar disk in a square sealed envelope" and *format* as "remembered instructions for labels, etc." The manual's format is small (5.5 × 8 inches); the printing is reduced typewriter; and the cover is outright silliness — an ugly creature that looks like a Cylon waves at you with one three-fingered hand and dips into a filing cabinet with the other. Hey! This is an electronic filing system, not a Bflstyx-from-Outer-Space game. Should you expect more for the program's price? Why not? We've seen some splendid manuals accompanying software that is less expensive than Mini Jini.

Mini Jini comes with a registration card that enables you to receive "information about enhanced new versions and free copy of the user publication." Beyond that, it has no guarantees or warranties. Nowhere are you counseled about what to do if something proves defective. Since Mini Jini is sold through local dealers, we presume that your dealer will be the one to harangue about problems you may encounter.

All told, Mini Jini is good value. It can do some of the things of which more-expensive data managers boast, and it is well supported with ancillary software. It can thus become a system that is reliable and easy to work with.
—*Henry F. Beechhold*

HOME

These programs turn your Commodore 64 into a "home" computer. With them, you can balance your checkbook, make music, create images and plan your diet.

REVIEW

The Electronic Checkbook

Balancing a checkbook is a classic example of a practical task that a home computer can tackle. The Electronic Checkbook program, from Timeworks, is a specialized data-base manager that tells your Commodore 64 how to balance a checkbook; it also performs other related financial functions.

This home-finance program lets you enter and then sort and analyze your check expenditures. More important, you can have the program sum or average categories of expenses, such as tax deductions, automatically. You can then print out any or all of the check records.

The Electronic Checkbook is designed to work hand in hand with Timeworks' The Money Manager

program to help you track your expenses and create budgets. A routine is included in the program to make backups of your data disk automatically.

The Electronic Checkbook consists of a disk and a users' manual. Timeworks deserves kudos for both its packaging and documentation. The box doesn't hype the product but accurately lists the program's attributes. For example, an "At a Glance" summary on the box tells you the size limits of the checkbook data base that the program can handle. These limits are: up to 2500 transactions per disk; and up to 200 transactions per system load (when you use a cassette for storage). These settings are ample for the purposes of average home or small-business users.

The manual states "As with all Timeworks software, if you have any questions feel free to call us at (312) 948-9200." It does not mention any other support or backup policy.

The manual is 20 pages long and contains such sections as Introduction, System Operation and Start Up, Let's Get Started, Entering Transactions, View/Modify Items, Analyzing Transaction Amounts, Monthly Reconciliation, Printing, Storing Transactions, Making a Backup Data Disk, Interfacing with the Money Manager Program, Odds and Ends and Trouble Shooting.

The manual has neither an index nor illustrations. Because the program is simple, however, the material included is adequate. The documentation has no tutorial, but it includes examples here and there, and its writing style is engaging.

A tutorial would help, though, because it isn't always clear which menu choice you should make.

The manual also includes instructions for using a Datasette cassette recorder/player. We tested the package for this review using a 1541 disk drive with the Commodore 64. You'll find that using a cassette system with any data-base program such as this is frustrating and slow.

The Electronic Checkbook takes more than a minute to load. If you have any problems, Timeworks has provided a second copy of the program, under a different name, on the same disk.

The first display offers to let you specially format a new data disk before doing anything else. You are reminded that the procedure will erase everything on the disk, and you are asked again if you want to format the disk. The program then asks you whether you want black letters on a white background or white letters on a black background for the screen display.

Formatting the disk takes four or five minutes. This isn't the standard formatting process, though. You have to use a special formatting routine, though you only need to use it the first

time you use the disk. You have to commit the disk you format to The Electronic Checkbook only — you can't use it for general file storage.

The Electronic Checkbook is built around menus. The main menu displays a numbered list of functions: View/Modify Information, Enter New Items, View/Modify Transactions, Analyze Transaction Amounts, Monthly Reconciliation, Dump Records to Printer and End Run. This menu just about sums up what the program can do. To choose one of the functions, you just press the key with the same number as the function.

First, you need to use function 1, which allows you to modify the basic data that is associated with your checkbook data base. You use this basic data to label the check file, and it includes information such as account number, bank name, personal banker, phone number, dates (from-to) and last revision date. Once you have filled in the blanks for these labels, you can return to the main menu just by pressing M. At least, that's what the manual says — actually, you can return to the main menu by pressing any key — but this is about as minor as a bug can be.

The next thing you do is to enter all your old checkbook information. This entry comes under the aegis of menu choice 2. The first time you do this, you're in for a lot of typing. That's OK; cheer yourself up by thinking how hard businesses have it when they have to computerize — your load of typing is just a drop in the bucket compared to theirs.

While you enter information, the keyboard is well protected from errors. Keys that aren't supposed to be in action are disabled.

After you select menu choice 2, a transaction number automatically appears on the screen, and you are asked for a transaction description. In

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The Electronic Checkbook

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
The Electronic Checkbook can help you balance your checkbook and manage your personal finances. Its speed is adequate and its menus easy to use.

System Requirements
☐ *One disk drive*

Suggested list price: $24.95

Timeworks, Inc.
444 Lake Cook Road
Deerfield, IL 60015
(312) 948-9200

most cases, this is the person or company to whom the check is payable. You are then asked for a check/deposit number.

The next question, which concerns the input transaction date, shows a limited sort of error handling. You must enter the date for only the month and day. If you want to work with different years, you have to set up different data disks for each year. If you try to enter a date without using the proper format (MM/DD, for month and day) the program rejects your entry and asks the question again. Here, too, there are a few almost invisible bugs. If you back the cursor up twice (to retype entered text), the keyboard sometimes freezes, and you can't enter any more information until you return to the main menu.

At this point we discovered that we should enter the original balance first, as a deposit. This fact isn't highlighted well enough in the manual.

The next question concerns the index category, and this is the heart of much of the program. A list of suggested index categories in the manual includes income, rent, utilities, car payment, groceries, auto/ transportation and medical/dental. The index categories are two-digit codes, and you assign one of them to each transaction. You can make your own list of codes to customize the checkbook file to your own needs. You use the codes later to tally your total expenses in various categories. For instance, if you want to use The Electronic Checkbook to keep track of all your tax-deductible expenses, you need to assign the same index category to all the checks you used to pay for those deductions. Think about what expenses you want to track before you use the index-category list in the manual. If you change your mind later, you have to change all the transaction codes.

Finally, you enter the value of the transaction. The program calculates the running balance automatically and then shows it on the screen. The other answers you have entered, such as transaction description and index category, are also shown.

You are then asked "Changes? (Y/N)," which lets you commit this transaction to the disk. If you answer Y, you again see the first question about transaction description. This gives you a chance to modify the answers you gave before.

As soon as the program stores this transaction, the next transaction number appears, and the process of entering a check record starts again. If you press Return before answering the first question, you are returned to the main menu.

Error handling in The Electronic Checkbook is a little uneven. Some errors are ignored, but others are rejected. For instance, you can enter two checks that have the same number, and the program doesn't notice. If you try to enter 22/22 for a date, however, the date question is asked again and your impossible answer is erased.

After you have entered all your checks, you may want to see what you entered and possibly modify some of the records. You can do this by selecting the third main-menu choice, View/ Modify Transactions. As with the other menu choices, you are led through the process by explanations on the screen.

The Electronic Checkbook is a data base that is dedicated to storing limited information about checks or bank transactions. Although its speed isn't astounding, it does work fast enough to manage an average-size checkbook. For the sample checkbook we used in this review, adding each check record took 10 seconds of disk writing (after we finished typing in the information), and searching through 200 checks for those

of a particular value took 30 seconds.

If you have trouble balancing your checkbook — and if you have deductions to add up for your tax forms — this is a practical program that is easy to use. Its design will prevent you from making major errors.
—*Phillip Robinson*

REVIEW

Synthesound 64

When the first Commodore 64 came on the market a few years ago, we were impressed with the SID (the 6581 sound chip, or sound interface device) built into it. At the same time, we were dismayed at how difficult it was to create music using the BASIC language and its PEEK and POKE operations — that being, at the time, the only way the SID could be made to produce sounds. We remember painful hours spent creating a musical masterpiece that had a playing time of about 25 seconds and we implored the powers that be for a software package that would allow people of all ages and skills to truly use the SID.

Well, somebody — Human Engineered Software (HES) — has come up with an answer to our plea. It's called Synthesound 64. You don't have to be a programming genius to get a lot of fun out of this program, but you do have to know quite a bit about musical synthesizers to run it. If you don't have this knowledge, you will surely gain it using the program — this means the package has considerable educational value, too. Also, it is so inexpensive that the few problems you may encounter

are well worth the trouble they cause.

Every field of endeavor has its own vocabulary of buzzwords, and electronic music is no exception. You learn right from the start about the capabilities of the SID: about its three voltage-controlled oscillators (VCOs) that generate the basic sound frequency; about three envelope generators (ADSRs) that determine how the sound will rise and fall; about its voltage-controlled filter (VCF); and about its single voltage-controlled amplifier (VCA). You learn that for special effects the VCOs can be synchronized and can modulate each other. (This process is called ring modulation.)

Synthesound 64 also provides eight low-frequency oscillators (LFOs), two piano "keyboards" (displays on the screen, not real keyboards), ability to store 256 predetermined settings (called patches) and use of one channel for "tape recording" to disk. On the disk you can record up to nine different songs as well as nine sets of 256 patches. This all sounds impressive, but what's it like to use the software? What can you really do with it?

To answer those questions, let's go through a sample demonstration. First insert the disk, type "LOAD "*",8" and then RUN when the Ready prompt appears. After a few moments (25 seconds), the screen gets crowded with a bunch of differently colored boxes, each of which represents some setting of the SID's many parameters. More about those later.

On the bottom of the screen are two 2-octave keyboards, one above the other. The top keyboard is the "solo" keyboard, and the bottom one is for accompaniment. The first thing you notice about the keyboards is that the keys are not the usual colors — the white keys are black and the black keys are gray. We find this disconcerting, especially considering that this is

InfoWorld
Report Card

Synthesound 64

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	■	☐	☐

Summary
For its price, this music-generation package for the Commodore 64 does a marvelous job of letting you use the sound chip inside the machine. It has a few bugs and doesn't handle them well, but it's a good educational tool, nonetheless, for those who want to learn about synthesizers or just have fun making music on a computer.

System Requirements
☐ One disk drive

Suggested list price: $19.95

*Human Engineered Software
150 North Hill Drive
Brisbane, CA 94005
(415) 468-4111*

supposed to be an educational program for children.

You then discover that an organlike sound emanates from the speaker when you press any of the keys in the top two rows on the computer's keyboard (the numbers row and the Qwerty row). For instance, the letter *Q* on the computer keyboard corresponds to a musical D on the solo (upper musical) keyboard, which illuminates in reverse video as you play it.

One nice feature of the keyboard operation shows you how to get a given musical note. Just press the Shift key and the musical keyboard is labeled with the corresponding computer keys, so you can see immediately which key you need to press on the computer keyboard to get the note you want. Pressing the Shift/Lock key keeps the labeled notes displayed constantly.

You also discover that you can press three keys simultaneously and create chords, because the SID has three independent oscillators. If you press four or more keys, only the lowest three play. Within a matter of minutes (and without even having read any directions other than the booting instructions), you are creating music and having fun.

The fun increases as you discover more things that you can do. For instance, while playing a group of notes on the solo keyboard, we discovered that if we operated the left-right arrow key the group of notes would slide up in pitch; and if we then operated the up-down arrow key, the notes would slide back down. In this manner you can literally "tune" the computer to a real instrument.

You soon discover some limitations, though, as you realize that many combinations of keys do not work together. As an example, the D major chord consisting of D, F# (F sharp) and A (pressing Q, 4 and T on the computer keyboard) works fine, but as soon as

you change the F# (the number 4) to a G (the letter *R*), the solo keyboard shows a C, a D, a G and an A, and a D-G-C chord (not a D-G-A chord) sounds from the speaker. Many other combinations exist where the musical chord that sounds does not agree with the keys that are played.

During the course of one of these experimental sessions, the keyboard suddenly went dead. That's when we discovered Glitch!. Glitch! is the friendly gremlin who, along with Sid Clavier, acts as a "guide" who narrates the manual. We found a paragraph from Glitch! that deals with the situation. "Glitch! sez: 'Though it is hard to mess up Synthesound 64, sometimes it might "hang" or become unresponsive to your keypresses. If this happens, shut the computer off and repeat the startup sequence.' " Apparently we were not the only ones who have experienced the death of a keyboard.

We also ran into a slight annoyance when we played the lower, or accompaniment, keyboard. When we operated the keys in the lower two rows, we could see the corresponding musical keys activate (turn to reverse video) on the screen, but we could not hear any sound. The reason: when you start the program, all three VCOs are assigned to the upper keyboard, leaving no oscillators to produce sound on the lower keyboard. You can then split the assignment of the three VCOs to any combination of upper- or lower-keyboard assignments you want.

Now let's take a tour of the TV screen to explain the boxes we mentioned earlier. The upper part of the screen is the VCO control area. Color is utilized effectively here because each of the three VCO parameters are displayed in separate colors: red, green and blue, respectively. Effective use is also made of the Commodore 64's function keys to control these and all other parameters.

Function key F1 steps you through 13 functions, one of them being Set SID (VCO) Parameters. Individual function keys let you begin and end creating the VCO settings. Individual function keys also step you through each setting (such as Attack time, Decay time, Sustain level and Release time); another lets you select the value. By experimenting you can make a great variety of sounds.

Set VCOs from Keyboard is another of the 13 functions you can use with the F1 function key. This one allows you to assign each of the three VCOs to either the solo or accompaniment keyboard.

Engage Direct To Disk is the function that lets you make recordings. After you select this function, anything you then play on the keyboard will be recorded on disk. Selecting Engage Direct From Disk lets you play it back.

We were extremely disappointed with the sample recording on the program disk. We listened to it several times and it sounded like an unrhythmic garbling of sound, though a familiar garble. After about the third time, we realized that the program was attempting to play "Music Box Dancer."

We like the feature of the documentation that gives sample settings for different sounds. The examples give a name to a particular sound and then tell you how to set the VCOs, the modulation pitch and depth and the tune and glide settings. By taking the time to follow the examples, you gain a better understanding of how to create your own sounds. Once you have created a sound, the parameters you have set become a patch, and you can save them onto disk for future use.

Summarizing the operation of Synthesound 64 is not easy. We cannot compare the performance of the program with other computer synthesizers mostly because of

hardware differences between the systems on which the programs run. The Commodore 64 computer keyboard is not suitable for playing Beethoven, and the SID, which has only three voices and a small handful of waveshapes available, is no Stradivarius. Nonetheless, you don't need to buy extra hardware to make music.

Despite some of the unexpected bugs and other inconsistencies that show up, Synthesound 64 produces marvels in its limited environment. Where else can a person learn so much about creating electronic music, and have fun doing it, for such a low price?
—*Marty Petersen*

REVIEW

Ultisynth 64

Ultisynth 64 turns your Commodore 64 into a music synthesizer. If you want to get serious, you can experiment with sound constructs such as waveshapes, pitch bend, envelope shaping, synchronization and many more. On the other hand, you can just have a lot of fun with sounds. Ultisynth isn't perfect, but it does deserve the attention of Commodore 64 owners who want to use the sound capability that is built into their machines.

The creators of Ultisynth refer to themselves as the "Game Lords of Britain." For several years, their company, Quicksilva, has been at the forefront of the production and marketing of software, including game software, for British computers such as the Sinclair ZX81 and Sinclair Spectrum.

Info World
R e p o r t   C a r d

Ultisynth 64

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
Ultisynth lets you use your Commodore 64 as a music synthesizer. If you want to play tunes, the manual provides you with sufficient guidance. Otherwise, this program is for budding sound engineers and those who are prepared to experiment with its impressive features.

System Requirements
☐ *One disk drive*

Suggested list price: disk, $39.95; cassette, $34.95

*Quicksilva, Inc.
426 West Nakoma
San Antonio, TX 78216
(512) 340-3684*

The documentation for this program is a 50-page, 3 × 5-inch booklet with a good table of contents. It is basically a reference guide that lists and describes Ultisynth's features. After a bit of tutorial, the manual leaves you to experiment with your new toy. Unfortunately, the manual's print is small, and there are few illustrations.

If you simply want to play a tune, the booklet and its tutorial provide sufficient instruction. The power of this program, though, lies in its command of complex sound controls such as filter resonance and ring modulation. The single-page explanations given for each of these concepts do little more than tell you where the on and off buttons are. This package contains enough bells and whistles to last a long time. Better documentation with tutorials and graphics would make it easier for you to discover those powers.

The back of the instruction manual has maps of the various keyboard controls. To use the program you set and adjust many, many parameters by pressing keys. Many keys have two or three "meanings"; your manipulation of the Control and Shift keys determines which function the program enacts.

One disadvantage of using Ultisynth and the Commodore 64 as a synthesizer is that you don't have a piano keyboard to work with. This isn't the fault of the software, but it does make simple tune playing more difficult. The notes appear on keys 1-7 and on the letter keys directly beneath those numeric keys — the 1 key is the lowest tone and the M key is the highest. Four octaves are available at any time, and you can reach a total of eight octaves by shifting the entire note range with the left-arrow key. You play sharps by pressing the Shift key and a tone key simultaneously.

All manual references refer to a cassette version rather than the disk

version we reviewed. The disk label tells you how to load the program — a small but important feature for novice users of the Commodore 64.

While it is loading, the program behaves a little oddly. When the program wants you to answer a question, it uses 15 at the end of its query instead of a question mark. In the Commodore 64 system, 15 is the character code for "?" — but why hasn't the programmer translated this? After you load the program, this menu appears: Record, Playback, Load, Save, Compose, Transfer Notes and Pretab. Ultisynth also displays the SID sound-chip controls and their values on the screen. Various keys are assigned for turning those values on and off and for increasing or decreasing the values. The manual leads you through each of the sound-chip controls, starting with simple notes and ending with complex modulations.

The program performs well. You set all the sound modifiers and then play tones. You don't need to read music to use this package. Ultisynth assigns a number to each note you play, in sequence, and stores the note with that number as a reference. Whenever you like, you can save any sequence of tones to a disk file, load a file or edit a file. The program doesn't save modifiers such as filters and volume with the tones; it only saves tone duration and pitch.

Editing isn't easy. You edit files by moving blocks of tones. This means that you have to recall the numbers of the sections you want to move; the program stores those numbers with their notes in the tone memory. If you know the numbers, you can copy, move or save any section of the tone memory. If you don't know the numbers, you have to resurrect the tone sequence and play through it until the part you want shows on the screen. Because Ultisynth

displays the numbers at the same time, you're in business. Ultisynth structures room in the Commodore for more than 7000 tones and their associated durations.

The Compose and Pretab menu choices give you different screen displays for building tones and sequences of tones. These choices are difficult to use, however, because information about them is scant. You have only the short chapters in the manual for help. The menu choices seem to offer wider vistas in sound synthesis, but you have to find your own way.

Ultisynth has preset rhythms — six of these for each voice. It also has two extra slots for rhythms you build yourself. Rhythms can range from fast tap dancing to hypnotic chime tones, and you can adjust their speed, waveform and other qualities. You can set tempo, ASDR (attack, sustain, decay, release) and other characteristics as well.

If you press a key that doesn't have an assigned function, nothing happens. From that perspective, error handling is good, but it is not all it could be. If you cannot save a recording because you have it on a disk that is write-protected, the program can't figure that out and tell you what is wrong. It should be able to check for this. Also, because the screen is so full of various symbols and values, and because almost every key has several synthesizer functions, it's easy to turn something on or off, up or down, and not know how you did it nor how to undo it.

Some of the indicators are poorly designed. The tempo of the preset rhythms appears on the screen as a bar graph. We assumed at first that a larger bar meant a faster tempo. Not so: the largest bar represents the slowest tempo.

Such contrariness makes this program harder to use than it ought to be.

Ultisynth is a synthesizer that allows you to exploit the power of the SID sound chip in the Commodore 64. Although Ultisynth has an impressive list of features and performs well, the documentation and the displays do not make this a simplistic "fun with music" package. Ultisynth is a tool for budding sound engineers. It provides a rich arena for discovery and experimentation with sound.
—*Phillip Robinson*

REVIEW

S.A.M.

Speech synthesizers are not new, so what S.A.M. (Software Automatic Mouth) for the Commodore 64 does is not outstanding. What is outstanding, though, is that S.A.M. does not require the usual hardware associated with voice synthesizers — it works entirely through software — and you don't need to spend thousands or hundreds of dollars to obtain voice synthesis.

The S.A.M. program disk takes 45 seconds to load into your computer. It does not load as a program in the sense that you will lose it if you boot another program, but instead it loads in as a "wedge" and occupies memory space beyond the computer's user-RAM area. This is significant because it means that you can write BASIC programs of your own that include S.A.M. commands.

We loaded a previously written program after we had loaded S.A.M. We then added S.A.M. commands to our program to make the computer say in English every input statement that

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S.A.M.

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	■	☐	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	■	☐	☐

Summary
S.A.M. is a low-cost speech-synthesizer program that works entirely through software. The package contains several supporting programs and makes ten additional BASIC commands available. The program's error handling and documentation are not good, but the package performs well and is easy and fun to use.

System Requirements
☐ *One disk drive*

Suggested list price: $59.95

Tronix
8295 South La Cienega Blvd.
Inglewood, CA 90301
(213) 215-0529

appeared on the screen. When we ran the program, S.A.M. did indeed parrot every input prompt. Every time S.A.M. spoke, however, the screen blanked out. We found out later that one of S.A.M.'s commands, Light, controls the screen display, and you can leave it either on or off (the default is off) while S.A.M. speaks. The reason for the option is that S.A.M. sounds better with the screen off. With the screen on, S.A.M. has to share time with the screen refresh and has a scratchy voice as a result.

You can command S.A.M. to speak in either of two ways. One way is to use phonemes — phonetic representations of syllables of speech. Phonemes take the inconsistency out of pronouncing words by establishing a set of consistent sounds.

The rules of phoneme language are a lot like the pronunciation rules of Spanish, which perhaps explains why, when we first heard S.A.M. speak, it seemed to speak with a Spanish accent. As an example of how you would say something in phoneme language, if you wanted to say "My name is SAM," you would type "May nehm ihz Sae4M." The "4" in this example is an accent mark, which is designed to take the monotony out of S.A.M.'s speech. On a scale of 1 to 8 (with 5 being the default normal stress, 1 being the loudest and 8 being the softest), you can ensure that S.A.M. puts the accent on the right syllable within a word and on the right word within a sentence.

The second way in which you can program S.A.M. to speak is by using direct English words. If you prefer not to use phonemes, you can load an additional program, called Reciter, after you have loaded S.A.M. Reciter is an English-to-phoneme translator that works well, but it doesn't have the flexibility of direct phoneme control. When you use Reciter, you can find yourself using pseudo-phoneme

language just to get the sound right. Two other restrictions when you use Reciter are that you don't have stress (or accent) control, and the program takes up additional memory. Reciter is good, though, if you have an existing text file and you want S.A.M. to speak it.

When S.A.M. is loaded into your computer, your BASIC-language interpreter increases its vocabulary by ten additional commands. The primary command is Say, which is equivalent to a Print statement. Just as with Print statements, you can create string variables such as A$ = "MAY NEHM IHZ SAE4M" and tell the computer to "SAY A$". Using other S.A.M commands, you can even make S.A.M. sing. Some of these additional commands are Pitch, Speed and Knobs. Pitch (with a frequency range from bass to soprano) and Speed are fairly self-explanatory, but Knobs takes a little explaining. When you utter a sound from your voicebox, the sound has to pass through your throat and your mouth. How wide or narrow you adjust your throat and mouth openings affects the sound — Knobs are two controls that adjust the width of these two openings. S.A.M.'s manual suggests settings to make S.A.M. sound like an elf, a little robot, a stuffy guy, a little old lady or even E.T., the extraterrestrial.

The S.A.M. package contains, besides the S.A.M. wedge and the Reciter program, some other interesting programs. The first of these is Sayit, which lets you immediately (without having to write a BASIC program) type in English words, phrases and sentences or phonemes and hear S.A.M. say them back to you. All the special features of Pitch, Speed and Knobs are available to you, so you can experiment. The second program is Demo, which enables you to hear, among other things, the computer

sing "The Star Spangled Banner." The package also contains a program called Guessnum that gives you an idea of how, by adding speech, you can enhance a simple game. Finally, if you would like to hear what Hamlet's soliloquy or the "Gettysburg Address" sound like in S.A.M. talk, they are on a program called Speeches.

The manual is in some places good and in others inadequate. On page 6, for instance, the manual suggests that you can type in an English word and that S.A.M. will then say it. Later in the manual you find that you should first load Reciter.

What's good about the manual is that it contains some good tutorial information on phonemes and has a limited but good dictionary of words that shows you how to write those words phonetically and with stress marks.

In our tests S.A.M. crashed unexplainedly on many occasions, and we had to reboot the computer, thereby losing our program. One of the possible reasons for this was that the Reciter program occupied memory space that was invaded by our BASIC program, and when this occurred, the system crashed.

If you would like to enhance your own programs with S.A.M., this is possible, as the publisher states that a run-time package of the program is available. The publisher allows you to make backup copies of some of S.A.M.'s programs for your own use but not for distribution to others.

Although S.A.M.'s speech is not perfect and you have to listen hard in some instances to understand what the computer is saying, this limitation is not due to S.A.M.'s program but due to the limitations of SID, the sound-interface-device chip without which S.A.M. would not be able to speak at all. We are certain that as sound chips are

improved, S.A.M.'s progeny will become more eloquent. In the meantime, we are impressed with what can be accomplished in speech synthesis entirely through software.
—*Marty Petersen*

REVIEW

Paint Magic

Paint Magic is an artistic tool that you can use to draw and color images on your screen and then save, load and modify those images. It is as much fun as any game program, but instead of using a joystick to blast blips, you can use it to build and change almost any sort of image — from a stick figure to a multicolored sunset.

The Commodore 64 is well known for its color-graphic and sound-synthesis capabilities. With its sprites, bit mapping, SID sound-effects chip and user-defined character sets, the 64 has many of the trappings of a video and audio synthesizer. Unfortunately, the BASIC that Commodore provides with the machine doesn't make manipulation of these synthesizer powers easy. You must do all the work through machine language or laborious "poking" of various memory sites. Because of this difficulty, most Commodore 64 users only take advantage of the machine's graphic powers while they are playing games. Paint Magic works around these limitations, and it makes sketching and coloring easy.

Paint Magic comes as a disk with a 16-page booklet. The booklet introduces you to the program and then presents a tutorial. It ends with a four-

InfoWorld
R e p o r t   C a r d

Paint Magic

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
Paint Magic is an artistic tool that turns the Commodore 64 into a sketching and coloring machine. With it, you can load, save, copy, modify and create a multitude of video-screen images. Paint Magic performs quickly and powerfully — and it is fun to use.

System Requirements
☐ *One disk drive*
☐ *Joystick*

Suggested list price: $49.95

Datamost, Inc.
20660 Nordhoff Street
Chatsworth, CA 91311
(818) 709-1202

page command summary. An on-line Command menu, which you can call up at any point by pressing the F1 function key, is often useful when you are working on a screen display.

The documentation is well balanced and provides the necessary foundation for program use, but it has a few weaknesses. First, the writers should add some more on-line examples. The tutorial takes you just one time through most of the commands. Second, because this program is devoted to graphics, the documentation should contain some graphics — for example, screen photos or drawings. The tutorial is accompanied by some example scenes that have been recorded on the program disk.

One other type of documentation that should appear in all Commodore 64 software packages is loading instructions on the disk label. This is a minor point, but because the Commodore 64 doesn't load programs automatically, an instruction on the label, such as one telling you to type "LOAD "0:*",8,1" followed by "RUN," can make things a lot easier. Paint Magic doesn't have such a label.

Paint Magic is fun. Its commands are powerful and yet not too complicated to understand or to learn. The fundamental commands are especially simple to use, and the more complicated commands have a clear and logical structure. You may find that making mistakes is more fun than carrying through an intended action; you will not quickly exhaust the variety of functions in this package. Because you execute so many of the instructions by moving the joystick, it is an easy program to enjoy.

The Command menu is composed of several groups of commands. The first group contains the disk-control commands: Load a Picture, Save a Picture, Kill a Picture and List the Picture Catalog. These let you manipulate any number of pictures. The second group lets you change the active color (the one with which you're painting).

You use the third group of Commands to "paint." This group includes: Draw a Line, Draw a Box, Draw a Circle, Draw a Ray and Draw a Point. You tell the computer which command you want to use by pressing a key. You then use the joystick to sketch the outline of the image you wish to see. You can create figures anywhere on the screen.

The fourth group is the "fill" commands. You can define several different patterns and then use a single key to fill in any bordered area with a colored version of the pattern you choose.

The next group of commands — Transpose, Grab, Slide, Merge and Restore — is the most powerful. You can use them for any image you outline on the screen. By setting boundaries and then pressing a single key, you can create a pattern and put versions of it anywhere you want. Using other keys, you can magnify or shrink the pattern and slide the image around on the screen.

Finally, you can select color masks for painting that allow you to replace all of a certain color in a design without touching any other color. This amazing facility demonstrates that, in some ways, you can do more with a computer than with a conventional canvas. Other useful facilities enable you to store images and to rescind actions. If you don't like what you've done, you can go back a single step or all the way to the beginning of the most recent session. Many artists would give their eyeteeth for that potential. The only limitations on your creativity are the size of the screen, the bit-map resolution and the limited number of colors.

Paint Magic is protected against keyboard entry of meaningless commands, but because so many keys have been defined for the program's various functions, it is a good idea to use the joystick for most work.

The program's performance is excellent. Its action is quick, and the commands take advantage of virtually every graphic manipulation you would want to use.

Datamost promises to replace the disk free of charge if it is damaged in any way. You only have to send in the registration card at the time of purchase and mail in the damaged disk if you discover you have a problem. The program's documentation is copyrighted.

Paint Magic is a sketching and coloring tool that is easy and fun to use. Don't expect to mimic the art of painting; instead, learn to use a new form of painting. Paint Magic and the Commodore 64 won't offer you the host of colors, the fine resolution or many of the other features of standard paint and canvas, but they will give you a slew of powerful tools for experimenting with images. If you're looking for a recreational or educational program, Paint Magic stands well above many programs that offer empty fun and boring lessons.
—*Phillip Robinson*

REVIEW

IFR Flight Simulator

The IFR flight-simulation program for the Commodore 64 accurately simulates flight in a small airplane (a Cessna 172RG) using instrument flight rules. What this means is that you, as the pilot, get no view out of the window. You must take off, navigate and land using only such tools as map, compass, airspeed indicator and altimeter.

The complexity and realistic detail of this program make it fascinating entertainment for anyone who enjoys a challenging game. If you are interested in aviation, the IFR Flight Simulator can even be a first step toward learning basic flying skills.

To use this program, all you need is a Commodore 64, a disk drive or cassette recorder, a joystick and the IFR Flight Simulator disk or tape.

During the flight, you are presented with a screen display that depicts the airplane dashboard, which contains 14 instruments. The joystick controls your angle of ascent, descent and turns; you manipulate other aspects of flight control by using the keyboard.

Among the most interesting instruments featured in this program are the ILS (instrument landing system) and the ADF (automatic direction finder). The ILS provides vertical and horizontal crossbars that help you aim toward the center of the runway and glide in at the correct rate of descent (glide slope). Included with these crossbars are the outer, middle and inner beacons that blink as your plane approaches the runway. Using the ILS helps you focus on one instrument for landing rather than the four or five you would need without it. (Not all the airports on the IFR Flight Simulator

InfoWorld
Report Card

IFR Flight Simulator

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	■	☐	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
The IFR Flight Simulator is a challenging, educational program. You can use it to learn how to "fly" a small plane by using instruments.

System Requirements
☐ *One disk drive or cassette recorder*
☐ *Joystick*

Suggested list price: disk or cassette, $29.95

Academy Software
P.O. Box 6277
San Rafael, CA 94903
(415) 499-0850

map have this system.)

The ADF is a long-to-medium-range navigation aid. ADF beacons are placed on your map at several strategic points — for instance, at mountain passes and airstrips.

To use the ADF, you simply adjust its setting to the desired beacon. The ADF indicator then shows you whether you are heading to the left of, to the right of or directly at the beacon. The ADF provides an interesting alternative to steering by latitude and longitude readings; however, you still need to use the latitude and longitude readings for close-range navigation.

Planning your flight, watching the numerous instruments and adjusting them correctly can be difficult and frustrating, especially as you attempt higher levels of difficulty at which wind speed, turbulence and stall speeds become more important. Many were the times that we stalled in a narrow mountain pass because we forgot to switch gas tanks, or we prepared a beautiful approach only to crash on the runway because our landing gear wasn't down.

Here is where one of the nicest features of the IFR program comes in — the Editor. You can use the Editor to set up practice flight situations. Rather than allowing the computer to start you in the middle of runway 1, you can enter the Editor prior to starting your flight and choose the altitude, position, airspeed, throttle setting, heading and amount of gas with which you want to start.

Going one step further, the IFR Flight Simulator has two Quick Edit practice situations stored in its memory. The Quick Edit can set you up for a practice landing using the ILS system, or it can put you high above the ground and far away from mountains where you can practice handling the stalls and spins. Once you have finished

practicing, you simply press the letter *X* to get out of the flight and back into the Editor.

Aircraft specifications — such as stall speeds under specific conditions, red-line speed and maximum bank angle —are all accurately duplicated during flight. If you violate any of these specifications, the aircraft can stall, spin or crash.

The instruments on the screen display look realistic, and they are accurate and simple to read. They also react in a realistic manner when you make adjustments — a feature that could have been easily overlooked. For example, the landing gear produces a noticeable amount of drag if you forget to raise it while you are flying. Also, the airspeed indicator's reading may lag behind the actual airspeed as the airspeed changes. Finally, when you use the joystick to level out, you often need to press the keys Q and A to effect "nose-down trim" and "nose-up trim," respectively. These two keys help you make fine adjustments when you're leveling off.

The game is both challenging and realistic. The stated objective is to land at each of four airports on the map. This is definitely a practicable objective, but its achievement takes practice and concentration. We don't intend to make this objective sound too imposing, though, because you can have many intermediate successes before you attempt this ultimate goal.

The program does shy away from reality in several instances; these are fairly minor, but they disconcerted us when we first encountered them. First, when you are flying through turbulence, the instrument panel jiggles up and down on the screen, but the needles and pointers within the gauges do not move when the gauges move. Second, during particularly intense situations, some of the keys are

sluggish in their responses. For example, once when we forgot to switch fuel tanks, we lost power and stalled. We pressed the key to switch tanks — nothing happened, so we pressed it again several times. When the program finally reacted (precious fractions of a second later), it executed every punch of the key that we had made. This reaction of the tank-switch key seemed more computer-like than airplane-like.

The realistic flavor of this simulator and the many variables you have to deal with make the program valuable and fun. You might also expect that these same aspects would make the simulator difficult to use, but this is not the case. Getting the computer started, getting the program started and learning to use the program are all well within the abilities of anyone who is interested in the IFR Flight Simulator. No prior knowledge about computers or aviation is required.

To get into the program, you need only insert the disk in the drive, type a simple loading command, type "run," wait for the prompts and press Return three times. You then find yourself on runway 1, ready to take off.

Mastering the flight techniques is challenging and takes practice, but you can achieve enough initial success to keep your interest alive, particularly if you use the Editor and the documentation. We were able to take off almost immediately after we started using the program and navigated with reasonable accuracy soon after that. Using the Editor and the documentation, we were able to land at all the airports by the third day of practice — and that still left us nine levels of difficulty and turbulence to master.

During your first few flights, it's a good idea to get a feel for each of the instruments. Get to a safe altitude and play with them. We discovered that the program was bombproof during flight. Nothing short of being a bad pilot ends your mission.

The Editor is not free from errors, but we had to work long and hard to find its faults. Most of these faults occur when the Editor accepts impossible values for the flight parameters. For example, if you enter a number outside the altitude limitations, the message "Lost in the Bermuda Triangle" appears. If you enter a value outside the limitations for another parameter, however, the Editor apparently accepts it and then later uses some other value that is within the aircraft's specifications. Furthermore, if you feed the Editor nonsense numbers for latitude and longitude, it apparently accepts the numbers and then presents you with a preposterous flight situation.

A second error-handling flaw of the Editor appears when you enter letters rather than numbers. After most such entries, the message "Redo from Start" will appear. If you enter E, however, the Editor accepts it without a message and later uses a standard value for that parameter in the flight program.

These errors are hard to create, and so shouldn't bother anyone using this program. There is, however, another problem that is significant and disturbing. The program lacks on-line documentation. Whether you are using the Editor or the flight program, you have no way to ask the computer for help or explanation. Of course, this lack of on-line documentation makes the simulation more realistic.

The written documentation is good, but it lacks some needed explanations. The strengths of this documentation are that it is concise, accurate and fairly complete. In 20 pages, all the instruments and commands are described and discussed, and these descriptions and discussions are easy to refer to.

If you wish to start using the simulator quickly, you can read only the first six pages or so before you take off. If a panic situation arises, you can use the P key to make the program pause for as long as you need to look at the manual.

The documentation also provides some basic flight and practice plans. It is in this area that the documentation could be improved. When you are moving through the flight tutorials, it is difficult to keep referring back to the book and then back to the screen. We were often a little late in pressing command keys because we were searching for the right command in the book. The content of the tutorials is fine, but their layout should be improved. We found it most helpful to read the tutorial before the flight and then to just wing it.

Academy provides a limited warranty for the IFR Flight Simulator. If your disk is defective, you can get a free replacement from Academy during the first 60 days after purchase (provided you return the disk with proof of purchase). If you damage the disk, Academy will replace it for $5 and return of the damaged disk. The company's address is printed on the title page of the manual, but no phone number is given.

We hope to see more software that tries to equal or exceed this example. Our suggestions for improvement of the IFR Flight Simulator are that the documentation layout, both in the book and on the screen, be made clearer and more educational and that memory be provided for the Editor so you can save preset flight positions. Finally, the program should come with more maps and perhaps make it possible for you to create your own maps.

Of the problems we've discussed, most are minor — except for the lack of good on-line and tutorial documentation. You'll forget even these disturbances, however, when you're involved in the fun, the fascination and the realism of this program. It is an excellent game.
—*Stephen Robinson*

REVIEW

The Model Diet

If you are counting calories or checking up on your food intake for any reason. Softsync's The Model Diet can provide an excellent and comprehensive means of monitoring your eating habits and nutrition. This program does not prescribe diets — that's left to you and your physicians — but it does keep track of your consumption of everything from calories and carbohydrates to potassium and phosphorus.

You can run The Model Diet on a Commodore 64. The program is easy to use, does what the blurb on its box promises and is complete enough to help you document almost any diet situation.

The heart of the program is a table of nearly 2000 food entries, each with 19 subentries that list the various nutritional elements of a standard portion of that food. (If you consume food in nonstandard portions, the program adjusts for this.)

When you first use the program, it asks you approximately two dozen questions. Some are the expected queries about your age, weight and height. Others may seem strange, such as "Do you live in a big city?" or "Do you have very dry skin?" The program

apparently uses the answers to customize the government's Recommended Daily Allowances of 11 different vitamins and minerals to your requirements. The results are your daily suggested-intake levels.

Once you have completed this personal profile, you save it to a separate data disk. The program will also store your daily-food-intake data on this disk.

Entering food information is easy. Let's imagine you had an omelet, an English muffin and coffee for breakfast. You are asked to "Enter Name of Food Eaten," so you enter the word *egg*. The screen clears and then displays a list of 15 different food categories. You select Egg Dishes as the most reasonable category. You're asked for the number of ounces, but because you haven't any idea how much an egg weighs, you press Return to choose the standard portion.

The program continues to ask you for the names of items you've eaten and an appropriate category for the item. If you know the weights, you can enter them, but most people would settle for the default standard portion. Entering the food items doesn't take you long because the program's stored list of different foods is extensive.

When you indicate that you've entered all the food items for that meal or that day, the program begins searching for the items in its tables.

Your "egg" entry causes the program to cycle through each of the items that begin with the word *egg* — for example, Eggs Boiled Hard/Soft (1), Eggs Fried 1 T Margarine (1), and so on.

Your omelet isn't in the list, so the program asks if you'd like to see the full listing of the Egg file. If you indicate you would, it's displayed. You see what you want — 15. Omelet Plain (1 Egg). Press 15, and you're given a 19-item

nutritional analysis of your omelet. The program also adds this same data to your daily-food-intake file.

Your analyzed omelet looks like this:

Omelet Plain (1 egg)
Ounces 2.2
Weight (g) 62
Calories 107
Carbo (mg) 1.5
Fat (g) 8
Protein (g) 7.19
Fiber (g) 0
Sodium (mg) 160
Calcium (mg) 50
Phos (mg) 117
Potassium (mg) 91
Magnesium (mg) 7
Iron (mg) 1
Vit B1 (mg) 0.05
Vit B3 (mg) 0.01
Vit A (IU) 670
Vit B2 (mg) 117
Vit C (mg) 0
Vit D (IU) 31

You now know more than you ever wanted to know about your omelet. You follow the same procedure for the English muffin, coffee and anything else you have eaten.

The program's food-category list even has a Fast Food sublist. For example, if you had eaten a cheeseburger and fries at one of the national fast-food chains, you could enter cheeseburger as the food item and select Fast Food as the category. Once you enter this land of Whoppers and Big Macs, you are asked to pick the particular fast-food chain. If you like, you can play the centuries-old game of "Where's the beef?" by comparing the nutritional value of the offerings of Wendy's and McDonald's.

The Model Diet also contains a food category called Your Own File. If you make your omelets with ostrich eggs and consequently cannot find an appropriate entry in the Egg Dishes

category, you can enter your own nutritional values, and the program will add them to your daily totals.

The program prompts you for the various values for each of the 19 nutritional items (from ounces to vitamin D), as shown above for the egg omelet. If you don't know a particular value, simply press Return, and the program will ignore that item. The program uses this information in your daily-totals file and does not add the actual food item to its food list.

After you have entered your food consumption for each day, the program shows you a total of the nutritional values of everything you've eaten. It also displays a chart showing the percentage of the Recommended Daily Allowance and the suggested intake you achieved.

You should now save this information in your daily-food-intake file. The easiest way to do this is to set up a record for each day and give each record a name, such as Day 1 or April 13. As the days and weeks pass and you add new records daily, you can retrieve and total these summary records to determine your progress.

If, in reviewing these totals, you notice that you apparently are not getting enough of a particular vitamin or mineral, you can select Vitamin and Mineral Information from the menu. This section of the program tells you why each vitamin and mineral is important in your daily diet and suggests the best food sources for each dietary component.

The Model Diet has the ability to print the entire food list plus the daily and cumulative food-intake totals, but it would not function with our printer (a Gemini 10X with MidWest Micro's Smart ASCII interface). If you have something other than a Commodore 1525 printer, you should check with Softsync or ask your dealer to run a demo of the program on your printer.

The program's typeset manual and its on-screen prompts are concise, complete and free of computer jargon. You must remember to format your data disk before use.

Error handling is generally good, but if you enter something other than the response that the program expects (for example, typing Help when the program is looking for a Y or N), you can get strange results. You can recover from such errors easily, however, and without losing data.

The Model Diet is a useful program for anyone who has both the need for it and the willingness to enter the daily-food-intake figures.

—*Phil Degnon*

EDUCATION

Computers are playing an increasing role in education, and school can be where your Commodore 64 is. The programs in this category enhance the educational process.

REVIEW

Chopper Math

Chopper Math, from Commodore, is an educational game program that drills users in basic arithmetic skills. It uses simple graphics and sound effects to make the drills attractive. Although it exploits little of the power of the Commodore 64's graphics or sound, this program definitely offers an improvement over the simple "answer the question and see a smiling face" type of educational software.

Supplied on a disk, the program loads quickly. After about 20 seconds, the screen goes blank. The first titles appear on the screen, followed by the first menu. The menu border colors flash, and the menu screen alternates with a screen of instructions.

The first menu is:

1. 0-9 Addition
2. 0-9 Subtraction
3. 0-9 Multiplication
4. 10-99 Addition
5. 10-99 Subtraction
6. 10-99 Multiplication

You choose one of these options by pressing the appropriate number, 1 through 6. Selection 5, for instance, presents subtraction problems that use numbers between 10 and 99. The difficulty of the problems increases from level 1 to level 6. At level 6, you'll probably need a pencil and paper (don't cheat by using a calculator) to answer the problem. The program displays the highest score at the top of the screen and the last score at the bottom.

The instruction screen lists the information: F1 — to stop game, A — to move left, S — to move right and F7 — to pause. It also explains the program's scoring method — stars represent 10 points and diamonds are worth bonus points — and tells you to answer the problems as quickly as you

REVIEWS

InfoWorld
R e p o r t   C a r d

Chopper Math

	Poor	Fair	Good	Excellent
Performance	□	■	□	□
Documentation	□	□	■	□
Ease of Use	□	□	■	□
Error Handling	□	□	■	□
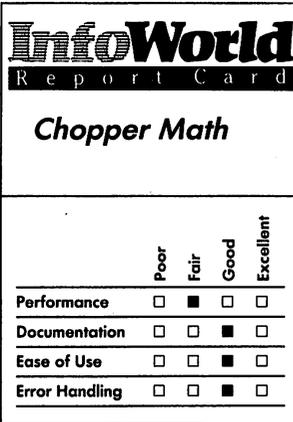
Summary
Chopper Math is a simple-to-use, arithmetic-drill program. You answer an addition, subtraction or multiplication problem and then try to land a chopper on a landing pad. The game has good documentation and error handling, but it's not very exciting.

System Requirements
□ *One disk drive*

Suggested list price: $19.95

*Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100*

can for higher scores and to press any key to continue. If you press function key F1 to end the game at any point, the screen then displays the main list of instructions again.

When you choose a level from 1 to 3 from the first menu, a dark background that has a line underneath it appears at the bottom of the screen.

When you choose a level from 4 to 6, you are given two options: you can enter your answer left to right, or you can enter it right to left. This choice is an excellent feature that allows you to either enter fully formed answers or to work out the various digits of your answer, column by column. After you choose one of these options, the background appears, just as it does immediately in levels 1 through 3.

The background represents the sky and is strewn with star and diamond shapes, and a helicopter dangling an arithmetic problem also appears in the sky. The helicopter is just a stick figure, but its props do move. The chopper immediately begins its descent, from the top of the screen toward the bottom. Its descent is accompanied by the sound of helicopter blades whining and whirring.

The problem dangling from the chopper looks like this example:

9
+8

You are supposed to type the answer. If your answer is correct, a landing pad appears somewhere on the line at the bottom of the screen. You must use the A and S keys to maneuver the helicopter and land on that pad. You try to pick up stars and diamonds as you descend.

If you don't answer the problem correctly, or if you miss the landing pad, your chopper explodes when it reaches the ground. Lose three choppers, and the round is over. The program then displays your total score, shows you the correct answer and returns you to the

main menu.

If you do answer the problem correctly and then succeed in landing on the pad, the sky scene disappears and your points, including previous totals and bonus points, are displayed. The sky scene then reappears with a new problem beneath the chopper. What's more, the chopper descends faster this time. Each time you get a problem right, the chopper comes down faster on the next run.

You score points by landing properly and by picking up stars and diamonds. When you pick up the shapes, they disappear from the background and are added to your points when the chopper runs over them. The diamonds are always at the edges of the screen.

To make life easier, you can use the Pause key (F7) to give yourself a chance to figure out the answer to the arithmetic problem. The quicker you get the right answer, though, the higher is your score. The number of bonus points you get from collecting the diamonds also depends on your speed.

To exit from the program, you press Control-X.

More than adequate error-handling routines are built into this program. When you press a key that isn't assigned some task, the computer won't recognize that you have pressed that key. In fact, while the program is tallying up the score at the end of each copter ride, even keys that you can normally use at any point in the game — such as F1, which returns you to the menu — are ignored.

Chopper Math is simple to set up. Setup isn't so easy that we could do it without the instructions, but the instructions are simple and brief.

The documentation is a pamphlet. After a disclaimer and a copyright notice, the pamphlet launches into a description of Chopper Math and its

objectives. A page of loading instructions is followed by four pages about playing and scoring in the game. Two screen photos are included.

Commodore includes a replacement instruction card with the package. If your disk gets damaged or worn out, you send the bad disk back to Commodore with the card and $5 to get a replacement.

Chopper Math drills users in basic arithmetic problem solving. Although its graphics are crude and the sound effects simplistic, the program does a good job and even has thoughtful touches that many other educational programs leave out. (For instance, the Pause key doesn't leave the Commodore 64 making an ear-piercing noise: the sound is disabled as long as the program is paused.)
—*Phillip Robinson*

REVIEW

Type Right

Type Right, from Commodore, is an educational program that is dedicated to teaching Commodore 64 users how to touch-type. The objective of Type Right is that, after you have worked through all the lessons, you will be able to type at 40 words per minute using the correct fingering.

Type Right comes with a thin 8-page booklet that describes the program's objectives, typing hand positions, program loading, how to use the program and how to play the educational typing games that are included on the disk. Though short, this minimanual does a good job of explaining the ins and outs of the program. The lessons and games themselves are self-contained; you could probably use them without the manual.

Commodore includes a disk-exchange form in the package. If your disk becomes damaged or wears out, you send it back with the card and $5 for a replacement. That, along with a copyright notice and a disclaimer of liability, is all the support information that the package contains.

The program first shows you a menu of 21 choices. Most of these are the lessons that lead you from the home keys (these represent your starting position on the typewriter keyboard) through the letters and the numerals to the punctuation keys. Interspersed throughout the lessons are typing games and speed-building practice sessions. The program uses different colors on the screen to emphasize special messages, such as the one that tells you to keep returning to the home keys.

It takes about 25 seconds to load the core of the program and then about 20 seconds more to load the first lesson. Each lesson is stored as a separate file on the disk. The screen does ask you to wait while the lesson is loading: this message will help beginners who aren't sure what is going on.

The program then asks you your name, which it uses later to personalize the conclusions and grades of the lesson.

If you pass a lesson, you are congratulated and moved automatically to the next lesson. If you don't do well enough, you are returned to the beginning of the lesson. You can be returned endlessly; there is no cutoff — the lesson won't pass you just to get rid of you.

Most lessons begin by showing you, slowly, an illustration of the keyboard, a blinking cursor on a particular key and

InfoWorld
R e p o r t C a r d

Type Right

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
Type Right is a fine typing tutor for use with the Commodore 64. It offers a large number of games and lessons, so you won't get too bored with the program.

System Requirements
☐ *No additional requirements*

Suggested list price: $19.95

*Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100*

a description of which finger should press that key. This portion of the lesson is not interactive: you are simply shown the key positions.

The lesson continues with an interactive practice portion. Typically, in the early lessons, you are presented with a line of characters, such as

aaa sss ddd fff jjj kkk lll ;;; fff

that you are supposed to type. When you finish trying to type what is on the screen, the program responds. These responses are varied and so make the program more appealing to use.

There are a dozen lines to work through in lesson 1 alone. You have no time limit, but you cannot go back and fix errors.

Type Right has 25 exercises for finger placement, 12 for key-typing practice, 10 for word-typing practice, 2 for sentence-typing practice and 5 for words-per-minute practice plus 4 games for general typing practice.

Each time you graduate from a lesson, you are passed to the next lesson. As with a standard typing textbook, the lessons increase in difficulty progressively. The lessons are separate from one another; you have to enter a new name each time you try a new lesson.

The speed tests are automatically timed and tallied by the computer. You are told both your number of errors and your words per minute after you've completed a test. This feedback is one of the greatest advantages of learning to type on a computer instead of in the old-fashioned way with a typewriter.

The games involve such tasks as thinking of all the words that contain a certain ending. Because these games are not directly linked to typing, they provide a welcome relief from the drills. They are akin to word games such as Scrabble. Because you have to type in the answers, and quick responses garner more points than slow ones, you

are still exercising your new typing skills to some extent when you play the games.

We did not run into any errors in the program. Error handling is complete, though that isn't surprising in a program that is specifically designed to watch for any input errors from its users.

Type Right rates well in every category. Although it is not fabulous fun nor extraordinarily original, it does a good job of presenting easy-to-start, easy-to-use, well-organized and thorough typing lessons. The number of lessons and games that it contains is unusually large for a home-computer program that teaches typing and helps make Type Right a bargain.

—Phillip Robinson

REVIEW

Typing Tutor + Word Invaders

Touch-typing is a useful skill for computer lovers and computer haters. If you intend to use computers regularly, you can greatly improve your own productivity by acquiring the skill of fast and accurate typing. If you'd rather stay away from computers, it still pays to know how to take a typewriter out and put it through a few paces. How do you learn? The answers used to be classes and books. Now you have a third choice: home computers.

Even those who contend that computers have little practical value in the home will admit that they can be excellent vehicles for learning touch-typing. The Commodore 64 is a classic

computer for that purpose: it has a full-size typing keyboard and a memory large enough to hold typing exercises. All it needs to complete the package is the right software.

This pair of programs, Typing Tutor and Word Invaders, is dedicated to that purpose. Typing Tutor is a series of lessons that leads you through the proper positions and motions of touch-typing. Word Invaders is a game that puts such knowledge to work. How good are they? It depends on what sort of typing you need. To learn enough typing to speed up school-report writing, computing tasks and letter writing, they are quite sufficient. To learn fast typing — that is, business-correspondence typing or the kind with which you can get a job — these programs don't go far enough. You could start with these, but you'd soon have to move on to something more powerful and extensive.

Typing Tutor presents a series of lessons aimed at making you a decent touch-typist. The booklet explains the key positions and which finger you should use for each key. The program challenges you to reproduce the letters that appear on the screen. These letters appear in several lines across the middle of the screen; each line is about 22 characters long. The program contains eight lesson levels, and each level has ten different screens for practice. Each level is based on a different selection of letters, with increasing difficulty from level 1 to level 8. This progressive tack is common to typing lessons; it's the way some of us learned from books in the old days. The computer makes learning a lot more fun. As you type the phrases that you see on the screen — some of them words and sentences, some of them nonsense — the letters you type appear underneath in positions that directly correspond to the phrase you are copying.

As an aside, one disadvantage of learning to type on a Commodore keyboard is its nonstandard placement of some keys. The parentheses, for instance, are on the shifted 8 and 9 keys instead of on the shifted 9 and 0 keys as on a standard typewriter. If you are a computer user, however, you may have noticed already that computer-keyboard layouts vary considerably.

When you finish a screen, the computer quickly marks and tallies your mistakes and calculates your approximate typing speed. Here is one of the program's weak points. None of the selections is long enough to estimate your typing speed accurately. The last lessons should be longer. The quick feedback on the lessons is nice, though. If your error rate is too high, the computer automatically recycles you to a previous page. If you reach the last lesson on a given level, and you meet the accuracy and speed standards (which are mentioned in the pamphlet), you move on to the next level.

At any point, you can press function key F7 to move to another level, another page, a previous page or Word Invaders. When you reach the final level and make it through the numbers and punctuation signs, you have graduated.

Word Invaders is a simple game that uses a few graphic devices to make fast typing fun. A ship appears at the top of the screen and begins depositing words in the sky. Against a backdrop of hills, your funny-looking, antiword gun appears on the ground. As you type letters in the correct order, your gun blasts the words from the sky. As soon as the ship has completed one row, it jumps back to the left of the screen and starts another. The previous row, meanwhile, descends one level toward your sacred ground.

This game is much like a simplified Space Invaders. If you type an incorrect symbol, the program waits for the

Summary
Typing Tutor prepares you for simple touch-typing, and Word Invaders makes all the work fun. Although these fast-moving lessons won't train you to type fast enough for employment in business, you can reach speeds adequate for most home and computer needs. The documentation is sparse, but the programs are easy to use and handle errors well.

correct symbol, but the ship goes on laying down more implacable terminology. If any of the words reach the ground, you lose. If you blast all the words, and none of them ever reaches terra firma, you win — the alien ship plummets to the ground, bounces and then cracks in the middle, and the game is over.

Word Invaders offers four levels (composed of different letters and symbols) and four speeds (based on how fast the letters are laid down).

One oddity in Word Invaders is that only uppercase letters try to make the landing. What happened to the lowercase letters? Is this some sort of warrior syndrome — lowercase letters appear in noncombat roles in Typing Tutor, but when it's time for battle they'd better skedaddle? Just wondering.

The programs are supplied on a single disk and come with a short booklet. The booklet starts with a description of how to load the program from either disk or tape and continues with a single paragraph on typing posture and a two-page list of the keys and fingers you should use. Finally, the booklet contains a 1½-page spread devoted to Word Invaders.

Although you don't need much documentation because these programs are so easy to use, it would be nice to see a bit more than this. A couple of photos of the screens, as well as several depictions of how you should sit, would improve the program for someone who has no typing background.

The documentation also includes instructions on the disk label that tell you how to load and start the program. "LOAD "*",8" is the proper instruction.

The program is well protected against errors. If you type an incorrect letter, you won't crash it — you'll just lose marks for accuracy in Typing Tutor, and you'll lose time against the Invaders. In some cases, such as when you type too many letters and forget to return at the end of a line in Typing Tutor, the program flashes a prompt to remind you to press Return. Although your letters sometimes may not appear on the screen as fast as you type them, when you get fast, the program is supposed to be able to handle input at speeds of up to 100 words per minute. We were only able to test it up to about 75 words per minute.

Academy Software offers a limited warranty. If you return a defective cassette or disk to the firm within 120 days of purchase, and with proof of purchase, Academy will replace it free of charge. After that time, the company will charge $5 for a replacement. The programs contain some degree of copy-protection: if you try to save the programs, they won't run.

Overall, these two programs do a good job of teaching the kind of touch-typing that is useful when you have a home computer. Because of the limited lesson length and the lack of information on proper typing habits and business formats, they won't prepare you for the more elevated realms of typing.

—*Phillip Robinson*

REVIEW

Kidwriter

Kidwriter, from Spinnaker Software, is an excellent educational program for the Commodore 64 computer. One of the titles in Spinnaker's Early Learning Series, it allows kids, ages 6 to 10, to make pictures on the screen and then write simple stories about those pictures.

The program takes more than a minute and a half to load from the disk. While it is loading, the screen reads, "Please Wait . . . Loading Kidwriter." It should show a little more action to make the loading period more interesting.

Once the program has loaded and the title displays have disappeared, a series of displays describes how to create pictures and text using Kidwriter. Throughout these instructions, a message at the bottom of the screen reminds you that you can leave the instruction-display series by pressing any key.

The instructions are followed by an example picture story (a series of images, each image accompanied by text). The screens load, one at a time, from the disk; the screen display goes blank while they are loading. The demo keeps cycling around until you turn the computer off or press a key.

When you do leave the demo, you see a short menu that lists the options: Make a new picture story, Load an old picture story, Directory of picture stories and Quit for now. By pressing just the first letter of any of these choices, you command the computer to carry out that function. This selection method isn't made obvious enough to beginners, however. The screen just reads, "Press a Key," and novices may not know which key to press.

Kidwriter also has submenus. For example, if you choose Directory from the main menu, you get this submenu list: See the directory, Erase a saved picture story and Back to story-making program.

If you try pressing S while the original disk is still in the disk drive, you see a list of the picture story screens that make up the demos. If you then press any key, you return to the Directory menu.

Press E and the program asks for the name of the picture story you want to erase. After you've given the name, Kidwriter asks if you are sure that is the one you want to remove.

The error handling has a weak link here. If you try to erase a story that isn't on the disk — which is, in essence, what you're doing if you misspell the picture-story name — Kidwriter tells you that your story has been erased. How was it able to erase a story that didn't exist? It should tell you that it can't find that story on the disk. If you now press any key, the screen asks if you want to erase another story. Answer yes — don't answer the question about which story you want erased and press Return. The program then assumes you want to erase the same story that you erased previously. Some programmer didn't catch this trivial bug.

If you press B in the Directory submenu, you return to the original menu.

Press L in the original menu, and you are asked for the name of the story you want to load. You are also reminded that the name can be no more than 12 letters long. The screen goes blank as the program tries to load your chosen story. If you choose a story that isn't on the disk, the screen shows:

I'm sorry . . . You have a drive error
Your error message was . . .
'File Not Found'

Summary
Kidwriter is an educational program designed for use by children ages 6 to 10. It allows them to create picture stories by providing a set of screen images and some rudimentary word-processing functions. The program is well documented and easy and fun to use.

That's pretty good error handling, though a little more explanation such as "You may have typed the name incorrectly" or "The file you want may be on a different disk" would help a lot more.

If you type more than 12 letters, the display lists the following message:

Remember . . . No more than 12 letters!

Try again . . .

This is nice error handling: it traps the error and gently informs the user about the problem.

Press M in the main menu for real fun — now you can make your own picture and story. A beginning screen shows helpful and encouraging instructions.

A background scene appears at the top of the screen. The first scene has a green bottom and an aqua top; it looks pretty much like a verdant lawn with the sky above. The colors are bright and engaging, making good use of all that the Commodore 64 has to offer. The bottom of the screen is divided into two areas. On the left is an object and a number. The object is the currently stored picture pattern, and the number tells where that particular pattern falls in the list of 99 available objects. On the right side of the screen is the Object menu accompanied by the instruction "Press a Key." The menu contains the items: Scene change, Forward to see next object, Back to see last object, Pick this object, Erase picture and Done — write story now.

The scenes include a black background with stars, different colored tops and bottoms, plain colors, a stage, a room and a picture frame — 11 in all. Each time you press S, you see another scene until you cycle around back to the first one.

You press F to move through the 99 objects, one object at a time. Each object appears at the bottom left of the screen along with its identifying number. The objects include people in different poses, rabbits, seagulls, flowers, moons and blobs we didn't recognize. Starting at object number 65 is the alphabet. Then the ten numerals, 0 through 9, appear. You can use these to create title screens for your stories. You can press B to go back through the object list.

When you find an object you like, you press P to pick it. It remains in the bottom left of the screen, and a copy of that object appears in the middle of your scene (at the top of the screen). The menu on the bottom right of the screen then changes to (CRSR) keys to move the object, (C)olor change, (S)ize change, (N)ext object, (E)rase picture and (D)one — write story now.

You use the cursor keys to move the object within your scene. Once you have that object where you want it, you can try changing its color. Each time you press C, the color of the object changes to the next of the 16 Commodore colors.

Press S, and the object changes to one of the four sizes allowed for Commodore sprites: normal size, double size (both width and height), double wide and double tall. Press N and the screen display returns to the Object menu. Here you can choose more objects to put in the picture.

Once you have eight objects on the screen, you cannot have any more. If you try to pick another, the message "No more objects left . . . Press D" appears at the bottom of the screen. This is another example of good error handling.

Press E to erase the picture, and your entire masterpiece, except the background, disappears. One feature that the program needs and doesn't have is the ability to remove a single object. Once you have put an object on the scene, you can only remove it by

erasing the whole picture.

Finally, when you are finished with the scene, press D; you can now start to write a story to go with the scene. The menu at the bottom right of the screen disappears, and you see the single message "When finished . . . Press *."

The Commodore 64 now acts as a sort of minimum-features word processor. You can type words in — they appear in the area beneath the picture that used to harbor the menu — but you can't do much with the words once they are on the screen. The program does have wordwrap — that is, it automatically moves words that extend beyond the right-hand edge of the screen over to the left, on a new line, without you having to press Return. You can type in only capital (uppercase) letters, though. Try to use the Shift key, and you get graphics characters.

You can use the Delete key to erase letters, or you can use the cursor keys to move around and type over the characters you don't want — and that is the extent of the program's word-processing functions. Advanced and even intermediate functions found in other word processors, such as copying, moving and finding and replacing, are absent. Don't expect this to be a real word processor, though — it's just a story saver for the pictures within Kidwriter. Because it is a bare outline of a word processor, it's an easy one to learn. In fact, once children are used to pressing the first letter of a command to call that particular function from a menu, this whole program becomes a snap to use.

Some keys have anomalous effects while you are using the word-processing part of Kidwriter. Press both cursor keys, and you can print heart shapes. The function keys, strangely enough, type out as the letters *E, F, G, H, I, J, K* and *L*. These, again, are minor bugs.

If you type a word that goes beyond the right margin on the final line of the text area, that word disappears, and the cursor stays at the right margin. You can't type much for each screen, but because you can link the screens and put many screens (both picture and text) within each story, this isn't much of a problem.

When your text is complete and you have pressed * to show you've finished, a tune plays. The tune is a two-part counterpoint that doesn't instantly seem old as do the tunes that come with some programs for kids.

Finally, a new screen appears to ask whether you want to save your text and the accompanying picture that together comprise a page. The program asks you for a name under which to store your page. At this point, if you press Run/ Stop and Restore, the program display instantly disappears and the Commodore 64 Ready display appears. You're not likely to do this, but it does illustrate an error-protection weakness, nevertheless.

Once you have saved a page, the screen asks if you'd like to save another page to the same story or start a new story. If you do save another page on the same story, when you play the story back later, the pages appear sequentially.

Once, while trying to save another picture-story page with the same name as one already saved, we saw this message:

I'm sorry . . . You have a drive error
Your error message was . . .
'File exists'

Although we were told that we could press any key to continue, we kept getting the same error message. The only way out was to turn off the computer and load the program from scratch. We couldn't repeat this error, however.

Other error messages are helpful.

When you are told to press Y or N, and you press another key, you see this message:

    Wait a minute . . . Try Again!

    Remember . . . You may only press

    one of the following keys: Y N.

This is particularly good hand-holding for kids and novices.

Kidwriter consists of a disk and a booklet that are contained in a plastic binder-box that is shaped like a book. Though cartridges are more reliable and sturdier than disks, especially when children are using them, this program requires a disk so that you can save picture stories.

The booklet begins with a description, designed for parents, of the aims of Kidwriter. Then a page describes how to load the program on both Commodore 64 and Apple computers. The only error we found in the book appears on this page. The Commodore loading command is printed incorrectly. Instead of "LOAD "SPIN",8" as it should be, the booklet says to type "LOAD "SPIN,"8" — which won't work at all. The comma must be outside the quotation marks. This important typo is covered, however, by a special note slipped into the binder. It is headed in large letters: ATTENTION COMMODORE 64 USERS, and it explains the comma mixup. We hope Spinnaker corrects the booklet soon. Though long-time Commodore users will be familiar with this disk-loading command (almost all programs must be loaded this way), tyros will be out in the cold until they notice the note.

The booklet continues with Chapter 1, "Getting Started," which is one page long. This does little more than reprint the main menu from the screen. The four pages of Chapter 2 are the meat of this booklet. They tell you how to make a picture and then list the editing commands for the word processor. The editing keys are the cursor keys (for moving the cursor), Delete (for deleting a letter at a time), Home (for moving to the top-left corner of the writing screen) and Clear (for erasing everything in the story area; this is on the same key as Home, but you need to press the Shift key also).

Chapter 3 tells you how to load a story from the disk into the computer, and Chapter 4 tells you how to get a directory of the stories on the disk. The booklet ends with a complete list of the objects you can use to make a picture.

The documentation is short, but with the help of the demonstration story on the disk, it does the job. We really cannot ask for more.

Spinnaker sends a warranty card with the software. Within the first 30 days after purchase, you can get a replacement from your dealer. After that, mail the disk to Spinnaker, with $5 if the disk has been damaged, for a new copy of the program.

Kidwriter is one of the best educational programs we have reviewed. It encourages creativity in visual and textual forms, as well as in the links between the two forms. It performs smoothly and well and provides a good introduction to the rudiments of word processing. Spinnaker should improve the error handling in the program, but don't wait until it does — Kidwriter is ready, even now, to encourage creative writing and thinking.

—*Phillip Robinson*

REVIEW

FaceMaker

FaceMaker, from Spinnaker Software, is an educational program aimed at children ages 4 to 12. It uses the Commodore 64 graphics to provide a blank face and a selection of features for children to put on that face. On a fundamental level, you can view FaceMaker simply as a child's game. An Animation feature, however, leads to some elementary computer-programming training, and a Game feature hones concentration and memory skills. This program is available on disk or as a cartridge.

A feature that should be added to FaceMaker is the ability to store faces. If the program comes on a disk, why not allow kids to store their favorite faces on it?

FaceMaker comes in a plastic binder — the same packaging that Spinnaker uses for all its programs. The binder is handy — it stands easily on a bookshelf and keeps the disk and the instruction booklet together — but it does have some sharp edges.

The documentation is a six-page booklet that includes information for Apple, Atari, IBM and Commodore computers. Those six pages include a note to parents about the uses of FaceMaker, information on loading the program, tips on getting started and descriptions of the four major parts of the program. Although this booklet is short, you don't need any more documentation.

After you load the program, it asks you if you want sound. You answer by pressing Y (yes) or N (no). It then asks you if you want a white background. Such a background is useful if the graphics aren't showing up well enough

on your video screen. Finally, you are asked if you need help. If you answer Y, a list of the four major choices appears: Build, Program, Game and Choices.

The first major menu choice, Build, enables you to build a face; this is the heart of FaceMaker. When you make this choice, a general face shape appears on the right side of the screen. On the left is a list of categories: Mouth, Eyes, Ears, Nose and Hair. An arrow points at one of the categories. If you press the space bar, the arrow moves to the next category. When you press Return, a list of choices for that particular feature replaces the list of categories.

For example, if you press Return while the arrow is pointing at Eyes, the program presents you with a selection of eight different sets of eyes. At this point, you again have to use the space bar to move the arrow to the set of eyes you want. Press Return, and that pair of eyes transfers to the face on the right side of the screen. If the face already has a pair of eyes, the old eyes disappear and the new eyes replace them. The original list of features then reappears on the left side of the screen.

Using the space bar and Return key, you can build a face with some or all of the features. The variety of features is broad, and you can make a lot of faces.

The next major part of FaceMaker, Program, lets you animate a face. Your face remains on the right side of the screen and has whatever features you have chosen. On the left side of the screen is a list of single keys and the movements you will see on the screen when you press those keys:

W: Wink
S: Smile
T: Tongue
E: Ear Wiggle
-: Delay
F: Frown
C: Cry

InfoWorld
Report Card

FaceMaker

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
FaceMaker will delight young children. By creating faces on the computer screen and making the features of those faces move, they can learn some simple elements of programming. Spinnaker offers a winner with this educational game.

System Requirements
☐ *No additional requirements*

*Suggested list price:
disk, $34.95; cartridge, $32.95*

*Spinnaker Software Corporation
One Kendall Square
Cambridge, MA 02139
(617) 494-1200*

At this point, by pressing the listed keys, you can make the face that you have created perform those various motions. For example, Tongue means "stick out tongue." The graphics dedicated to this activity aren't particularly advanced — the face jumps from no visible tongue, to a tongue sticking out, and back to no visible tongue. By using more defined characters or sprites, the programmers could have filled in the gaps in the motion and thus made the animation sequence more realistic.

Sound effects accompany the motions. If your screen face doesn't have a particular feature, you cannot animate that feature, although you can still hear the sound effects when you activate a motion.

If you press the space bar, a long rectangle appears on the bottom half of the screen. As you press the animation keys, they appear sequentially in this space. (FaceMaker can store as many as 30 keystrokes.) Next, you press Return. The face carries out the list of Animation commands. This is an introduction to a basic idea of programming: You plan what you want and then write a coded sequence to produce that effect. For example, pressing the W, F, S, - and E keys, in that order, shows up as "WFS-E" in the rectangle on the screen. This sequence makes the face wink, frown, smile, be still and then wiggle its ears.

The third part of FaceMaker is a game of memory and concentration. Instructions for the game appear on the screen. In the game the face makes some of the animation expressions listed above. First the face makes a single expression, which you must respond to by typing the key command for that expression. If you type the correct key command, the face moves on to the next round and makes two expressions. Again, you respond by typing the correct key commands in the correct order. This continues until you make a mistake.

The final choice, reached by pressing the 4 key, takes you back to the original questions about sound, background and help.

We couldn't find any combination of key presses that would interrupt the program: error handling is complete and invisible. Keys that you should not use are disabled — that is, the program turns them off so nothing happens if you press them.

FaceMaker is simple to start and to use. The only aspect that requires some learning is the Animation feature, but this advanced feature moves this program beyond the one-day-novelty category.

FaceMaker's warranty promises that during the first 30 days after purchase you can get a replacement from your dealer for any defective program. After 30 days, Spinnaker will provide a replacement. If your disk is damaged, you must pay $5 to get a replacement.

FaceMaker is a graphic, facial-feature-manipulation game for children that offers different sorts of education with its different subprograms. From simple face building to more advanced memory exercises and simple programming, it is an educational treat that is well aimed at young computerists. It doesn't require any knowledge of computers, and even kids who can't read can use it, provided they have a little key-recognition training before they play.

—*Phillip Robinson*

REVIEW

Bubble Burst

Bubble Burst is an entertaining, graphic, simple game for one or two players that Spinnaker terms educational because users must learn to predict an opponent's movements. Aimed at 4- to 8-year-olds, it has well-designed graphics and a nonviolent premise. This program is educational in the same way that Pac-Man is: it exercises its players' prediction faculties. Buy this game for its fun, but don't expect kids to learn a lot from it.

Bubble Burst comes in a plastic binder that fits easily on a bookshelf. The binder contains a catalog of Spinnaker software, the cartridge and the Bubble Burst instruction booklet. This booklet has five pages on the game (loading, playing, scoring and hints) and a 20-page story about Soapie the dragon (descended from the Loch Ness tribe) who is the hero of this game. The booklet concludes with a 12-page description of bubble-blowing tricks and experiments. The game instructions (for both Atari and Commodore computers) tell you all you need to know.

Errors are well handled, but we found a few undocumented key commands. None of those hurt the program, though. They just show that keyboard disabling isn't complete.

Bubble Burst is easy to use. We can't think of any change that would make it simpler. You plug in the cartridge and turn on the Commodore and the TV (or monitor), and the program starts. A game demonstration shows on the screen, and you press the space bar when you are ready to play. A tune plays in the background; bubblelike popping sounds accompany the music. You then have to specify

how many players you will work with: one or two. You also have to choose your skill level: 1 or 2. Level 1 begins at round 1 and is the easier; start there. Level 2 begins at round 11.

Once you have chosen your skill level, play begins. Instructions appear at the top of the screen as a tune plays over and over. The bubbles above Soapie — who is in the tub — are the stationary targets for the Zeboingers, who start flying in from the top and sides of the screen. Their sharp beaks pop the bubbles unless Soapie blows a new bubble to envelop the Zeboingers and float them away.

Different Zeboingers have different flight patterns (and different point values when you capture them): that is where strategy and planning are supposed to come in — you use your newfound knowledge about these flight patterns to better your score.

You aim Soapie's bubbles by using the joystick to move a circle around the screen. Once you center the circle on a target, you press the joystick button to release a bubble from Soapie's mouth. The bubble then drifts to the target spot. In the meantime, you can move the circle to a new spot for a new bubble. When a bubble contacts a Zeboinger, it surrounds the Zeboinger and floats it away. Successfully trapping a Zeboinger adds to your score. The score is displayed on Soapie's towel rack at the bottom of the screen.

Two kinds of bubbles exist: the ones you try to protect and the ones you use to trap Zeboingers. You have a limited supply of each. If the Zeboingers get all the bubbles you are protecting, the game is over. If they don't and, instead, you get all the Zeboingers with your weapon bubbles, you move automatically to the next round. There, the Zeboingers are faster and fly in more complicated patterns.

Several small graphic touches add to

InfoWorld
R e p o r t   C a r d

Bubble Burst

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	☐	■
Error Handling	☐	☐	■	☐

Summary
Bubble Burst is an amusing game for the Commodore 64. Its nonviolent theme is refreshing. The game is purported to be educational; its educational strengths, however, are no greater than those of most arcade games.

System Requirements
☐ *Joystick*

Suggested list price: $39.95

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this game: the shower head above Soapie drips periodically; Soapie turns to the player and smiles when she gets a Zeboinger; her tail moves every now and then; and so on. Some Zeboingers even whistle for faster friends to come in and take a shot at your bubbles.

Pressing the F7 function key freezes the game at any time; you resume play by pressing F7 again. You press F1 or Return to restart the game and press F3 to change the number of players and the skill level.

In the two-player game, players take turns. One plays through an entire game, and then the next player, using a joystick plugged into the computer's other port, plays a game. It would be better if rounds rather than games alternated.

Spinnaker's warranty guarantees that your dealer will replace any defective program during the first 30 days after purchase. After 30 days, Spinnaker will give you a free replacement. If the cartridge has been damaged, you must send $5 with the cartridge to get a replacement.

Bubble Burst is fun to watch and to play. Its graphics and theme are entertaining and nonviolent. Although it is probably easier to learn and master than some of the better-known arcade games, we doubt it teaches much more than an arcade game would.
—*Phillip Robinson*

REVIEW

Fraction Fever

Fraction Fever is an educational game from Spinnaker Software that is designed to teach simple fractions to children of ages 7 and over. It combines colorful graphics and a novel theme to make an attractive — and addictive — learning game. Its only fault is that it is more difficult to learn to play than are most other educational games. Once learned, however, it is easy and fun to play.

Because the program comes on a cartridge, all you have to do to get started is plug it in, plug the joystick into port 1 on your Commodore 64 and turn on the power to the computer and the TV.

A game demonstration shows until you press the S key to start the game. After you press S, the display on the screen separates into four sections: the top two-thirds of the screen is devoted to what looks like a side view of a pogo stick on a sidewalk; the bottom third holds a score-and-time square, a radar square and a square devoted to instructions, such as "Press S to Start."

The game has 20 levels of "sidewalk." A level appears as a series of squares, and only one level is shown on the screen at a time. You control the pogo stick using your joystick or the keyboard. The pogo stick is constantly hopping. You can send it in either horizontal direction by moving the joystick left or right, or you can increase the height of the hops by moving the joystick up. If you stop moving the joystick in a particular direction, the pogo stick gradually loses speed and eventually comes to a halt (though it is still jumping up and down).

One point to remember about

keyboard control is that you must press the direction-control keys repeatedly. Holding them down has no effect.

The squares of the sidewalk extend beyond the sides of the screen. If you move off the screen on either side, another section of the sidewalk appears immediately.

Beneath some of the squares that make up the sidewalk are graphic depictions of fractions. For instance, when you're playing on level 1, a fraction might be expressed as three squares: two filled with color and the other left empty. In addition, at the top of the screen is a single written fraction, such as ⅔.

When you press the joystick button, one of two things happens. If the graphic representation of the fraction that appears beneath the square the pogo stick is on is the same fraction as is written at the top of the screen, a white elevator appears and raises the pogo stick to the next level. If the fractions don't match, or if there is no fraction beneath the square the pogo stick is on, the square disappears. If the pogo stick is above a square that disappears, the pogo stick falls through to the next lower level when you press the joystick button.

The 20 levels are different lengths and aren't always directly beneath each other. Also, each time you play the game, the levels are created differently. If the pogo stick falls through and another level (or sidewalk) is directly beneath, the pogo stick stops at that new level. If there is no level beneath the pogo stick when it falls, the pogo stick can fall several levels or even all the way to the bottom. If the pogo stick falls all the way, or if it has fallen through ten holes, the game ends.

You can try to protect yourself from accidental falls by keeping an eye on the radar square at the bottom of the screen. In that square, three levels — the level you are on, the level above you and the level below you — are shown in miniature. Small markers indicate both the pogo stick's position and the holes in the levels.

As you get to higher levels, the fractions are more complicated and the graphic depictions are more difficult to interpret. Instead of a square or a circle, the fraction graphic might be two lines and a filled-in area between the lines. For 2/15 the filled-in portion between the lines is actually equal to 2/15, but you may find that a tough judgment to make when you look at the display.

The aim of Fraction Fever is to gain points before your time runs out. Knocking out incorrect fractions (by identifying them and then bouncing over them with the pogo stick, while pressing the joystick button) gives you points. The tougher fractions at higher levels are worth more points. You must also watch the timer at the bottom left of the screen. If it reaches zero, the elevator on your level leaves without you.

Fractions on each level are positioned according to their values. For example, the ½ fraction is one-half of the way in from one end of the level and the 1/15 fraction is one-fifteenth of the way in.

Fraction Fever comes in a plastic binder that fits nicely on a shelf. The binder does have some sharp edges, though. The documentation is a six-page booklet that is loaded with sketches of children on pogo sticks. It includes instructions for Atari, IBM and Commodore computers. The various versions of the program are similar, though, so the differences in instructions are limited mainly to those concerning loading and keyboard controls. The instructions tell you how to load the program, how to control the pogo stick and how to score. Some hints on playing the game are also

InfoWorld
R e p o r t C a r d

Fraction Fever

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	☐	■
Error Handling	☐	☐	☐	■

Summary
Fraction Fever is a well-designed, stimulating educational game. Players match fractions with their correct graphic representations by jumping a pogo stick to the correct positions on the screen.

System Requirements
☐ *Joystick*

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included. The documentation is short, but you can learn the game quickly without needing detailed explanations.

Although pressing a few odd key combinations can bounce the pogo stick around a little, we didn't find any errors that could slow down, much less crash, this program. That's important in a game aimed at children who will no doubt be pounding the keyboard.

Fraction Fever shouldn't wear out because it is supplied as a cartridge, so you don't need to worry about backups. Spinnaker provides a warranty that allows you to return the program to the dealer for a free replacement if it fails during the first 30 days. After 30 days, mail the cartridge to Spinnaker for a replacement. If the cartridge has been damaged, you must send $5 with the cartridge to get a replacement. A fillip to this package is a small Fraction Fever poster.

Ignoring whatever educational benefits it might have, Fraction Fever caught our attention as a game. Although we think we know our fractions pretty well, we found that the play alone is fun. In addition, Fraction Fever is well designed for fraction practice. You have plenty of time to try to work out what each fraction is, though quicker recognition gains you more points. Also, the process of identifying fractions is well integrated into the game. Kids will find themselves thinking about 6/11 without even being aware of it.

The two outstanding characteristics of Fraction Fever are the progressive practice it gives you in recognizing fractions and the quality graphics and sound effects, which are simple enough not to overwhelm youngsters. We recommend Fraction Fever to anyone who wants to slip kids a nutritious, but sweet, treat.

—*Phillip Robinson*

REVIEW

Jukebox

Spinnaker calls Jukebox a "musical strategy game that's kind of a cross between a chess match and a dance contest." We can't think of a more apt description. This educational program for one or two players is aimed at ages 8 to adult and is designed to teach such skills as strategy, concentration and pattern recognition. Because these skills, though important, are difficult to measure, many games claim to promote them while actually performing as little more than shooting galleries.

Jukebox, which runs on the Commodore 64, is fun and challenging. What you see on the screen looks much like the colorful front of a jukebox. A repetitive but catchy tune starts to play in the background. Although the tune is more complex (and therefore more enjoyable) than most Commodore music, it is not really the sort of thing we have ever heard on a jukebox. It sounds more like a new-wave synthesizer composition than an upbeat rocker or country lament. Nevertheless, we like it. Each of the other tunes is a little different. One sounds like a sort of barrelhouse piano boogie. The other has an almost Latin rhythm.

After you start the program, you are immediately asked how many players there will be — one or two. When you have chosen, the question disappears and the front of the jukebox becomes a dance floor that is divided into 20 pink squares. This is the arena for the contest.

You control a pair of feet that hop around a dance floor. Each time the feet land on one of the squares that make up the dance floor, the record underneath it gets more and more popular. The goal

is to collect the greatest possible number of gold records.

When you're ready to play the Jukebox, your joystick should be plugged into port 1 on the right side of the Commodore 64. The information space at the bottom of the screen says "Get Ready" and then "Dance."

If you have chosen one player, the top left square displays a pair of shoe imprints that look as though they were made by a pair of substantial wing tips. The music starts, and an indicator on the right side of the screen begins to slide down (the latter tells you how much time you have left in this round). The bottom of the screen contains two pairs of feet: the ones on the left mark your score, and the pair on the right marks the score of the second player in a two-player game.

You can make your feet jump from one square on the dance floor to another each time you press the joystick button. When you jump to a blank square, a small hit record appears in that square. Each time you jump on that square in the future, the hit will grow larger: from small to medium to large hit. If that square is one of the three flashing squares on the screen, you can then jump on it and turn a large hit into a gold record. That gold record will remain gold, and a single gold record will be added to your score pile at the bottom of the screen. Whenever you create a gold record, another square on the screen starts flashing, so you can get to work on making yet another gold record.

Strategy enters the game through a rule: you cannot jump from a smaller hit to a larger hit. When you jump, the square you jump to must be smaller or on the same level as the one you are in. Therefore, you can box yourself in — it takes forethought to avoid painting yourself into a corner. If you are trapped, the game automatically ends, a line of chorus animals pirouettes across the top of the screen and your score is tallied.

A two-player game is similar to the one-player game; in this case, however, players take turns making jumps. Two pairs of feet occupy the floor, and the action switches back and forth. The player who collects the most gold records wins.

A meter at the right side of the screen indicates how much time you have left. When it reaches zero, the program automatically takes one of your gold records, inserts it in the coin slot and fills the time meter back up. The better you play — that is, the more gold records you get — the longer you can keep playing. As you play, you hear the first tune for a while, then the second tune, then the third and then the first again. This cycle continues until the game is over.

You can end the game or change the number of players at any point by pressing the F3 key. Press F7 to pause a game, and then press it again to continue. (The inclusion of a Pause key is a boon to almost any game.)

This isn't the easiest game to begin to play. It took us a few rounds to figure out what was going on, but that is part of the challenge. Because strategy is involved, the game holds your interest longer — as both fun and education — than games that merely offer target practice.

Error handling is, in general, ably performed. Some controls are undocumented, however. For instance, at the completion of a game, pressing the joystick button starts a new game. The keyboard isn't completely locked, either. If you press the four keys Q, W, E and R all at once, the feet point down. Press 1, 2, 3 and 4, and the feet point up, diagonally. Other combinations of keys allow you to turn the feet left or diagonally up left. Also, pressing the

InfoWorld
Report Card

Jukebox

	Poor	Fair	Good	Excellent
Performance	□	□	■	□
Documentation	□	□	■	□
Ease of Use	□	□	■	□
Error Handling	□	□	□	■

Summary
Jukebox is a likeable educational game for the Commodore 64. The object of the game is to pile up gold records. Your task is to learn the strategies that allow you to create those records. The game is for one or two players.

System Requirements
□ *Joystick*

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space bar jumps the feet. None of these controls are any more than curiosities. We found no errors that crash the game or force it to accept unusable data.

Supplied as a well-made cartridge (a cartridge, by the way, is an excellent medium for most educational games), Jukebox comes on immediately when you push the Commodore 64's power switch to the on position.

The cartridge inserts easily, which isn't true of all Commodore 64 cartridges. It comes in a plastic, binderlike box that seems nearly ideal for a child's use. We say "nearly ideal" because the edges of the binder are a little too sharp for kids. Easy to clean and simple to stand on a bookshelf, the binder holds the cartridge, the instructions booklet and a catalog of other Spinnaker programs.

The booklet begins with a quick description of the game's theme. That is followed by four pages describing the rules of the game. Finally, a 30-page, decade-by-decade history of jukeboxes is interwoven with experiments that you can try (such as creating a jug band and playing tunes on a touch-tone phone) and knock-knock jokes.

The instruction section of the booklet is applicable to both Atari and Commodore versions of the program. Although it is brief, it includes all the necessary information.

With a cartridge, you don't need to worry about the most common type of program failure: disk wear. The warranty policy promises to replace your cartridge (from the dealer in the first 30 days, from Spinnaker after that) if it fails to work for any reason. If the cartridge is damaged, you'll have to send $5 to get a replacement.

Jukebox is a fun game that incorporates planning, competition and colorful graphics. Although a larger repertoire of tunes would be welcome, Jukebox succeeds in teaching players

without letting them know they're learning.
—*Phillip Robinson*

REVIEW

Delta Drawing

Spinnaker Software makes a point of describing Delta Drawing as a "learning program" designed to teach concepts of computer programming to "kids of all ages" (or at least ages 4 to adult). Viewed strictly as a learning program, Delta Drawing is effective. It is fun to use, and you find yourself writing simple drawing programs almost as soon as you begin using it. You are not, however, likely to produce any great art. The pictures you or your children create on the video screen tend to be abstract geometric patterns: drawing a face or a realistic-looking tree is possible but probably not worth the trouble.

Delta Drawing comes in cartridge form for the Commodore 64. (It also is available on cartridge for Atari computers and on disk for Apple computers and the IBM PC.) Plug it into the computer's expansion slot, turn on the power and the program starts running. Since it is on cartridge, the program is not likely to fail if it works properly the first time you use it. Spinnaker Software offers a 30-day warranty on the cartridge and will replace it after that period for $5.

The *delta* of the program's title refers to the V-shaped cursor that appears on your video screen and points the way as you draw. A mathematician might call this vector drawing: You aim

the delta in the direction you want to draw and order it to move a certain distance. You then change the angle and head off in another direction.

Delta Drawing requires no special accessories, such as joysticks or light pens. You control the movements of the delta entirely through keyboard commands. For example, when you press the D key, you draw a short line, and when you press the L key, the delta rotates 30° to the left. The program operates in the Commodore 64's High Resolution mode, and you can use up to four colors (including the background color) at the same time.

Delta Drawing makes the process of drawing more interesting by recording your moves as you draw. At any point you can declare those moves to be a self-contained program. You can then repeat the same sequence of moves as many times as you wish by typing a single command, or you can use the program inside yet another program. You can put one program inside another in this way for up to nine programs. This is Delta Drawing's strongest feature. It encourages you to think of your drawing in terms of structuring a program, but it is simple enough that children can pick up the techniques quickly.

Once you are comfortable with these techniques, you have the option of switching from the Drawing mode to a Text mode in which the program displays your moves as keyboard symbols — D for draw, R for turn right and so on.

The symbols form a rudimentary programming language, a kind of stripped-down Logo. In the Text mode, you can edit your moves or create a new sequence from scratch. You can program most drawing functions from either mode (Text or Drawing), although some of the program's more advanced commands, such as Random

Drawing, are easier to keep track of in the Text mode.

In both modes you can easily produce certain kinds of interesting designs — repetitive geometric patterns, for example. You can generate a pleasing oriental-carpet pattern by setting distance, direction and color to random and using the Kaleidoscope command, which reflects every move in quadruplicate. Often, however, getting the precise results you want can be hard because you have to figure the distance and direction at every point in the drawing. The difficulty of making those adjustments presents the kind of programming challenge that makes Delta Drawing an excellent piece of educational software. Those same difficulties, however, limit its usefulness as a graphics tool.

Delta Drawing has some other limitations. The Commodore 64 and Atari versions allow you to save a drawing program to cassette but not to disk. A spokesperson for Spinnaker Software told us that the company is considering an upgrade of Delta Drawing that would enable you to make disk saves. If and when the upgrade becomes available, the spokesperson said, Spinnaker will exchange it for the old version at no charge. (Versions for Apple computers and the IBM PC already allow disk saves.)

Notice that Delta Drawing saves the Drawing program, not the drawing itself. This is the more efficient approach, since a high-resolution image in the Commodore 64 fills a minimum of 8K of memory and requires several minutes to record onto cassette. On the other hand, if your drawing is complicated, the time you save by storing it as a program is lost as you wait for the picture to reconstruct itself once you've loaded it back into the computer. Delta Drawing includes a command called High Speed Drawing

InfoWorld Report Card

Delta Drawing

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
Delta Drawing is a drawing program designed to teach concepts of computer programming to "kids of all ages." As educational software, it is effective, fun and easy to use. This program is not a graphics tool — realistic drawing is difficult, and your drawings are confined to the video screen.

System Requirements
☐ *No additional requirements*

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that makes things go faster, but even with the high speed, you can easily write a program that takes several minutes to execute. The only consolation is that sometimes the reconstruction is amusing to watch.

Just as Delta Drawing saves your Drawing program to cassette rather than saving the drawing itself, it also allows you to send a program listing to a printer but does not print the drawing itself. Your creations, be they great art or something less, are confined to the video screen.

The designers of Delta Drawing have taken trouble to enable you to recover from mistakes. You can erase the last move or the last sequence of moves. The program's Redraw command erases the whole screen and repeats the entire sequence. Sometimes this won't help you.

The most frustrating (and amusing) mistake involves Delta Drawing's Fill command. You use that command to fill a closed shape, such as a circle or polygon, with color. Used correctly, the command works nicely. It fills every nook and cranny of the most complicated shape you can devise, and it does it surprisingly quickly. If you neglect to completely close the shape, however, the color spills out and slowly but surely fills the entire screen. Nothing short of turning off the computer can stop it, and salvaging your drawing is tricky at best.

Delta Drawing comes with a well-written users' guide that explains the program's operation step by step and includes a number of sample drawings you can try. A reference section summarizes all the commands, and a thorough index/glossary rounds out the manual. The guide also includes a separate quick-reference card that lists an abbreviated version of the commands summary.

The program's basic drawing

commands are sufficiently simple that beginners can pick up the reference card and start drawing without reading the manual. The more advanced commands require the fuller explanations that the manual offers.

A few undocumented commands duplicate the ones described in the users' guide. The Run/Stop key, for example, changes the drawing color, as does Spinnaker's documented command, Control-C. The extra commands seem to be due to quirks of the Commodore 64's keyboard.

Delta Drawing's strength is the way it entices you to write programs while you are drawing. As long as you view it as an educational program, you are not likely to be disappointed, despite certain shortcomings — realistic drawing is difficult, and you cannot save drawing programs to disk or print your drawings on paper.
—*James Calloway*

REVIEW

Up For Grabs

Up For Grabs is a word game for players ages 8 to adult. From one to four players use paddles or joysticks to select letters that appear on a rotating cube in the center of the screen. Players then take the letters they have chosen and position them on their grids so that they form words, both horizontally and vertically, with the letters already in place.

After a set amount of time, which the computer monitors, the game ends, and players add up their total scores by pointing to words on the grid. The

Commodore 64 calculates the value of the words, although players have to determine what is a word and what isn't — the computer can't tell. Common letters are worth fewer points than exotic letters.

This game is tricky to use the first time you play — timing the press of the joystick button to capture a letter and then selecting horizontal and vertical positions takes practice.

Up For Grabs has several educational aspects. First, of course, it gives you spelling and vocabulary practice. For that alone, this is a good program. As play progresses and the players improve, however, increasing levels of difficulty add other educational profit to the game. More letters, a faster-spinning cube (making letter selection more difficult) and shorter between-round times (for deleting unused letters, which detract from the final score) force players to constantly analyze which letters they want and then make quick decisions to get them. At the higher levels, the game tests your strategy, memory and decision-making skills.

Playing alone against the computer is a race against the clock to see how high a score you can rack up.

The program's main sound effect is the tune that plays at the beginning and during intermissions. It is a simple tune, like a Quaker melody, but it wears a little thin with time. The graphics for the moving cube are really all the graphics there are, although they're great. Letters appear on the right and are realistically foreshortened. As they become more visible with the cube's rotation, they move across the cube's face and then disappear on the left.

Other than this impressive display, the screen is static. Although cartridges have limited memory space, the lack of variety in both music and graphics makes this program a bit dull.

As this program is on a cartridge, you don't have to wait a long time for a disk to load. With the cartridge, the game starts as soon as you turn on the computer's power — the rotating cube appears, and you have an opportunity to use the function keys to select a level of play.

The program's documentation consists of a 9-page pamphlet that contains information about starting; level selection; grabbing, placing and erasing; scoring; letter values and joining the Up For Grabs association. It works, but it could be extended with some illustrations of games or the action of grabbing letters.

Spinnaker has copyrighted the program and explicitly forbids copying. No other support policy is stated, though the address of Spinnaker is included with the instructions about how to join the game's players' association.

Up For Grabs is easy to use once you know how, but it's not simple to learn. More documentation would help. The program handles errors well, and Spinnaker avoids such problems as disk errors by packaging the game as a cartridge.

Up For Grabs doesn't grab you like a good arcade game, but it is fun, it performs well and it is simple enough to be used by those (8 years and up) at whom it is aimed. Competition makes it more exciting, though one player can play against the clock. The program comes in a plastic booklike package that makes it easy to save the documentation and the cartridge together on the shelf.
—*Phillip Robinson*

Info**World**

R e p o r t   C a r d

Up For Grabs

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
Up For Grabs is a word game that one to four players, ages 8 to adult, can play using paddles or joysticks. Although it is tricky to use the first time you play, with practice it is fun. It is suitable for the age range indicated.

System Requirements
☐ *Joystick or paddle for each player*

Suggested list price: $39.95

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REVIEW

Dungeon of the Algebra Dragons

Dungeon of the Algebra Dragons combines the graphics and adventure of a game with the drills of an educational program. Although it does enliven problem solving, it doesn't overwhelm us with its graphics or teaching potential.

The plot is simple. You are locked in a dungeon with dragons, spiders and pits — and there is only one way out. To escape, you must survive the dangers and find the two magic keys that unlock the single exit.

Your champion appears in one of the rooms on the bottom level of the dungeon. The room is sparsely furnished — the only possible contents are a spider, a dragon, a ladder, a trapdoor (once you're on a higher level), a bag of money and a magic key. Most rooms have none of those things. A doorway is straight ahead of you, another is on your left and a third is on your right. A status line on the screen tells you what level you're on, what room you're in and how much gold you've got (you start with 1000 pieces).

Clues — that is, hints of danger — also appear on the screen. Though a dragon or spider may not be in the room with you, the clues tell you that you can smell a dragon or hear spiders in an adjacent room. It is a good idea, as the accompanying booklet advises, to write these clues down along with the number of the room in which they occur. Otherwise, you have little chance of remembering where you've been and figuring out how to return to a particular room so that you can climb the ladders to higher levels.

You can pick up the bags of gold by stepping on them. If a spider bites you before you can jump on it or run through a doorway into another room, that is recorded on the screen — three bites, and the game ends. If you chance upon a dragon, you are asked an algebra question. These come in the form of equations that you are supposed to solve for the unknown variable. A typical equation might be:

$$Y = 282/X$$
If $Y = 6$ SOLVE FOR X

on the simplest level or

$$Y = 44*X + 49$$
If $Y = 445$ SOLVE FOR X

on the highest level.

Type in the correct answer, and the dragon is vaporized; type in any incorrect answer, and you lose some of your gold. Lose it all, and the dragon eats you. The game then ends. Some rooms on the lowest level are bottomless pits — fall into one of these, and the game ends. So much for ways to lose.

To win, you must find the magic keys, and then climb ladders and survive through many rooms until you find the final exit ladder from the top level.

What about the play? We found the way out, and we found the magic keys, but not in the same run. Spiders are the most bedeviling problem.

You might find the sameness of the player's perspective an annoyance. Every room looks the same, except for the accoutrements described above. If you make a map and keep in mind that you have no time limit, though, you should be OK. It isn't easy to find your way out, so the game should hold your interest for some time.

The program takes nearly three minutes to load. If you have any trouble, a backup of the program (recorded under a different name) comes on the same disk.

If you use a joystick, you don't have much chance to make an entry error.

You can use the keys to control your champion; if you do so, the program handles entry errors fairly well by disabling keys that shouldn't do anything.

We did find one surprise on the Z key. If you press this key, which isn't supposed to do anything, you can instantly teleport from the room you're in to another room and possibly to another level. You cannot, however, choose the room: the process seems to be random.

We were impressed by the documentation. First, the information on the box that holds the disk and short booklet is unusually explicit — it should certainly prove useful to potential buyers of the program. This type of packaging is characteristic of Timeworks' products. Although Timeworks' honesty may lose it some sales, those who buy the program can't complain that they were misled. The text on the box lists the type of program (educational), the subcategory (algebra skills), the suggested age range (14 to adult), the number of difficulty levels (four), the time necessary to use the program (1 to 2 hours to complete), the peripherals needed (optional joystick) and the appearance of the program (3-D graphics and sound effects). A photo of the TV screen accompanies all of this.

The booklet is only eight pages long, but a game really doesn't need more than that. It starts with a thorough table of contents and then describes plot, perils, helpers, loading instructions and strategy. It concludes with a quick description of troubleshooting and a list of other Timeworks projects. The manual is typeset and easy to read.

Before starting the game, you are asked to choose from among four levels of play. As the level number increases, so do the difficulty of the equations and the number of dragons, ghosts, spiders

and so on. If you choose level 4, you can specify the difficulty of the problems, the number of dragons and the number of perils. We could not get this specification on level 4 to work, though. No matter what sort of number we entered, the program accepted it, and yet the play seemed no different from levels where we didn't specify anything. In one case where we specified only one peril, three rooms out of four were bottomless pits. This bug is inconsequential, however, because you don't really need the specification at level 4 — you reach the most difficult problems by the time you attain level 3.

At the start of the game, you see your champion advancing to the castle and then falling to the dungeons. The graphics are crudely three dimensional, and the motions of the hero and the spiders are jerky. The sound effects that accompany any movement from then on consist of a single tune played over and over ad nauseam.

No backup policy is stated in the documentation.

Timeworks calls this "an adventure-in-learning game" and a "challenging and enjoyable way to develop algebra skills." The game isn't in the same league as good arcade games in terms of action and graphics. In addition, although the algebra drill does occur, it doesn't appear frequently — and you need some skill to start, even on the bottom level.

Still, this is the sort of package that can hold players' attention longer than straight drills and can provide a motivation to find solutions to problems. We recommend Dungeon of the Algebra Dragons over more traditional math-drill programs.

—*Phillip Robinson*

InfoWorld
Report Card

Dungeon of the Algebra Dragons

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
Dungeon of the Algebra Dragons mixes math drills with adventure-game features. The amount of practice you're given in developing algebra skills per game you play is not great. The game offers enough interest to keep you coming back, though, so you should eventually learn a lot.

System Requirements
☐ *One disk drive*

Suggested list price: $24.95

Timeworks, Inc.
444 Lake Cook Road
Deerfield, IL 60015
(312) 948-9200

REVIEW

Turtle Toyland, Jr.

Turtle Toyland, Jr., another winner from Human Engineered Software (HES), is a pre-Logo program that is designed to teach programming to people six years of age and older — six-year-olds may have a chance at using it if they can keep daddy away from it.

The program teaches you basic programming skills utilizing a turtle. You don't have to learn how to use a keyboard because you can operate the whole program using a joystick. You use the joystick to control the turtle's moves and turns and also to make selections from the program's menus. The program is entirely menu-driven and uses icon-style menus. You use the left/right and backward/forward action of the joystick to move a cursor icon to surround the picture that represents your choice and then press the joystick button to execute that choice. The only time you use the keyboard is when you save your work on disk — you have to type in a filename. To load your project back into the computer when you start up again, however, you use the joystick to select filenames from a window that scrolls them as you maneuver the joystick.

Turtle Toyland, Jr., in the spirit of Disneyland, offers you a choice of six "worlds" (or "lands"), which you select from the main menu. In Training Land and its counterpart, Playground, you have fun learning how to use the turtle. MusicLand lets you create music; in SpriteLand you produce colorful moving shapes. You can transport the results of your activities in all these worlds to Toybox, where you can combine them to create a filmstrip. You can also mix pictures, animated sprites

and music to make a slide show. Finally, in I/O Land you can save the results of your creative efforts on disk.

When you first start the program (after waiting a long time for it to load; Commodore disk drives are slow), you must choose between learning and programming. If you choose to learn, the program lets you practice moving the turtle until you feel confident that you can move and turn the turtle by manipulating the joystick.

You can then choose to program. This choice lets you see a main menu on which the six Lands are arranged as positions on a clock face (two hours apart). The turtle is in the middle. Each time you move the joystick left or right, you turn the turtle toward a choice and a cursor icon surrounds the picture you choose. You then push the firing button to make your choice. The program is geared for six-year-olds, so no words or text appear — all menu choices are pictures.

HES suggests that you try Training Land first. Here you use the turtle to "paint" in any of three colors, using a "pen" of three possible widths, and you can control 16 background and border colors. When you are satisfied with your masterpiece, you can transport it to the Toybox for storage.

Another fascinating experience awaits you in MusicLand. Here a musical staff appears (with no key signature, however), and a quarter note rests on the F position of the staff. You operate the joystick to move the note up the scale through a distance of one octave, or eight notes. As it moves, each note sounds on your TV speaker. When you reach the note you want to save, you press the joystick button. You can save up to 18 notes per sequence. After you create a sequence, you can play it back with the sound of a piano, a horn, a guitar or a piccolo. If you like your sequence enough to use it later, you can

store it in the Toybox, as you did with your turtle drawings.

Our only criticism of MusicLand is that it plays a minor scale, which is not the best scale to use if you want to teach diatonic scales to children. It also plays only quarter notes and has no rests.

Creating sprites in SpriteLand is equally fascinating. In this land a 16 × 16 grid appears, and you create a sprite by filling in the squares with a design.

You then move your sprite to a "training area" where you give it instructions about where and how fast it should move on the screen. As with your other creations, you can save your sprite in the Toybox.

Now comes the really fun part. When you select Toybox, you see several vertical columns of boxes. On the left are three boxes that scroll to a total of 16 boxes in which you store the drawings that you created with the turtle in Training Land. To the right of these boxes are six sprite boxes and six music boxes. On the far right of the screen are 16 more boxes (three are showing, the rest are accessible by scrolling) that you use as a filmstrip. You can fill the filmstrip boxes with any of your drawings, sprites or music in any order. A clock is available for you to set the time you want each box to display, and a loop maker allows you to repeat the filmstrip up to 99 times. When you select Go on the menu and press the joystick button, you are in for a treat as you watch the computer draw your drawings and play all your music.

The package includes several large, colorful posters. One is a map of the main menu that shows you all the lands you can visit in Turtle Toyland, Jr. The other poster is a complete reference guide to the operation of the joystick, and it explains in detail what happens when you operate the joystick in each land you visit. The manual contains comprehensive instructions, but they are written in language that an adult would read and then explain to a child. The manual lacks a table of contents and an index.

In our tests, the program crashed only once. We created a music sequence that we wanted to play back using MusicLand's Piano option, but when we pressed the joystick button to start the sequence, the music hung up on the first note. We could find no way to abort the run except to restart the program. We were unable to duplicate this error, however.

In HES tradition, the disk is copy-protected — you cannot copy it. A 90-day warranty on the disk protects you against defects, but you cannot buy a backup disk.

Credit is due to Childware Corporation, which jointy developed this program with HES. They have produced a fine product that has great educational value for young people.
—Marty Petersen

InfoWorld Report Card

Turtle Toyland, Jr.

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	☐	■
Error Handling	☐	☐	■	☐

Summary
Turtle Toyland, Jr., uses turtle graphics to teach basic programming skills to six-year-olds and over. The program is menu-driven and uses icon-style menus that don't involve reading. You can create music and colorful shapes for filmstrips and slide shows and save your results on disk. This program is both educational and fun to use.

System Requirements
☐ *One disk drive*
☐ *Joystick*

Suggested list price: $34.95

*Human Engineered Software
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Brisbane, CA 94005
(415) 468-4111*

PROGRAMMING

After you've had your Commodore 64 for a while, you may want to enter the realm of programming. The products in this category give you a variety of programming possibilities.

REVIEW

Simons' BASIC

Simons' BASIC, written by a 16-year-old British boy named David Simons, is an enhancement for Commodore 64 BASIC. The plug-in-cartridge program allows you to use sprites, high-resolution graphics, sound and other special functions of the Commodore 64. Altogether, this program adds 114 new commands to BASIC's vocabulary.

Gaining the ability to use sprites, or movable icons, is probably the best feature of Simons' BASIC. Working with sprites used to be a messy task, but with Simons' BASIC, sprites are a snap. There's only one convention you need to get used to — sprites are not referred to as sprites, they're called MOBs. (MOB stands for movable object block.)

The Design command allows you to set aside memory space for a MOB and lets you specify a single-color or multicolor MOB. After you have set aside some memory for your MOBs, you can easily design one with the @ command. The @ command uses a grid to define the MOB, which means you can design your MOB on a piece of graph paper and transfer it to your program in a matter of seconds.

You can move the MOBs on either the character or hi-res screen with the MMOB and RLMOB commands. It's easier, though, if you use the MMOB command to move a MOB between any two points on the hi-res screen, and the RLMOB command to move the MOB anywhere on the character screen. With these simple MOB functions, it is fairly easy to create a simple game with sprites — a virtually impossible task if you are using regular Commodore BASIC.

Simons' BASIC also allows you to redefine your character set. The commands to do this are similar to the

MOB-definition commands and are great for quickly creating scenery or patterns on the screen.

Sound is another feature of Simons' BASIC. The Vol, Wave and Envelope commands allow you to define the characteristics of a sound. The Music command allows you to define and play a song; its drawback is that you can play a song through one voice only. Simons' BASIC also lacks the ability to use the filters built into the Commodore 64 sound chip; this seriously decreases the flexibility of the music routines and other sound effects.

Simons' BASIC includes an extensive set of hi-res commands that you can use to create simple pictures easily. These commands work in either Single-color or Multicolor mode, and you can use them to draw lines, circles, ellipses, arcs, radii, boxes, frames and characters. In addition to these features, Simons' BASIC has the "smartest" Fill routines we've ever seen. Unfortunately, they are also the slowest.

Simons' BASIC also has a Plot command that allows you to plot individual points on the screen. The Check command lets you test points on the screen to determine whether they're on or off — that is, displayed as part of characters or as background.

Simons' BASIC also includes a facility for creating shape tables. Programmers can use these sets of instructions to define and place shapes anywhere on the hi-res screen. Shape tables are handy for creating all-purpose icons that you can include in games or utilities. You can also rotate and change the scale of a shape.

Along with the graphics and sound commands, the program offers several commands that you can use to manipulate the text screen. For example, Fill and FCHR allow you to fill areas of the screen with any character in any color, and Move allows you to

duplicate any block of characters on another part of the screen. Simons' BASIC also allows you to scroll blocks of characters in any direction.

BFlash allows you to flash the border around the screen, and Flash allows you to flash individual characters. Be warned, however. You have to use the Off command to stop the flashing. Certainly you can carry on writing your program, but the continued flashing may irritate you as much as it did us.

Simons' BASIC is not restricted to display-oriented commands, however. This BASIC includes many other types of commands. The most interesting are a set of new statements oriented toward structured BASIC programming. For example, EXEC is similiar to GOSUB, except that EXEC requires a user-defined label instead of a line number; REPEAT . . . UNTIL lets you construct a conditional loop without FOR . . . NEXT or IF . . . THEN; LOOP . . . EXIT IF . . . LOOP END is similiar to REPEAT . . . UNTIL, but LOOP . . . EXIT IF . . . LOOP END allows you to specify many possible conditions to exit from the loop; and the old IF . . . THEN statement has been replaced by IF . . . THEN . . . ELSE.

Simons' BASIC also has many programming aids. Key allows you to assign a 16-character string to any one of the eight special-function keys, which is useful for commands that you use often. The Auto command invokes the automatic line-numbering function. The Renumber comand renumbers the lines of your program but it does nothing to your GOTOs and GOSUBs — you have to change them manually.

You can use the Pause command with user-defined messages and user-specified number of seconds to instruct the computer to display certain lines of your program. CGOTO allows you to use a variable or an expression instead

Summary
Simons' BASIC, an enhancement for Commodore 64 BASIC, offers you many fine features, including the ability to use sprites, to redefine your character set and to take advantage of the 64's sound and graphics abilities. Unfortunately, several programming problems, inadequate error handling and a terse manual all interfere with efficient use of the program.

System Requirements
☐ *No additional requirements*

Suggested list price: $49.95

*Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100*

of a line number in a GOTO statement.

If you use the Reset command plus a line number, the computer resets the data pointer to a specified line of data, enabling you to use the Read command on any line of data as many times as you wish and skip over other lines. With the Merge command, you can append a program in memory to one on disk or tape.

The listing and debugging commands are helpful when you are trying to figure out what is wrong with your program. Page divides your listing into pages that fit onto the screen so that you don't need to hold down the Control key while your program is listing. Option highlights all the Simons' BASIC commands in your program.

If you want to see a line in a long listing, you can control the speed of your listing by using the Delay command followed by a number of your choice, ranging from 1 to 255. (The fastest is 1; the slowest is 255.)

The Find command searches for a code or a character string in your program, but unfortunately, the program finds only strings that appear in quotes. The Trace command turns on the Trace window in the upper-right corner of the screen. In this Trace window, you can see the line number of the line that is being executed. The Dump command allows you to look at all the variables in your program, and Cold reinitializes your computer. The Old command restores a program that you have erased accidentally by using the New command.

Simons' BASIC also contains commands that help you protect your program. The Dispa and Secure commands cause specified lines of your program to vanish in your listing. This can be useful if you don't want unauthorized persons looking at your code or data.

The program also has several commands that help you manipulate string variables: Insert allows you to insert one character string into another; Place determines the placing of a substring within a large string; Centre centers a string in the middle of a line; Print At allows you to put a string anywhere on the screen; and Use lets you align and format lists of numbers.

Along with Input, there are a few more data-entry related commands: Fetch restricts input to either characters or numbers; In Key tests for input from one of the function keys; and On Key allows you to restrict the input to only a few characters on the keyboard.

Simons' BASIC also has more numerical operations: Mod returns the remainder of a division operation; Div divides two floating-point numbers and returns the answer as an integer; and Frac returns the fractional part of a number. Simons' BASIC also does binary and hexadecimal conversions. In addition, an extra Boolean operation — EXOR (Exclusive OR) is included.

Disk commands are also included in Simons' BASIC. The Disk command allows you to execute any disk command without having to open and close the disk port. The command DIR"$ gets you the disk directory without destroying your program in memory.

The manual that comes with Simons' BASIC is not an instructional guide — it assumes you are already familiar with Commodore BASIC. Nor is this manual the best reference tool. Its descriptions of the commands are sketchy and difficult to follow the first time through. The examples that are given with each instruction are not especially helpful.

Simons' BASIC has only mediocre error handling. Although you can't easily make the computer crash, you can get unexplainable errors. For

example, if you try to reset the F1 key with the command KEY 1," ", you get garbage when you press F1. If the result of your Dup operation is greater than 255 characters, you sometimes get a random number of characters in the string.

There are also problems with some of the debugging functions. The Trace command only works when you are in the Text mode. When you move the character screen in memory or when you are using the hi-res mode, it is impossible to see a program tracing. The Page command divides your program into pages, but there's no way to exit from the listing, except to step through the entire listing. This can be time-consuming when you have a large program. EXOR doesn't work on negative numbers, which is odd because all the other operations do work with negative numbers. RCOMP does not perform a comparison of the previous IF . . . THEN . . . ELSE statement as the manual says it does. It simply returns the result of the last IF . . . THEN . . . ELSE operation.

Another major problem occurs as a result of Simons' BASIC's tendency to "tokenize" certain words that appear in its commands. *Tokenize* means that the program creates a sort of shorthand for the word in order to reduce the amount of memory needed to store the command. Consequently, Simons' BASIC garbles elements in data statements that contain a word used in one of its commands. For example, if you have a string Angle in a data statement, the program automatically tokenizes *ANGL* of the word *ANGLE* because Angle is a Simons' BASIC command. Instead of getting the word *ANGLE* when you want to read the data statement, you get a control character.

In summary, Simons' BASIC is only a fair program. Although none of the aforementioned problems are seriously

crippling, they are certainly not acceptable to serious programmers. Simons has some good ideas, but it's too bad that Commodore didn't give him a bit more guidance in developing this BASIC tool. As it stands now, Simons' BASIC is a worthwhile investment only if you need a tool that lets you use the Commodore 64's special features without dealing with the messy PEEK and POKE statements required when you use ordinary BASIC. If, however, you want a more powerful and dependable BASIC, Simons' BASIC is definitely not for you.

—Kevin Cheung

REVIEW

Commodore Logo

Many people think of Logo as simply a children's computer language. Its emphasis on graphics and the ease with which children seem to learn it often obscure Logo's sophistication as a programming language. In some ways, it is more powerful than BASIC.

Under the Commodore label, Terrapin of Cambridge, Massachusetts, has developed a version of Logo for the Commodore 64 that reveals the strengths of the language as well as some of its weaknesses. The strengths are due largely to Logo's kinship with LISP, an advanced list-processing language that is used in artificial-intelligence research but rarely found on microcomputers. Logo was developed on mainframe computers, and Commodore Logo's few serious problems seem to result from being shoehorned into a small computer.

InfoWorld
R e p o r t   C a r d

Commodore Logo

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	☐	■
Error Handling	☐	☐	☐	■

Summary
Commodore Logo is a fine implementation of the language, making use of Logo's turtle graphics and procedural constructs. You may be disappointed by Commodore Logo's slow operating speed, however.

System Requirements
☐ *One disk drive*

Suggested list price: $73.95

*Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100*

Commodore Logo uses most of the 64K RAM that is available on the Commodore 64, including memory that is "hidden" beneath the 64's BASIC and operating system. About 12K remains free for you to use to write Logo procedures.

That doesn't sound like much, but Logo procedures are stored in compact fashion, and some of the powerful features of the language allow you to save even more memory by writing concise code.

Commodore Logo's interpreter is 28K long (compared to the 8K BASIC that comes built into the Commodore 64), which pretty much rules out any possiblity of cramming the interpreter onto an affordable ROM cartridge. The language is not available on cassette, but instead Commodore Logo comes on a pair of disks.

One of the disks is copy-protected and contains the working version of the language. The disk is not, however, write-protected, so you might damage the contents of the disk by writing accidentally to the disk. (We haven't had the nerve to test that possibility.) Commodore does not provide any kind of warranty on its Logo, but it does offer to replace a damaged disk at a cost of $5 with the exchange of the original disk.

The second Logo disk is neither copy-protected nor write-protected. It contains more than 50 utility files, including demonstration procedures, a Sprite editor, a Music editor and a BASIC program that allows you to print Logo pictures on a Commodore printer. Before discussing some of those utilities, let's look at the language as a whole.

Logo features an extensive set of procedures for handling words and lists of words. The language is better known for its turtle graphics, however. On the Commodore 64, the turtle looks like a

triangle. You can rotate the triangle until it points in the direction in which you want Logo to draw. You can move the turtle in real time or by writing a procedure and then running that procedure.

Most of the commands are simple. For example, Forward moves the turtle forward by whatever distance you specify. Right and Left rotate the turtle to the right or left by the number of degrees you request. Penup and Pendown determine whether the turtle draws as it moves.

You may have noticed that we use the term *procedure* in place of the word *program*. In Logo, instead of writing a self-contained program as you would in BASIC, you write something called a procedure, which becomes a part of the language that you can use in other procedures. This encourages you to write software in a building-block fashion. You first try to solve simple problems, and then you proceed to handling more complicated jobs by combining the simpler solutions. For example, to draw a house, you first create a procedure to draw rectangles. You then use that procedure in a new procedure to create windows or doors. Finally, you draw the house by combining all the necessary procedures into a single big procedure.

What makes Logo even more powerful is that you can use any procedure within itself. This ability is called recursion and is not found in many other languages, especially those versions designed to run on home computers.

One of the utility procedures included on the second disk demonstrates recursion by drawing a snowflake. It begins with a single large triangle, then grafts a smaller triangle onto each of the three sides, so that the image becomes a six-pointed star. The process is repeated on a smaller and

smaller scale until you get a splendidly curved snowflake figure made up of a few hundred tiny triangles. The procedure that accomplishes the bulk of this can be as short as a dozen lines.

The shortcomings of Logo on the Commodore 64 result partly from the fact that the language pushes the 64 to the limit of its power. Commodore Logo can run as many as 200 procedures at the same time, but if many of them are complicated, Logo slows to a snail's pace. Mathematics in Commodore Logo is more limited than in BASIC. You can express numbers with only six digits of accuracy. Logo has no provision for fractional powers, and it must pull logarithm procedures from the utilities disk.

For some reason (probably its slowness) Commodore Logo resorts to a program written in another language, BASIC, for printing its pictures on paper. To use the BASIC program, you must record the picture on disk, then exit from Logo by turning the computer off and back on.

We contacted Commodore's customer-support office to find out why the job isn't handled by a Logo procedure. The representative was friendly and seemed to know a lot about the way Commodore Logo works, but on this score he could offer no help. We called Terrapin, but the people there referred our questions back to Commodore.

In any case, the BASIC program runs excruciatingly slowly. Also, it may not work with non-Commodore printers. We were unsuccessful in our attempt to use it with an Epson RX-80.

On the plus side, the utilities disk gives Commodore Logo several abilities that BASIC does not have. One set of procedures makes the Commodore 64's sprites much easier to use than in BASIC. The turtle itself is a sprite. You can change its shape, although when

you do so, it either loses its ability to rotate or reverts back to its original shape when rotated. Also, you can make each of the seven other available sprites act as nonrotating turtles.

The utility procedures do not support multicolor sprites, but you can easily change the procedures so that they do. The Sprite editor is easy to use, although a bit slow. Similar procedures make the 64's built-in sound-synthesizer chip easy to use.

The users' manual for Commodore Logo is a paperback that is more than 350 pages long. It is thorough and includes an excellent tutorial that serves as a good introduction to Logo for beginners. A separate reference section covers the same territory in more concise form and has some added technical information, such as instructions on using the machine-language assembler that is included on the utility disk. Both sections and the copious appendices are thoroughly indexed.

The one part of the manual that we found difficult to use was the explanation of error messages. It is clearly written, but because of the way the list is typeset, finding a specific error message can be frustrating. Fortunately, most error messages are self-explanatory — more so than in BASIC. If the error happens within a procedure, Logo shows you the line in which the error occurs and tells you what level of recursion the procedure is in.

If a procedure gets stuck in an endless loop, you can abort it safely by pressing Control-G. You can crash Commodore Logo easily, however, if you use the Deposit procedure, which resembles BASIC's POKE operation in that it enables you to change the contents of any location in the computer's memory. No language that allows you such free access to memory

InfoWorld
Report Card

HesMon 64

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary

HesMon 64 is a machine-language monitor that allows you to check on the basic operations of your Commodore 64 and to write programs in 6502/6510 assembly language. If you want to try machine-language programming, let HesMon 64 give you a hand.

System Requirements
☐ *No additional requirements*

Suggested list price: $39.95

*Human Engineered Software
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is going to be crashproof.

Commodore Logo brings some powerful abilities to the Commodore 64, although at some sacrifice of speed and mathematical functions. The language's turtle graphics have been well publicized, but Logo's procedural structure is equally important and useful. We recommend Commodore Logo, with few reservations, to families with children and also to adults who are interested in a new approach to programming.
—*James Calloway*

REVIEW

HesMon 64

A machine-language monitor is a program that allows you to examine and modify your computer's memory and to write programs in the microprocessor's machine language. For those who use packaged software or write BASIC programs, a machine-language monitor has little value. Computer scientists, programmers and teachers of computer science, on the other hand, genuinely need to go beyond BASIC and look at the elemental workings of the computer itself.

HesMon 64, from Human Engineered Software, satisfies this need and has a few extra features besides. The HesMon 64 cartridge plugs into the expansion port of the Commodore 64 and takes control of the machine. When you turn on a HesMon 64-equipped computer, the HesMon 64 screen greets you with a table of hexadecimal numbers and abbreviations. These are labels and values of the registers or special memory locations in the microprocessor that tell you the exact condition of the computer's inner workings. The registers are the program counter, the interrupt-request vector, the status register, the accumulator, the x register, the y register and the stack pointer.

Machine-language programmers use the values (which are stored in the registers in hexadecimal notation) to interpret the status of various parts of the microprocessor and memory.

You can write programs in the simple version of 6502/6510 assembly language that HesMon 64 offers. This low-level language is more efficient than BASIC. HesMon 64 also has a disassembler, which reads machine-language programs and displays them in assembly language. Its external relinker permits you to translate programs partially from one computer with a 6502 microprocessor to another, such as Commodore to Apple or vice versa.

Other programs in the HesMon 64 system display the Commodore 64's memory in ASCII characters or in hexadecimal notation. HesMon can run, save, load or relocate programs or blocks of code in memory. It can also examine your computer's electronic health by checking its random-access memory.

Using the Number Base Conversion routine, you can type either a hexadecimal or a decimal number and display it in the other number system.

HesMon 64 performs flawlessly and instantly. Serious programmers will find that it gives them access to all the features of such well-known Commodore monitors as Extramon and Micromon and the built-in PET monitor. The assembler does not have all the extensions of a professional system, but it contains most commands that someone new to the use of an assembler might need.

It takes considerable practice and training to learn to use machine-language monitors. They cannot be learned casually. HesMon 64, however, is easier to learn than most because it is contained on a cartridge and all its parts are instantly accessible.

Because of HesMon 64's convenient cartridge format and the tutorial style of its manual, a rank beginner in machine-language programming should understand HesMon 64's underlying principles after a few hours of experimenting. Learning to program takes much longer.

Unlike BASIC, machine language doesn't give you error messages. A wrong command can freeze the machine hopelessly; because HesMon 64 allows you to save a program with a simple command, it's easy to save a copy of the program before you try to run it. If you issue an invalid command from the keyboard, the screen flashes a question mark or two.

The documentation packaged with HesMon 64 doesn't pretend to be a guide to machine-language programming. The first three pages are entitled "If you've never used a 'machine language monitor' before." This first chapter explains the register displays of the monitor concisely and gives beginners a quick, tutorial tour of the major functions. On the following pages, each function is described in plain English.

For beginners to start programming using HesMon 64, they will need to peruse other publications, which are cited in the documentation. The original MOS Technology assembly-language manual for the 6502 is out of print, and some of the cited magazine articles may be difficult to find. Several current books on 6502 programming are available, though, and articles about machine language appear regularly in Commodore-specific magazines.

Human Engineered Software maintains a technical-assistance hot line, which is manned by people who can give reliable advice. The cartridge has a limited, 180-day warranty against defects in materials or workmanship. After the warranty period ends, Human Engineered Software will replace the cartridge for a $6 charge.

HesMon 64 is a solidly produced and professionally packaged product that even beginners can use to get their feet wet in machine-language programming.
—*Ned Heite*

REVIEW

Step by Step

Step by Step, a BASIC tutorial for the Commodore 64, consists of a disk and a student workbook. It is advertised as an interactive course in BASIC programming for beginners. Its ten lessons cover only the bare essentials of BASIC, such as PRINT, RUN, INPUT and LIST statements, nested loops, and GOTO, GOSUB, READ, DATA and RESTORE instructions.

It's the presentation of these ten lessons that made us rate the package's performance as fair. Step by Step's "interactive" approach is even less exciting than a lecture. The scenario goes something like this: (1) The computer asks you to read a "frame" of material in the workbook. (It could have displayed this material on screen complete with graphics and sound.) (2) You do as instructed, then press the Return key to let the computer know you've done it. (3) The computer asks you a question about the material

InfoWorld
R e p o r t   C a r d

Step by Step

	Poor	Fair	Good	Excellent
Performance	☐	■	☐	☐
Documentation	☐	■	☐	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	■	☐

Summary
Step by Step, a BASIC programming tutorial for beginners, covers only the bare essentials of the BASIC language. Rather than exploit the computer's advantages as a learning aid, the program uses a textbook style of presentation for its lessons. Although error handling is good, documentation is inadequate; we cannot recommend this program.

System Requirements
☐ *One disk drive*

Suggested list price: $59.95

Program Design, Inc.
95 East Putnam Avenue
Greenwich, CT 06830
(203) 661-8799

you've read. (4) You respond and are trapped in a loop until you enter the correct answer. (5) You repeat steps (1) through (4).

The Commodore 64 computer has an unusual way of displaying keyed-in characters on the screen. In one mode the letters are all displayed as capitals. In the other, the letters appear in lowercase when you type them unshifted and in uppercase when you operate the Shift key.

What degrades Step by Step's presentation even further is the way in which it instructs the computer to display your inputs and its own responses. When it calls for you to enter information, the program won't accept shifted characters in your response. Thus, when it asks for your name, it accepts "marty" but not "Marty." The manual explains that using the second mode is preferable because, even though you can enter only lowercase characters, the computer can respond with mixed uppercase and lowercase text, which is easier to read.

The program, however, actually gives you its instructions in all-uppercase text, which is single-spaced and therefore hard to read. After it had learned this reviewer's name (which had to be entered in lowercase), the program responded with "HELLO, marty, ARE YOU READY TO START?" Is this what the manual means by mixed lowercase and uppercase text?

Once you have a few lessons under your belt, the program provides you with some sample programs to analyze and modify. We were distressed to discover that we had to type these programs into the computer first. That kind of experience we could get from a textbook, but this is supposed to be a computer program. These examples should be provided on disk — the subject at hand is learning BASIC, not perfecting your typing skills.

Another weak point of this program concerns the chaining of lessons. You have to type "LOAD "MENU", 8" in order to get the program started, and then you're asked to choose a letter of the alphabet that represents the lesson you want to start with. Once you've done so, the program chains to the lesson you have selected.

This is good. Why, then, is this feature not used within the lessons as well? After you finish lesson 1, part 1, for instance, you have to manually enter "LOAD "LESSON 1-2",8" in order to continue.

We have rated the manual as fair because it shows the frames of material that the program asks you to read but does not say which lesson they belong to. You have no idea of how they relate to anything unless you run the program at the same time. It's like reading the script of a two-character play in which only one of the parts is printed.

Finally, the end of the book contains a sheet on which you can record your quiz scores. Wouldn't it be great if the program kept track of your score and gave you a graphic progress report?

Step by Step's error routines are good. You can't enter a wrong response and continue. We did notice, though, that the old-fashioned method of screen scrolling (rather than page refreshing) is used when the computer displays information in response to incorrect answers.

The package contains no information about warranties pertaining to the disk, which is write-protected but not copy-protected.

In conclusion, we feel that using this program is not the best way to learn BASIC. It is no better than a textbook on the subject, and the interactive experience might as well be achieved using pencil and paper.

—*Marty Peterson*

REVIEW

Tool 64

Tool 64, a machine-language enhancement for Commodore 64 BASIC, is a helpful program for those who want to write business-oriented programs. Among other features, this cartridge allows users to format screens, use high-resolution graphics and define subscreens within a screen. The latter feature is particularly useful in programs, such as mailing-list programs, that require you to enter a large amount of information.

Using Tool 64's screen-generator commands, you can easily create text displays that are colorful and well-organized.

The screen generator uses the command DECZ to declare a zone. You can format these zones to any length within the screen width, and you can also design zones so that they only accept certain types of characters, such as numbers, letters or formatted numbers. Once it is defined, you can use a zone for either input or output.

The command REQZ allows you to enter information into a zone. If you exceed the zone length or enter characters that are not valid, Tool 64 clears the zone, and you start again. After you have written to a zone, the command INZ transfers the contents of that zone into a string. The OUTZ command outputs a string into a zone. INZ and OUTZ are roughly equivalent to BASIC's Print and Input commands, but they are much easier to use.

The TLINE and TCOL commands allow you to draw horizontal and vertical lines on the text screen. With these commands you can easily do such things as partition a section of the screen for a specific purpose, underline titles and put boxes around important information.

The command OUT lets you output a string to any part of the screen, and the REV command allows you to highlight a string in any color. You can use these commands together to create flashing displays and other colorful text effects.

Tool 64's CLEAR command allows you to clear any frame or group of characters in the text screen. You use the Scroll function to scroll a string in any direction. This function also enables you to create moving displays or continuous readouts.

The screen generator allows you to save any screen format. You can create screen overlays for different parts of a program or use the same screen template in many different applications without having to redefine it in every program.

Along with the screen generator, Tool 64 has a hi-res generator, which allows programmers to take full advantage of the Commodore 64's high-resolution-graphics ability. This generator includes commands to draw lines, plot points and even output text to the hi-res screen — you'll find these commands useful for creating graphs.

An interesting feature of the hi-res generator is the way in which it addresses the screen. Most computers define the coordinate 0,0 as the upper-left corner of the screen, but Tool 64 defines 0,0 as the *lower-left* corner. This approach may take a little getting used to, but it makes graph plotting easier because it's the way we are taught to plot graphs when we learn mathematics.

Although the line plotting is slow, Tool 64's graphics commands make plotting information and designing mathematical graphs easy. Tool 64 allows you to output text, which is helpful because you can put labels and other helpful and important information

InfoWorld
Report Card

Tool 64

	Poor	Fair	Good	Excellent
Performance	☐	☐	■	☐
Documentation	☐	■	☐	☐
Ease of Use	☐	☐	■	☐
Error Handling	☐	☐	☐	■

Summary
Tool 64 is a machine-language enhancement for Commodore 64 BASIC. It offers a screen generator, a high-resolution generator and special debugging commands. If you can get past the jargon in the manual, you'll find Tool 64 a handy package.

System Requirements
☐ *No additional requirements*

Suggested list price: $39.95

Handic Software, Inc.
Fellowship Business Center
520 Fellowship Road, Suite B206
Mount Laurel, NJ 08054
(609) 866-1001

on your graphs with a minimum amount of effort.

Tool 64 also has a nice set of editing functions that take some of the pain out of BASIC programming. These functions include standard editing functions such as automatic line numbering, block delete and line renumbering.

Using the DUMP command, you can look at all of the variables in your program. This can save you many hours of debugging time. When an error occurs, you can use the ERROR command and the program pinpoints the line where an error has occurred and highlights the offending characters. Tool 64's FIND command finds a string of characters anywhere in your BASIC program; this can be helpful when you are wading through a long, messy BASIC listing.

The star of the debugging commands, though, is the TRACE function. This function allows you to single-step through your program using the Shift key. When you press the Shift key, Tool 64 displays the line it is executing without harming the program display, and on multistatement lines, it highlights the statement being executed. You can also use TRACE inside a program to monitor a subset of instructions. Tool 64's TRACE command is one of the most powerful debugging features we've seen for the Commodore 64.

Tool 64 also has some BASIC extensions. The first is HUNT, which searches for a letter in a string and tells you how many times that letter occurs (how many Es, for example). This HUNT function can also determine the position of a character in a string. CREAST is an instruction that creates a string of characters, such as a string of 1s or a string of asterisks.

Tool 64 supports IF . . . THEN . . . ELSE statements.

These statements make programming easier because they allow you to specify many different courses of action within an IF statement. An example is: "IF the light is red THEN stop ELSE IF the light is yellow THEN slow down ELSE IF the light is green THEN go." Tool 64 supports up to 16 nested IF . . . THEN . . . ELSE statements, which is probably more than you'll ever need even for the most complex decisions.

Another feature that Tool 64 adds to BASIC is the HCOPY function. This powerful function outputs the contents of the screen to the printer, which is useful if you want a record of a screen-generated report. The HCOPY function also lets you output the contents of the hi-res screen — providing your printer allows high-resolution graphics. As a result, you have the added ability to print graphs and charts.

The last BASIC feature worth mentioning is the JOY command. This command allows you to determine the joystick value in memory without any messy PEEK or POKE operations. If you use the JOY command in conjunction with the hi-res screen, you'll have a handy graphics tool.

Along with all these goodies, you get a DOS wedge, which simplifies the DOS commands. Instead of typing "LOAD "$",8" and then "LIST" to get the directory, you only have to type @$. You can thus get a directory of the disk without destroying the program you have in memory. Another plus is that you can use your original DOS commands as well — when you run other DOS wedges, you usually cannot do this.

The documentation that comes with the package is fair. It is written for programmers, and you should be prepared to reread the manual several times. (It's possible that some of the manual's lack of clarity is due to

translation difficulties — the programmers who developed Tool 64 are Swedish.)

The commands in Tool 64 are powerful; you should not expect to understand them on the first pass through the instructions. The best way to learn how to use the commands is to experiment with them.

Tool 64's error handling is excellent. The program includes commands that let you check disk errors and errors in your program. It also has a few more specific error messages that are geared toward its commands. It's hard to bomb Tool 64. If you do, recovery is fairly easy because Tool 64 is in a ROM pack.

Some BASIC programs do not run on Tool 64. If you use it with other prepackaged software, you may get some weird data because Tool 64 redefines part of the character set. You can easily solve this problem, however — simply pull out the Tool 64 cartridge and boot the system again.

Tool 64 is a good product. It extends BASIC and allows you to use features that are normally inaccessible. Its debugging ability saves you the time and frustration normally associated with Commodore 64 BASIC. This program allows you to spend more time programming your computer and less time fighting it.

—*Kevin Cheung*

PERIPHERALS

Now it's time for reviews of peripherals — a variety of them. In this category, you'll find reviews of printers, light pens, touch tablets, disk drives, monitors and more.

REVIEW

Edumate Light Pen

Most light pens are designed for professional use. The Edumate light pen, however, is for families to use at home. It is lightweight and inexpensive. FutureHouse, the manufacturer of the Edumate pen, also publishes several educational programs that use the light pen.

A light pen is a hardware device with which you can point directly to a location on your display. In contrast, a joystick is also a pointing device, but one that lets you specify a screen position indirectly. With a light pen, you can point to your menu choices or draw right on the screen.

The picture you see on a television or monitor screen is made by a moving gun that shoots electrons at the back of the screen, which is coated with a sensitive material. Because this beam moves more quickly than the human eye can see, we see a smooth image.

When you hold the light pen against the screen, the pen senses the light beam as it passes the point the pen marks. The pen sends a signal into the computer to report that the beam passed by. The Commodore, knowing where the beam is at all times, can automatically translate the pen's report into a screen location.

We tested the Commodore 64 version of the pen and its accompanying disk-based programs. We used the pen with both a Commodore 1702 color monitor and a Sony Trinitron color television.

The Edumate light pen is about the size of a pencil. At one end it has a small plastic lens that senses the light beam on the screen. You connect the pen to the computer by a self-coiling cord that plugs into control port 1, just like a joystick. We think the cord's self-

coiling design is a nice touch.

Unlike a joystick, the light pen does not have a built-in trigger. This means that, for most applications, you must use the keyboard in some way. The light pen always sends its signals into the computer; you need to be able to tell the program when to pay attention. Peripheral Vision, a program you use with the Edumate pen, requires you to press either the Commodore-logo key or the F7 key to "activate" the pen.

Also unlike a joystick, the light pen affects the computer's keyboard. When the Edumate pen is plugged in, the lower rows of the keyboard do not work. For example, the space bar and the M key are deactivated.

This disabling feature probably reflects a design compromise that helps FutureHouse keep the cost of the pen down. Unfortunately, it also restricts what you can do with the pen. For example, you cannot load the accompanying programs when the pen is plugged in because their names include some of the deactivated characters. With most simple applications, this feature should prove annoying but not fatal. It does, however, prevent you from using the Edumate pen with more powerful programs.

The Edumate pen works well with both the television and monitor. It reads screen positions accurately and with little wobbling or instability. Because it is easy to hold, you can draw and point naturally.

The Edumate pen comes with several example programs: a simple sketching program, a disk utility, a three-dimensional ticktacktoe game and a music program. These programs allow you to use the pen immediately and are fun to play with.

The sketching program lets you draw on the screen in any of the Commodore's 16 colors. It is an excellent way to get started using the light pen. We found it unintimidating and appreciated the fact that it lets you produce immediate results.

The disk utility lets you choose disk procedures by pointing to menu items. You can choose to load and run a program; to validate, initialize or format a disk; or to delete a disk file. This utility is really more novel than useful, although it works very well. In the long run, it is just as much trouble to load and run the utility as it is to perform the functions directly.

The three-dimensional ticktacktoe game is played on a $4 \times 4 \times 4$ grid. You can see only one layer of the game at a time, so you must keep the play in your head. It is a good challenge, although all ticktacktoe games lose their thrill after a while.

The Pen Music program is our favorite. This program presents you with a screen full of note names. Each octave is arranged in a column. To sound a note, you just point to the note name and activate the pen. You can also choose among three waveforms and set the note decay. It is fun just to wave the pen around in front of the screen and listen to the different sound patterns you get. It is more challenging to try to play songs.

These programs are, in a way, part of the pen's documentation. They illustrate what a light pen can do and how you can use it. If you are interested in writing your own programs that would use the light pen, you can learn much by looking at the BASIC code of each example program to see how it works.

The manual for the pen and example programs is short but not too short. It explains how to set up the pen (plug it in) and how to load the menu that lists the programs. The manual gives a brief description of each of the programs.

The last two pages of the manual

InfoWorld Report Card

Edumate Light Pen

	Poor	Fair	Good	Excellent
Setup	☐	☐	■	☐
Ease of Use	☐	☐	☐	■
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Serviceability	☐	☐	■	☐

InfoWorld Report Card

Peripheral Vision

	Poor	Fair	Good	Excellent
Performance	☐	■	☐	☐
Documentation	☐	☐	■	☐
Ease of Use	☐	■	☐	☐
Error Handling	☐	☐	■	☐

Summary
The Edumate Light Pen is a well-built pointing device that works well with both a television and a monitor. Peripheral Vision, a drawing program, is more of a toy than a serious tool.

Features of unit tested
☐ *Edumate Light Pen*
☐ *Peripheral Vision software*

Suggested list price: Edumate Light Pen and example programs, $34.95; Peripheral Vision, $39.95; Combined package, $59.95

*FutureHouse, Inc.
310 West Franklin Street
P.O. Box 3470
Chapel Hill, NC 27514
(919) 967-0861*

contain technical information. Here you find a very short explanation of how the pen reads screen positions. You also find which VIC 20 and Commodore 64 memory locations contain the light-pen information. There are very short BASIC examples that read the light-pen registers and that read the keyboard for a triggering signal.

FutureHouse also produces a more elaborate drawing program called Peripheral Vision. You can buy Peripheral Vision separately or packaged with the Edumate.

With Peripheral Vision, you can draw freehand or make circles, rectangles, triangles and straight lines. The program allows you to draw in any of 15 colors — always with a white background — and to vary brush strokes and textures. You can save your pictures in disk files for future use.

The Peripheral Vision program is easy to learn to use. You choose the program option you want, such as Mirror or Print, by pointing to an icon (small picture) at the bottom of the drawing area and then activating the pen. To draw, you point the pen at the drawing area, activate the pen and then move it as you would a pencil.

Peripheral Vision offers standard drawing-program features. Its Zoom option magnifies your picture so that you can modify it in detail. The program lets you print your pictures or save them on disk. With the program's Move and Copy options, you can put shapes you've already drawn in new locations.

The program allows you to use any one of 35 predefined "textures" (two-color repetitive patterns) for drawing and filling. The program also lets you design your own textures and store them on disk.

The option menu is on the screen while you are drawing, making it easy to choose the option you want and to keep track of which option is currently in

effect — other programs require you to switch back and forth between the drawing area and the menu to get such information or to make a new choice.

The program also has other features that we have not seen before. You can specify one of five levels of focus for the pen. This determines how accurately the program interprets the pen's position. More accuracy means a slower drawing speed, however. We found it difficult to move the pen slowly enough for the most accurate setting.

The program lets you use the Commodore's full character set, including the low-resolution graphics characters. To choose a character, you point to a box in the menu and scroll through the character set until you see the one you want. To place the character, you point to the drawing area and activate the pen.

This method of access is tedious. We found it frustrating to have to run through the entire character set one character at a time when the keyboard was in front of us.

It is also difficult to place the characters precisely on the screen. We tried to put a simple phrase in one of our pictures. After an hour, we still hadn't managed to get all the characters in a straight line.

In fact, many of the features of Peripheral Vision are like this one: handy but not quite first-rate.

The program will draw circles for you (much more easily than you could freehand), but the circles are not circular, not even close. Perhaps the option should be called "Oval." FutureHouse has released an update that draws true circles and eight degrees of ellipses, but it was not available for this review.

The Fill option is fast, when it works. The program will not always fill a region, however. The manual claims that you can fill any area that has

borders of a single color, but this is not the way the option really works. Sometimes you can fill a region with a two-color border, and sometimes you cannot fill a region with a one-color border. You can never fill a region that intersects the edge of the drawing area, regardless of colors.

Peripheral Vision lets you print your pictures, but we did not bother to print many pictures. The program transmits the image on the screen one line at a time to the printer. Using a Commodore 1526 printer, each line takes about 30 seconds to print (even blank lines). The Commodore 1525 printout takes about 10 minutes, and the Gemini 10X or Epson MX-80 takes about 7 minutes. The whole screen takes nearly half an hour to print.

The Peripheral Vision manual is slim. It explains how to plug in the pen and load the program. It tells you how to activate the pen and gives a brief description of each of the options. It also shows what each of the option icons looks like. All this occupies only eight, small, manual pages. The remaining four pages of the manual explain how you can write BASIC programs that use stored Peripheral Vision screen files. This explanation includes a simple program example.

The example programs and the Peripheral Vision program are warranted to load and run. If an original disk is defective, FutureHouse will replace it for free within 30 days. If the disk wears out in use, you can buy a new copy for $5 if you return the original disk. The manual warns that the disks may not be copyable with the standard copying procedure.

The Edumate light pen is a good buy. The pen and its accompanying programs cost no more than a game, yet they will give a lot more entertainment for your money. It is easy to write programs that use the light pen, so

novice programmers will be able to spend hours experimenting with the pen. The Edumate pen is an ideal addition to a family computer system.

Although Peripheral Vision is not the best drawing program available, it is less expensive than others. You'll have some fun playing with it. As long as you buy it as a toy and not as a serious tool, you won't be disappointed.

—*M. A. Olds*

REVIEW

Inkwell DT-170

The Inkwell DT-170 is a professional-quality light pen. It comes with a software package that is clearly not designed for home use. The pen and software are both good.

The light pen itself is simple to use: You just plug it into the Commodore 64's control port 1 and point it at the screen. The Inkwell pen sends data to the computer as long as it is pointed at the screen. Because an application program needs some sort of signal to know when to pay attention to the data, the Inkwell pen has a built-in trigger in its nose. When you press the pen against the screen, the pen sends a signal to the computer that a program can interpret.

The pen works well. It seems accurate, and the screen positions it reports are relatively stable.

The manual supplied with the pen is excellent. It tells you how to plug in the pen and how to use it. It also explains how you can write programs that use the light pen; this explanation is short but excellent. The manual includes the

Summary
The Inkwell DT-170 light pen is excellent. It comes with Flexidraw, a software package that contains several useful programs. Both work well and are easy to use, but they are intended for professional use. Home users might prefer to buy a cheaper pen and software that is more fun to use.

Features of unit tested
☐ *DT-170 light pen*
☐ *Built-in trigger*
☐ *Flexidraw software*

Suggested list price: $149.95

theory of operation of the pen, which is helpful, and it also presents a short BASIC program that reads the pen's position and looks for the trigger signal. The manual refers you to the accompanying programs and the Commodore *Programmer's Reference Guide* for additional information.

The programs that come with the Inkwell pen are good examples of the pen's use. One pair of programs allows you to draw and animate sprites. You draw the sprites using the pen, and you control the operation of the programs completely with the pen (except when you must type disk filenames). These programs are good examples, but they are also useful in their own right because they store the sprite information in the standard format.

The package also contains two music programs. One of them emulates a synthesizer that has sliding switches, and you use the light pen to "slide" the switches and change the sound. The other program emulates a one-octave piano. You can specify the attributes of the piano and then "play" it with the pen. These programs demonstrate the use of the computer's sound system as well as use of the pen.

The most important program that comes with the pen is the Flexidraw drawing program. This program also has three supporting programs: Pen Palette (a coloring program), Transgraph (a communications program) and Flexiplot (a machine-language routine that can be called from a BASIC program).

Flexidraw itself is a powerful high-resolution drawing program. It allows you to draw freehand, make predefined figures (such as circles), fill and shade. You can enter text directly from the keyboard into your picture.

The program has two distinct resolutions: Pixel (320 × 200 pixels) and Grid (40 × 25 blocks).

Some operations, such as text entry, work only in the Grid mode. The Grid mode's resolution corresponds to that of the coloring capabilities of the Pen Palette program

Flexidraw allows you to fill in areas of your drawing with any of 284 patterns. Some of these patterns are predefined; you can construct the others from the characters on the computer's keyboard. The filling procedure is fast.

Flexidraw also has a Zoom mode that enlarges each pixel to character size. This makes it possible for you to draw in fine detail or to make very small changes.

The program also features an Averaging function. When you turn this function on, the program filters out pen jitter so that you can draw smoother lines.

Flexidraw has two drawing areas, and it allows you to move pictures and parts of pictures between them. The Put function has several options that allow you to specify the kind of interaction you want to have between the existing image and the image you want to put in its place.

With Flexidraw, you can either print a picture directly using your printer — the program supports several models — or you can save the picture in a disk file.

One of the handiest features of Flexidraw is a set of cross hairs. If you turn on these cross hairs, they run completely across the screen, horizontally and vertically, from the pen's position. You can then easily align two objects in different parts of the screen.

Flexidraw is difficult to learn to use. To draw with the program, you simply draw on the screen itself — that's easy enough, but it is more difficult to get used to the commands that let you control the program. Although an on-screen menu displays most commands, you cannot always easily figure out

what all the options mean. The menu changes constantly and gives you possible choices only. For example, you can draw a circle only after you have selected Point mode. This is not intuitive.

Once you get the hang of the program's operation, though, it is easy to use. The menus are compact and fast, and it is really convenient to have a menu on the screen at all times.

Flexidraw's documentation is good but not great. It is not easy to find any particular feature in the manual, although the explanations of the features are good. The manual also lacks any extended examples to help you learn the procedures necessary to draw with the programs.

The manual does include a paper template that fits around the function keys and gives the definition of each one. You don't use these keys often, though.

The program disk contains several excellent sample pictures (including a portrait of the program's author). These show you what the program can do and give you something to play around with while you learn to use the program.

The program disk also contains several symbol templates — including symbols for electronics, mathematics, music and architecture — which you can move into your own drawing. You can also make your own template files.

The Flexidraw drawing program allows you to produce only black figures on a white background. To add color, you must use the Pen Palette program. The Pen Palette operates only in a low-resolution mode (like the Grid mode of Flexidraw). This means that the program colors in small blocks. Within each of the blocks, you can specify a foreground and a background color. The foreground color takes the place of the black lines you originally drew with Flexidraw, and the background color

replaces the white background.

You operate the program using the light pen. A menu of colors and color pairs ("paint pots") runs down the right side of the screen. To color the picture, you must first specify some paint pots. For example, you can use the pen to make pot G represent a yellow background with a green foreground. Then you can select pot G by pointing to it with the pen.

While paint pot G is selected, any block you point to on the screen is colored with that combination. If you later change combination G to represent blue on gray, all the blocks colored from pot G will change to match.

You can choose from the Commodore computer's set of colors. The color scheme you design is stored on disk along with the picture itself. You cannot print out the colored picture, though you can still print it in black and white by using Flexidraw.

Pen Palette's documentation is fairly good. It explains how to use the menu, which is not at all obvious, and it also provides an extended example to get you started. As with Flexidraw, the best way to learn to use Pen Palette is by using it.

The Flexidraw examples are accompanied by sample color schemes that you can examine and change. You need some practice to be able to draw pictures that look good when colored in blocks, because the blocks may not match up properly with the shapes in your picture. The manual contains hints to help you combine Flexidraw and Pen Palette.

We did not test the Transgraph program or the Flexiplot drawing routines.

The Inkwell DT-170 light pen comes with a two-year limited warranty. Service is available, but the details are not given in the manual.

The Flexidraw disk is copy-

WICO
Joysticks

	Poor	Fair	Good	Excellent
Setup	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Performance	☐	■	☐	☐
Documentation	☐	☐	■	☐
Serviceability	☐	☐	■	☐

Summary
*These four WICO joysticks —
Bat Handle, Famous Red Ball,
Powergrip and 3-Way Deluxe —
are similar in design but have
differently shaped handles. They
are all robust and durable, but
their handles are too long and
their eight-direction capability
can be a hindrance when you
play games that require you to
make movements in four
directions only. We prefer the
Bat Handle.*

Features of unit tested
☐ *Four joysticks, each with
different handles*
☐ *5-foot cords*

*Suggested list price: Bat Handle,
$29.95; Famous Red Ball,
$34.95; Powergrip, $29.95;
3-Way Deluxe, $32.95*

*WICO Corporation
6400 West Gross Point Road
Niles, IL 60648
(312) 647-7500*

protected. You can examine the code of the programs, but do not make backup copies. The manual does not recommend that you work with a backup copy of the program. If you damage the original disk, you can replace it by sending $7.50 for the disk and the damaged disk to Inkwell plus $2.50 for shipping and handling.

The Inkwell DT-170 light pen and the Flexidraw software are a powerful combination, designed for professional use. The Flexidraw program is for advanced drawing applications not for amusement. If you think that a light pen or a drawing program could help you with your professional drawing, try Inkwell's offering. If you are a less experienced user who wants a pen to use at home, you should consider one that it less expensive and designed for fun.
—*M. A. Olds*

REVIEW

WICO Joysticks

The WICO joysticks are arcade-style game controllers for the Commodore 64. For this review, we tested four WICO joysticks: the Bat Handle, the Famous Red Ball, the Powergrip and the 3-Way Deluxe. Although similar, each joystick has slightly different features. Of all of them, we prefer the Bat Handle joystick for general use.

Each joystick has a 4-inch-square base and a 4-inch-tall handle. The bases are made of black-and-red matte-finish plastic and the handles of smooth red plastic. The base has a flat bottom and rubber feet for tabletop use. The front

of the base is contoured for hand-held use as well, although we think the base and handle are too large for that. Each joystick weighs about 13 ounces.

Each joystick has a 5-foot cord that plugs directly into either of the two control ports on the Commodore 64. It has two firing buttons, one on the base and one on the handle, and you select the firing button you prefer by moving a sliding switch on the base.

Each of the joysticks offers a different handle shape. The Famous Red Ball joystick has a slender steel handle with a red plastic ball on the end. The Bat Handle joystick is shaped like a baseball bat. The Powergrip joystick has a handle shaped like a pilot's ridged handgrip. The 3-Way Deluxe joystick has three interchangeable handles: a bat-shaped handle; a ridged handgrip; and a smooth handgrip with an elongated, curved top. These handles slide on and off a steel rod that is permanently attached to the joystick base. The sliding switch allows you to choose between using the firing button on the base and using both the base button and stick button.

The WICO joysticks are all self-centering. Their action is neither particularly stiff nor soft, but the 3-Way Deluxe gives more resistance than the others.

We asked several people to play different kinds of games with each of the joysticks, and each person came to prefer one of the handle shapes over the others. The Bat Handle was the most popular, possibly because it allowed the most different hand positions.

No one chose the Famous Red Ball joystick. Its design exaggerates the problem common to all these WICO joysticks: the handles are too long. It is more work to use a long handle, and the greater leverage makes it difficult to hold the joystick steady. On all but the Famous Red Ball, you can choke up on

the handle (hold it close to the base), but the handles are not designed for this, so you lose some efficiency.

·The joysticks are designed primarily for eight-direction games, and they are not suited to four-direction games, such as mazes and imitation 3-D games. In a maze game, you only need to move up, down, left and right, and so the in-between positions of these joystick give dead spots that can make it difficult for you to turn corners quickly. We tested the joysticks with Datamost's Paint Magic program and found it difficult to get fine control when drawing.

WICO builds its joysticks well; they are sturdy and durable. We did not notice any deterioration in their performance. WICO started in the business by building arcade joysticks, and its home joysticks are clearly built to take more abuse than they are ever likely to see.

The joysticks have a limited warranty: two years for the Powergrip and 3-Way Deluxe and one year for the Bat Handle and Famous Red Ball. The manual includes the address to which you can send your joystick for repair.

The joysticks' documentation is sparse, but it covers everything it should. The leaflet explains how to plug in the joystick and how to use the firing-button selection switch. It also contains a description of the WICO line of game controllers. The manual for the 3-Way Deluxe joystick describes how to change handles.

It is ironic that the person who had the most trouble with the WICO joysticks was an aggressive arcade-trained tester. He is used to having his joystick firmly nailed down, and he heaves it around. When he used the WICO joysticks, he had difficulty keeping them in his lap. He found it impossible to use the 3-Way Deluxe because the handle slipped up the steel rod and covered the firing button.

For general use, we prefer the Bat Handle joystick because it minimizes the faults of WICO's joystick design. The Bat Handle allows you to choke up to use a variety of hand positions, and the handle stays firmly attached. For some games, such as flight simulations, you might find you prefer the Powergrip joystick, though.
—*M. A. Olds*

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REVIEW

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KoalaPad

The KoalaPad touch tablet is a pointing device that you can use to indicate screen positions. It is designed primarily for home use, and like a joystick, you can use it to play games, draw pictures and make menu choices.

You point out positions in a different way with the KoalaPad, however. The touch tablet has a pressure-sensitive area, and each point of this area corresponds to a point on the screen. To select a point on the screen, you put your finger or a stylus (one is included with the pad) on the corresponding point on the tablet. Which one you choose will depend on what you are using the pad for — fingers are better for pointing, and a stylus is better for drawing. The KoalaPad is especially well suited to drawing and writing — you can draw on the surface of the tablet while watching your picture appear on the screen.

You can't just plug the KoalaPad in and start drawing, though. Without software, the KoalaPad would be just a paperweight. The KoalaPad comes with an excellent drawing program called

InfoWorld

R e p o r t   C a r d

KoalaPad

	Poor	Fair	Good	Excellent
Setup	☐	☐	☐	■
Ease of Use	☐	☐	☐	■
Performance	☐	☐	☐	■
Documentation	☐	☐	☐	■
Serviceability	☐	☐	☐	■

InfoWorld

R e p o r t   C a r d

KoalaPainter

	Poor	Fair	Good	Excellent
Performance	☐	☐	☐	■
Documentation	☐	☐	☐	■
Ease of Use	☐	☐	☐	■
Error Handling	☐	☐	☐	■

Summary
The KoalaPad touch tablet is an excellent tool that you can use to perform many of the functions that joysticks or light pens perform. It comes with good, easy-to-use KoalaPainter software that lets you draw and color pictures and save them.

Features of unit tested
☐ 4½-inch-square drawing
      surface
☐ Two trigger buttons
☐ KoalaPainter software

Suggested list price: $99.95

*Koala Technologies Corporation
3100 Patrick Henry Drive
Santa Clara, CA 95052-8100
(408) 986-8866*

KoalaPainter that enables you to draw pictures, color them and save them to disk. To give a command to the program, you use the pad to move the cursor to that command on the screen and then press a button on the tablet. You use the keyboard only to name a new picture file.

The KoalaPad weighs about a pound and is 8 inches long, 6 inches wide, and 1 inch high. The drawing surface is 4¼ inches square. The pad is made of white textured plastic, and the drawing surface is black textured vinyl. It is built up at the rear so that the drawing surface slants down toward the front. Two trigger buttons reside just above the drawing surface. The pad is completely symmetric, so left-handed and right-handed people can use it equally well. The KoalaPad plugs into the Commodore 64's joystick port and has a 4-foot cord.

This pad works well and is easy to use. It is accurate and much more stable than a light pen, and the position the computer reads is steady as long as your finger or stylus is reasonably so. It is designed to be easy to hold, and it allows natural drawing and writing motions. You can hold it in your lap or lay it on the table next to your computer.

The KoalaPad's documentation is brief. It tells you how to plug in the pad and lists the Commodore 64 and VIC 20 memory locations that contain the pad's reported position. The KoalaPad manual claims that you can use the pad in place of a joystick in most games, but although we tried several games, none of them worked with the KoalaPad.

If you want more information about writing programs that use the KoalaPad, you should buy the Instant Programmer's Guide, which consists of a disk with example programs and a slim manual that briefly describes the programs. Run the programs, and they

explain how to program around the KoalaPad; examine the BASIC code of the programs, and the programs show you how to do it.

The KoalaPainter drawing program is an excellent introduction to the power of the KoalaPad. With KoalaPainter, you can draw freehand or make preprogrammed geometric shapes, such as circles, lines and boxes. You have 16 colors and 8 brush shapes to choose from.

The program also has a disk utility that lets you save your pictures for later use. You select the disk operation and the file you want by pointing to each on a menu and pushing a button on the pad.

The program lets you fill in figures and "zoom in" to draw exact details. One interesting mode mirrors whatever you draw around two (invisible) diagonal axes. The most dramatic mode is Rays, which enables you to draw lines that radiate from one point. You can combine this kind of image with others for unusual effects.

You enter each of these modes by pointing to it on a Command menu and then pushing the pad's button. Each mode is represented by an icon (representative symbol) and its name. Selected modes flash slightly so you can keep track of them.

The Color menu, Brush menu and Command menu occupy a full screen. You can switch back and forth between the menu screens and the drawing screen by pointing to the edge of the pad and clicking the pad's button. You get to the Disk menu by selecting the Disk icon in the Mode menu.

The only complicated modes are Copy and Swap. KoalaPainter has two drawing areas, and Copy lets you move pictures and parts of pictures between the two areas, but you have to use Swap to switch back and forth between the areas on the screen. Because you select

both Copy and Swap from the Mode menu, you must include that screen in the procedure, too. It takes a bit of practice to get the procedure down pat.

Perhaps the most useful command is Oops, which undoes the last thing you did. If you make a change you don't like or if you destroy part of your picture by mistake, Oops can save your bacon. All the modes work exactly as promised. The Fill mode is particularly good; it is fast and accurate. The geometric figures come out the way they should — the circles are round and the lines are straight — and Oops works every time (unless you use Zoom just before it).

The best way to learn to use KoalaPainter is to play around with it — this may also be its best feature. The program is an excellent way to introduce timid people to computers because it is impossible to do any damage to either the pad or KoalaPainter, and the latter's Oops mode is reassuring. Most people won't be afraid to make mistakes as they doodle or draw.

Perhaps most important, the pad produces immediate and dramatic results — and without any complicated syntax or incomprehensible error messages.

KoalaPainter does not have all the features of more expensive, professional drawing programs, but these are, on the whole, not important features for home use. For example, KoalaPainter does not allow you to design your own patterns for filling and drawing, and you can choose only either a solid color or a fine-grade checkerboard of one color with black.

Its Mirror mode has only one mirroring scheme. Other drawing programs allow you to choose two-way or four-way mirroring and to specify which axes you want to mirror around. For example, you might want to have your drawing mirrored on the left side

of the screen while you draw on the right, but KoalaPainter does not allow you to do this.

KoalaPainter also makes no provision for printing your pictures. There is no explanation of the format of the picture files stored by the program, either.

We were never able to cause KoalaPainter to fail. The program allows you to perform only legal operations, because you can issue commands only from the menu.

The one error message we saw told us that the disk to which we were trying to save a file contained a write-protect tab. KoalaPainter does report other disk errors, too, such as those that appear if you try to put a file on an unformatted disk.

The KoalaPad comes with a limited 90-day warranty. Once the warranty has expired, you can get a complete repair and refurbishment for $25 by mailing the pad to Koala Technologies' repair center in California.

The KoalaPainter program is copy-protected, so you cannot make a backup copy. If you damage the disk, you can get a replacement by sending $8 and the damaged disk to the company.

We enthusiastically recommend the KoalaPad to all Commodore 64 users. It is well designed and comes with an excellent drawing program. If you are a new user, the KoalaPad and KoalaPainter can help you get started without anxiety. If you are a programmer, the KoalaPad gives you a sophisticated pointing device to use with your programs. Either way, you win.

—_M. A. Olds_

REVIEW

Radiotap

Many people miss out on the most interesting part of shortwave-radio listening, because only some of the signals on shortwave are intended for human ears. Casually tuning across the bands with a shortwave receiver, you can hear a wide range of programs, ranging from the famous Overseas Service of the BBC and the official Soviet pronouncements carried by Radio Moscow to the endless chatter of amateur radio operators. If you listen carefully while tuning about, though, you can find many signals that make no sense to the human ear. Some of these are signals sent in Morse code — with some training and lots of practice, you can learn to decipher the rhythmic stream of dots and dashes. Many more are radioteletype codes that are meaningless unless you have a teleprinter.

Radiotap is a receive-only modem that is designed to connect your Commodore 64 to a shortwave radio, and it converts Morse code and most of the teleprinter codes into a stream of characters that your Commodore 64 can display. Included in the package is a program cartridge that provides the software to display Morse code, Baudot teleprinter codes and the ASCII code used for computer-to-computer communications. All these kinds of signals are scattered around the shortwave bands.

The process of setting up Radiotap can be a bit puzzling for newcomers. Although the manual does an adequate job of explaining which wires go where, you may still have some problems setting up your system. The first difficulty is that the people at Kantronics don't know what kind of external speaker connector your radio uses, so the cable they supply to connect the radio to Radiotap may not fit your radio. If you are handy with a soldering iron, you will find it a simple task to change the plug. If you don't even know what a soldering iron is, then your local stereo shop can supply you with an adapter or a new cable. Be sure to take both the radio and Radiotap with you when you go, though, because about two dozen possible connectors are available and many of them look alike.

A more serious problem is that not all shortwave radios can work with Radiotap. To operate successfully, the receiver must have a beat-frequency oscillator (BFO), which is a circuit that makes Morse code and radioteleprinter signals audible. Not all shortwave radios have a BFO. Small portable radios on which the shortwave bands are a secondary feature are less likely to have a BFO than are larger, line-powered receivers. If your shortwave radio has a switch labeled BFO or a mode switch with a code or CW setting, then you have a BFO. If you are tuned to a regular voice broadcast and turn on the BFO, you will hear a tone that varies in pitch as you tune across the signal.

Although Kantronics can't do much about these two difficulties, it could help with the serious deficiency that we encountered when we set up Radiotap. Like many devices designed for the Commodore 64, Radiotap is powered by a plug-mounted transformer. The transformer supplied with the unit we received was equipped with a switch that enabled it to supply either 6 or 9 volts DC. Unfortunately, neither the back panel of Radiotap nor the manual provided the slightest clue as to what the proper supply voltage should be. After establishing that the device could run on 6 volts, we took a deep breath

and flipped the switch to the 9-volt position. Nothing happened, and Radiotap continued to function normally — its operation was not affected by the position of the switch. At the very least, the documentation should tell you this. Given the number of transformer-powered accessories for the Commodore 64, many of which use the same power connector as Radiotap, it would be prudent for Kantronics to also label the power connector on the back panel of the device.

Connections between Radiotap and the Commodore 64 are simpler than those between Radiotap and the transformer; they are also well documented. A cable runs from the computer connection on Radiotap's back panel to the user port on the Commodore 64. Once you have connected the unit, you insert a program cartridge that contains the decoding software into the Commodore 64's cartridge slot and turn on the computer.

Once you have connected everything and turned on the power, things go smoothly, and the documentation is helpful. Tuning into these strange signals can be tricky if you've never done it before, but Kantronics makes it easy. Radiotap has a front-panel tuning indicator, and the portion of documentation concerning tuning is reasonably clear. If that isn't enough, Kantronics has provided an audiotape cassette that contains samples of properly tuned Morse-code and teleprinter-code signals. Even newcomers can quickly learn what Morse-code and teleprinter-code signals sound like by listening to the tape. If you have any doubt about whether Radiotap and the computer are functioning, you can feed these taped signals into the system as a test.

The Radiotap package includes a 248-page book of frequency listings to aid you as you browse through the shortwave bands. Entitled the *Confidential Frequency List,* this book includes information about the identities of thousands of shortwave stations, both those transmitting voice broadcasts and those using Morse code and teleprinter codes. It is actually a shortwave radio "phone book."

The performance of Radiotap in decoding on-the-air signals is good. Our only criticism is that it requires a fairly strong signal to operate properly. This is where a good-quality shortwave receiver and a good antenna can really help. Even with only a few feet of wire for an antenna and an inexpensive receiver, though, we were able to receive broadcasts from stations in Australia, South America and Europe. The signal performance of Radiotap is better on weak Morse-code signals than on weak teleprinter-code signals.

Although the device does have some difficulty deciphering Morse code sent by a sloppy telegrapher, Radiotap can keep up with even the fastest of telegraphers. We tuned in to some ham stations that were sending Morse code at rates of better than 75 words per minute. We suspect that these stations were using computers to generate their Morse code, because not even the military services have many operators who can perform at much more than half that rate unassisted.

Although the vast majority of the signals that you find on the shortwave bands use normal teleprinter codes, a few use a technique called bit flipping to encode their data, in an attempt to exclude casual listeners. These stations reverse the state of one or more of the bits that make up each character of a message. Radiotap has the ability to decode these signals; although you do have to try several bit-flipping patterns before the typical signal yields a plain text message.

InfoWorld
Report Card

Radiotap

	Poor	Fair	Good	Excellent
Setup	☐	■	☐	☐
Ease of Use	☐	☐	☐	■
Performance	☐	☐	☐	■
Documentation	☐	■	☐	☐
Serviceability	☐	☐	■	☐

Summary
Kantronics' Radiotap is a radio modem that enables you to connect a shortwave-radio receiver to your Commodore 64. With its accompanying software, it can decode Morse code and radioteleprinter signals. Casual listeners can listen to portions of the shortwave bands that were formerly accessible only to expert telegraphers and those with exotic communications equipment. Setup of the system may be tricky for someone who has little or no knowledge of shortwave radios.

Features of unit tested
☐ *Radio modem*
☐ *Decoding program supplied on cartridge*
☐ *Cables*
☐ *Tape with Morse-code and teleprinter-signal samples*
☐ *Frequency-listing book*

Suggested list price: $199.95

Kantronics, Inc.
1202 East 23rd Street
Lawrence, KS 66044
(913) 842-7745

The technique of bit flipping is only the most rudimentary form of data encryption, and it is not used when truly secure communications are required, so don't expect to stumble on a spy ring or a major military coup with your Radiotap. That doesn't mean that everything you intercept will be dull, though. In a single evening of monitoring, we caught resupply orders from a forestry task force that was fighting a forest fire, ship-to-shore messages requesting emergency medical information and signals from a group of radio amateurs who had ventured to an obscure island in the Pacific, just to put a station on the air from an unusual place.

All in all, we found Radiotap to be an enjoyable accessory for the Commodore 64. It enables Commodore 64 owners to be privy to a host of shortwave-radio transmissions that most shortwave receivers can receive but which are unintelligible to the untrained ear. Although Radiotap isn't an essential computer accessory for everyone, if you own a shortwave radio and a Commodore 64, it can greatly enhance your enjoyment of both and provide you with an inside view of modern communications systems in action.
—*Richard A. Milewski*

REVIEW

SD-2 Super Disk Drive

Micro Systems Development's SD-2 Super Disk Drive for Commodore computers is compatible with several Commodore disk drives and offers improved performance at a competitive price.

MSD documentation states that its Super Disk Drives are compatible with the Commodore Series 2000 (with BASIC Version 3.0 or higher), Series 3000 (with BASIC Version 3.0 or higher), Series 4000 (with BASIC 4.0), Series 8000 (with BASIC 4.0), Commodore 64 and VIC 20. For this review, we used the unit with a Commodore 64.

The documentation also states that the drives are upward compatible with the Commodore 2040 and read/write compatible with the 2031, 4040, 1540 and 1541 disk drives. For comparison, we tried a number of tests on both the SD-2 and a Commodore 1541.

The SD-2 has two drives, each with a total capacity of 174,848 bytes per disk, on 35-track soft-sectored disks, with 17 to 21 sectors per track. It uses a standard 5¼-inch, single-sided, single-density disk.

The SD-2 dual-disk drive is one of two packages that MSD offers for Commodore computers. The SD-1 single-disk drive is the other. Both the SD-2 and SD-1 have two interfaces, a dual Commodore-compatible serial bus and a Commodore-compatible IEEE parallel bus. Since the Commodore 64 does not come with an IEEE adapter cartridge, we tested our unit with a Batteries Included IEEE bus card.

You can change the disk-drive device number by two means. The SD-2 is shipped with device number 8

selected, the usual configuration. If you use more than one disk drive, you must give each a different device number. You can make a temporary change through software by using two program statements. This method requires you to turn on one drive, execute the statements, turn on another drive, execute two other, similar statements and so on, till all drives are on. These device numbers remain in effect only as long as the system remains powered up. You can make a more permanent change by making a simple hardware adjustment — you remove six screws, take off the disk-drive cover and unplug one or both of two jumpers. Later revisions of the drive require one or two jumper cuts. Both methods are well documented and easily performed.

Because the SD-2 is compatible with Commodore's 1541, you don't need special utilities to format disks or to read to or write from them. Anything that works for the 1541 also works for the SD-2.

The advantages of the SD-2 over the 1541 are twofold. The first is that the SD-2 has two drives in single unit, and the 1541 has one. Having two drives greatly speeds up and simplifies the backing-up process. Although Commodore is rumored to be planning a dual-disk drive for the Commodore 64, it does not have one currently on the market. The second is that the SD-2 can use the IEEE interface, which speeds up data transfers by a factor of 2 to 2½.

We performed a number of comparison tests between the SD-2 and the 1541.

We used the 1541 to back up a full disk (including track 18, for a total transfer in this test of 678 blocks). The method reads sectors, which, according to the BAM (block-available map), have information on them, into the computer's memory by way of the serial port. It then swaps disks when the

memory is filled up and writes the information back to the new disk, for a total of five swaps. It took us five seconds to perform each swap, and this time must be taken into account, because you have to "babysit" the entire process — if you don't, it would take even longer. Using this method with the 1541 took 24 minutes and 39 seconds, versus 17 minutes and 13 seconds when we used one drive of the SD-2 and the IEEE card. The latter's faster time is due to the IEEE interface.

Of course, the most efficient way to perform a backup is to use both drives of a dual-disk drive. This took less than 1 minute 57 seconds using the SD-2's backup facilities. (You both format a new disk and back up to it with the BASIC command OPEN 15,8,15,"D0=1":CLOSE 15.)

Loading a 30K program took 1 minute and 18 seconds from the 1541. Loading the same program from the SD-2 with the IEEE card took 39 seconds — that is, it was twice as fast. To give the 1541 a fair chance, we tried loading the same program with the SD-2 connected to the serial port. This took 1 minute and 25 seconds.

Formatting a disk on the SD-2 with the IEEE card took under 18 seconds, as compared to 1 minute and 25 seconds with the 1541 — that is, it was nearly five times as fast.

We wrote a BASIC program to exercise the drive's read/write head. It read data into the disk drive's memory buffers, but not the computer's, moving the head ten times between track 1 and track 35. On the 1541 this took 27 seconds; on the SD-2 with the IEEE interface, it took 8 seconds.

The unit is rugged and seems reliable. Although the 1541 has a reputation among Commodore owners for easily going bad (that is, developing read errors), we have an acquaintance who has had an SD-2 for six months

Info World
R e p o r t   C a r d

SD-2 Super Disk Drive

	Poor	Fair	Good	Excellent
Setup	□	□	□	■
Ease of Use	□	□	□	■
Performance	□	□	□	■
Documentation	□	□	■	□
Serviceability	□	□	□	■

Summary
We found this dual-disk drive to be a superior product for the Commodore 64. It is fast, particularly when you use it with an IEEE interface, which the 1541 single-disk does not support.

Features of unit tested
☐ *Two disk drives*
☐ *Compatible with most Commodore computers*
☐ *One parallel (IEEE 488) port and two serial (Commodore-compatible) ports*

Suggested list price: $695

Micro Systems Development, Inc.
10031 Monroe Drive, Suite 206
Dallas, TX 75229
(214) 357-4434

and has had no problems. He uses it extensively, performing lengthy machine-code assemblies that run the drive continuously for 30 to 40 minutes at a time. He tells us that the unit does not heat up, nor has he experienced any read errors.

One drawback to the MSD drives is that some of the software available for the Commodore 64 is not compatible, due entirely to the copy-protection methods that some software developers use. (This does not include Commodore's own software.) Among such software are programs from Electronic Arts and Koala Technologies. The latter, however, has issued a disk specifically for the MSD drives. Aware of the problem, MSD has upgraded its ROMs to accommodate the software protocol of several popular programs for the Commodore 64, including Mirage Concepts Database Manager, Continental Software's The Tax Advantage and Timeworks' Checkbook. We have heard of some programs that, the publishers claim, can override the copy-protection schemes, thus permitting the use of copy-protected software in the SD-2, but we have not tried any of them.

In addition to incompatibility problems caused by copy-protection schemes, you should be aware of another pitfall. The software that an IEEE interface card uses can occupy the same memory area as some application programs. If you plan to use the SD-2 with an IEEE interface card, you should make certain that the application you are interested in and the interface program do not conflict. If they do, you can always use the drive in its Serial mode.

Two other small defects exist. The drive mechanisms are not labeled, but they should be. You probably won't have your SD-2 long before discovering that drive 0 is on the left and drive 1 on

the right. Beneath each disk door is an activity light; to the left of the drive doors are three LEDs, which are labeled POWER, DRIVE 0 and DRIVE 1. You can't immediately tell which drive is being accessed because there seems to be no direct correlation between the drive lights and the activity lights.

Also, it is physically impossible to hook up at the same time both the IEEE interface and both serial connectors. You might want this ability so that you can more readily switch back and forth between software that works on one but not the other.

The operating manual is clear and well written. Examples are given for all commands. This is not, however, a technical manual; no schematics are provided. The manual loses a few points for not having an index — and a few more for being a stapled photocopy of daisy-wheel-printer output.

Setting up the SD-2 is easy. You just plug it in and connect the serial port of the Commodore 64 to either of the two serial connectors on the drive using a supplied cable. If you want to connect a printer or another drive, it just daisy chains from a second connector on the drive.

When you turn on the power, the unit performs a self-test diagnostic for a few seconds and is almost immediately ready to use. If it fails (which it never did for us), the power-on LED flashes in a pattern that indicates the source of the problem.

If an error occurs during operation, you can query the drive to determine the cause of the error by using four simple programming statements.

MSD provides a six-month warranty with each unit; and the company provides good support for its products. Someone always returns calls and gives straight answers to users with questions. On two occasions the company supplied our acquaintance

with upgraded ROMs at replacement costs.

The SD-2 is an excellent dual-disk drive for Commodore computers. In our tests, it performed faster and more efficiently than Commodore's 1541 single-disk drive.

—*Michael Wiesenberg*

REVIEW

Cardboard/5

The Cardboard/5 is a plastic-encased circuit board that has five plug-in slots. It plugs into and extends the Commodore 64's game port. Using the Cardboard/5 allows you to plug in five cartridges simultaneously, which is handy for those who don't want to wreck their Commodore machines by constantly yanking out cartridges and then jamming in others. It is particularly useful if you have a couple of cartridge-based games, a monitor or language program and an application program such as a spreadsheet.

Cartridge programs start as soon as you turn on the computer, without the long waits you experience with a cassette drive or the cursedly slow 1541 disk drive. Also, if your main program is on a cartridge, you only need to invest in a single disk drive on which to run your data disk. Many programs that require two disk drives use one of the drives just to hold the program disk.

A 27-page instruction booklet accompanies the Cardboard/5. This manual's sections include: What is Cardboard/5?; Installing the Cardboard/5, Lights . . . Camera . . . Action!; Normal Operation; Special

Operation, Theory of Operation, Parting Shots; and several appendices. The booklet has no index and no table of contents, but the writing is simple and generally clear.

The introduction advises you to read through the manual. Fortunately, you don't need to understand the section that is the hardest to understand — the theory behind the use of the LEDs and switches. To use the Cardboard/5, you don't need to know much more than where the Commodore 64 game port is. If you do want to fully appreciate why the Cardboard/5 works, you'll have to dig into some complicated explanations.

The reason for that complexity is that when a cartridge is plugged into the Commodore game port, the computer senses the presence of the cartridge and changes its internal addressing to suit the new situation. In most circumstances, you cannot have more than one cartridge on at a time, and must, in fact, protect the Commodore 64 from knowing about the other cartridges. That is what the instruction booklet is for. Each of the five cartridge slots on the Cardboard/5 has four LEDs and two switches associated with it, which you have to interpret and set properly if you want to know just what is going on.

The Cardboard/5 itself is about 1 inch tall (to the top of the cartridge slots), 7 inches long and 5½ inches wide, and it sticks out behind the computer. The card's width and the placement of the plug that fits the game socket make the edge of the Cardboard/5 line up with the side of the Commodore 64.

The Cardboard/5 casing is the same color as the computer's case, though the green of the cartridge sockets and red, white, green and yellow of the LEDs and switches add a little color to the system. You can pop off the case of the Cardboard/5 easily to take a look at

InfoWorld
R e p o r t   C a r d

Cardboard/5

	Poor	Fair	Good	Excellent
Setup	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Serviceability	☐	☐	■	☐

Summary
The Cardboard/5, which plugs into the Commodore 64's game port, allows you to plug in five cartridges at once. If you often switch back and forth between different cartridge programs, this device can save you some time and effort, as well as decrease the wear on your cartridges. The unit itself is not particularly rugged, however, and the documentation lacks clarity in some sections.

Features of unit tested
☐ *Five cartridge slots*
☐ *Four LEDs and two selector switches on each slot*

Suggested list price: $79.95

Cardco, Inc.
300 South Topeka
Wichita, KS 67202
(316) 267-3807

the integrated circuits and other electronic components on the card. The Cardboard/5 is well put together but is not particularly rugged.

A fuse and a large red button at the back of the Cardboard/5 complete the package. Underneath the circuit board is a piece of styrofoam. Unfortunately, the foam isn't quite thick enough to support the Cardboard/5 completely. This doesn't agree with the instruction in the manual that tells you to make sure the Cardboard/5 rests on the desktop. When we plugged the Cardboard/5 into our Commodore 64, the only point at which the foam touched the desk was at the extreme rear of the board. The board fits in the game port snugly, but with this lack of support and its awkward extension behind the Commodore, this piece of hardware makes your Commodore system a little less secure.

The switches on the Cardboard/5 also tell the Commodore what memory map to use. That is, depending on the setting of the switches, the Commodore 64 uses different parts of its RAM for various purposes. This doesn't matter to average users, but programmers will find the memory-map information crucial.

The documentation leads you through plugging in the Cardboard/5 and then setting the switches. If you put in a cartridge and then don't see the proper LEDs light up, you should remove the cartridge (such a cartridge requires a special setting). Four of the five cartridges we tested fell into this category. These special settings are discussed in the manual's Special Operation section.

When you do have a cartridge that is set properly, and you want to use it, you just flip the two switches to on and then press the Reset button at the back of the Cardboard. This makes the Commodore 64 act as though that

cartridge were just plugged in by itself. When you've finished, you move the switches to off and press the Reset button again.

The Special Operations section of the manual discusses the cartridges that don't light up the proper LEDs in normal operation. These cartridges want the Commodore to use a different memory map. Because there are a variety of memory maps, the cartridges can interfere with each other. Section E of the manual tells you how to read the LED patterns to set up these cartridges properly. Some cartridges act as though they are part of the Commodore system, but others take a part of the computer's memory and use it for their own purposes. After the cartridge is turned off, that memory is still dedicated to it. This can mess up the next cartridge.

Appendix A in the manual explains how some programs are designed so that two cartridges can be enabled at once. This is nice if, for instance, you want to use an 80-column cartridge and a word-processing cartridge at the same time. We did not test this capability.

Unfortunately, after we had read through six pages of the manual that give an example of what to do if a cartridge doesn't work, we were left baffled. The manual also contains a seven-page description of the theory of operation of all the switches and indicators. This might be interesting to some, but most users just want to see their cartridges working without having to plug and uplug them over and over again.

Well, this paragraph from the manual is the magic paragraph that tells you how to deal with cartridges that require special switch settings:

"Solutions to the problem will vary with the number and types of cartridges inserted. There are too many different types of cartridges being produced now — and probably some that haven't been

produced yet — and too many possible modes of operation for this manual to give a complete list of switch combinations. Trial and error, that is, trying several combinations of switch positions on each cartridge, may be the easiest method." Why not say that sooner and just save all the theoretical stuff for the appendix?

Once you find a combination of switch positions that does the trick, stick with it. You can experiment easily, and every one of our cartridges worked after just a few tries.

The Cardboard/5 is guaranteed for as long as it is owned by the original owner. Cardco promises to repair or replace any part of the Cardboard/5 if it doesn't work because of manufacturing or material defects. You have to return the Cardboard/5 undamaged to Cardco, along with a purchase receipt, to take advantage of this warranty. The customer-service department is open from 1:00 to 5:00 P.M. (Central Time), Monday through Friday; you can also write to that department.

Just plug the Cardboard/5 in, and you can use as many as five cartridges without any more plugging or unplugging. Although it is not useful to all Commodore 64 owners, this ability is useful for those who use many cartridges. We don't have any major quarrel with the Cardboard/5 in any of the rated categories. The documentation makes the setup sound more complicated than it is, however, and its construction is a little less solid than we would like.

—*Phillip Robinson*

REVIEW

Cardprint +G

Cardco's Cardprint +G graphics interface card for Commodore computers is a Centronics-compatible printer interface that lets you use the many printers that do not interface directly with the Commodore 64. Although Commodore makes some high-performance printers, you can purchase cheaper printers that have similar performance from other manufacturers. Because they don't connect directly to the Commodore 64, you need an interface card to convert Commodore's nonstandard PET ASCII serial output into standard ASCII Centronics-compatible output.

If you want to print graphics (including such things as boldfacing on some dot-matrix printers), you need a graphics card. The Cardprint +G graphics card has a built-in character set that enables most printers to print characters that are not part of their own character set just as fast as they would print any other characters. The built-in character set also includes Commodore's special graphics characters. The interface has ROM routines that emulate the Commodore 1525 printer when they dump a high-resolution or multicolor bit-mapped graphics screen so you can directly print graphics produced by many applications.

Cardco's documentation states that its interface "performs correctly with all programs written to conform with the Commodore VIC 1515/1525E printer codes as set out in the appropriate Commodore publications" and that it works with both the VIC 20 and Model 64 printers. The documentation gives explicit instructions for using the card

InfoWorld
R e p o r t   C a r d

Cardprint +G

	Poor	Fair	Good	Excellent
Setup	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Performance	☐	☐	☐	■
Documentation	☐	■	☐	☐
Serviceability	☐	☐	■	☐

Summary
Cardco's Cardprint +G graphics interface card enables you to use the many Centronics-compatible printers that are available — you are no longer limited to printers made by Commodore for the 64. It works well, although printing graphics can be difficult due to inadequacies in the otherwise excellent documentation that accompanies this product.

Features of unit tested
☐ *Centronics parallel ribbon connector*
☐ *Built-in ROM character set*

Suggested list price: $69

*Cardco, Inc.
300 South Topeka
Wichita, KS 67202
(316) 267-3807*

with many dot-matrix printers, including all Epson printers; Star Gemini 10X and Delta 10; ProWriter; C. Itoh 8510; NEC 8023; Okidata 82, 83, 84, 92, 93 and 94; Seikosha 100; Axiom 100; Gorilla Banana; BMC; and Panasonic KXP1090. It further states that the card interfaces with most daisy-wheel (parallel-port) printers. For this review we used the unit with a Commodore Model 64 and a Leading Edge Gorilla Banana, a Star Gemini 10X dot-matrix printer and a Daisywriter daisy-wheel printer.

With the two dot-matrix printers we tested, the Cardprint +G properly translated Commodore graphics characters into dot-addressable graphics, "telling" the printer where to position its printhead and which dots to turn on.

The interface also worked well with the Daisywriter, a daisy-wheel printer. If you have a daisy-wheel printer, though, you might consider buying Cardco's less-expensive Cardprint A or Cardprint B cards. The Cardprint +G is only one of several interfaces that Cardco offers for Commodore computers, and you don't need its graphics capabilities if you are using a daisy-wheel printer.

The Cardprint +G comes with a Centronics-type parallel ribbon connector that attaches to the printer and a cable that connects to the computer's serial port. The interface gets its power from the computer through a separate power connector that attaches to the cassette port of the Commodore 64. This power connector has another edge connector that you can use to daisy-chain other devices that use the cassette port.

Setting up the Cardprint +G is easy. You just plug the ribbon connector into your printer, connect the serial cable to the serial port of the Commodore 64 and plug the power connector into the computer's cassette port. Make sure

that the connector faces down, with its small circuit board above the connector. A tag on the connector warns in large letters, "Stop. Read instructions before using." The warning is important, because the connector could go in either way. Probably you would do no harm by attaching it incorrectly, but don't take the chance. The documentation clearly explains the proper method of attaching the connector.

If you have a cassette recorder, it plugs into the small circuit board on the connector and operates normally. If you use a disk drive, the serial cable plugs into the back of the disk drive and not into the computer. This, too, is clearly explained in the manual.

The first time you install any new printer, you must change the switch settings on the card because each printer requires different switch settings. The DIP switches are inside the case and to reach them you must remove four screws and take the unit apart. This is not difficult to do, but it could be bothersome if you have more than one printer.

You can change the printer device number by two means. The Cardprint +G is shipped with device number 4 selected, the usual configuration. Using programming, you can select either device number 4 or 5 for the printer, which permits you to daisy-chain two printers and to print to either without disconnecting the other. The Cardprint interface card and its associated printer must be the last link in such a chain, though. You can also change the preselected device number from 4 to 5 by changing one of the internal switch settings. Both methods are well documented and easy to perform.

In addition to settings for various printers, optional switch settings permit you to control conversion of Commodore ASCII to standard ASCII and to control automatic line feed. Both

functions can also be performed by software.

The Cardprint +G supports Commodore's print protocols, so you don't need special utilities to use most printers. The few notable exceptions are well documented in the manual. For most printers, anything that works for the Commodore VIC 1515/1525E printers (and presumably their successors) also works for printers connected through the Cardprint +G.

Another useful feature of this board is its ability to print hexadecimal representations of all characters sent to the printer. This feature lets you debug print routines.

The easiest way to use the interface is in normal Print mode with a word processor. In this mode it does everything claimed for it. You just hook it up and use the word processor's print routines, and it works well.

Printing graphics is trickier, mainly because the card's otherwise excellent documentation is poor in describing how to do it. The interface does everything claimed for it, but getting the information from the documentation is time-consuming.

Currently, Cardco supplies its Cardprint A manual with some supplemental information that applies to the +G card. One document is an eight-page booklet entitled "Corrections and Additions," but it contains a few mistakes. Another is a single sheet folded over to make what you might describe as a four-page document. Called the "Cardprint +G/Instructions Temporary Addendum Sheet," it lists switch settings for the printers cited at the start of this review, a few special code sequences and two new secondary addresses. One address prints the hexadecimal representations of characters sent to the printer; the other prints the characters in the internal ROM character generator in the

interface. The start of the addendum reads, "The new manuals are at the printer, and will be sent to you upon receipt of your guarantee card." We hope that, when the promised manual finally appears, it provides a better description of graphics printing.

The rest of the documentation, contained in a digest-size 47-page manual produced on a daisy-wheel printer and cheaply printed, is good. The manual explains almost everything you need to know. Printer codes, error messages and demonstration programs are provided. The manual has no index.

We have some criticisms of the unit. First, it is made of plastic and doesn't seem strong, although this is not a major problem because you don't need to handle it roughly in normal usage. Second, the cable that runs to the computer is not anchored within the housing — if you pull hard on it, it comes out, ripping several wires from their connections to the board. Third, the protruding edge connector of the power connector could endanger your equipment.

If you don't have another device, such as a cassette recorder, plugged into it, six metal strips are precariously exposed. You could easily short your computer or the interface by accidently dropping something metallic onto the connector.

For support, Cardco prints its phone number in the manual and encourages people to call if they have problems. The documentation states, "If you run into a severe problem, don't hesitate to call us. We want to get you on line!!" Cardco provides a lifetime warranty with each unit.

Cardco's Cardprint +G is a useful product for the Commodore 64. You need a printer interface if you want to use printers other than those made by Commodore, and the Cardprint +G is a good product, particularly if you want

InfoWorld

Report Card

1702 Monitor

	Poor	Fair	Good	Excellent
Setup	☐	☐	☐	■
Ease of Use	☐	☐	☐	■
Performance	☐	☐	☐	■
Documentation	☐	☐	■	☐
Serviceability	☐	☐	■	☐

Summary
Commodore's 1702 Color Video Monitor, for use with the Commodore 64, is a good buy. It gives you better images, color and sound than a television. All control knobs are on the front, making it convenient for you to adjust the screen image. Check the monitor-computer cable connection on your machine at the store where you purchase the monitor — our connection was too loose.

Features of unit tested
☐ *14-inch color monitor*
☐ *5-DIN two-jack connection*
☐ *8-DIN three-jack connection*
☐ *Speaker*

Suggested list price: $279

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

to get the most out of a graphics printer.
—*Michael Wiesenberg*

REVIEW

1702 Color Video Monitor

The 1702 Color Video Monitor is an economical and well-designed alternative to your television set. We recommend it as a good buy for Commodore 64 users.

You can use the monitor with either of the two common video-output standards: the microcomputer industry's common 5-DIN, two-jack connection and Commodore's own 8-DIN, three-jack connection. The 1702 comes with an 8-DIN, three-jack cable.

The monitor is easy to set up — you just unbox it and plug it into the computer. Connecting the interface cable to your computer is easy because it only fits into the computer one way. The jacks on the monitor end of the cable are color coded.

The two-jack cable plugs into the front of the monitor, and the three-jack cable plugs into the back of the monitor. A sliding switch on the back of the monitor allows you to select which input jacks the monitor will use. For example, we attached both an Atari 800 (which uses the 5-DIN interface) and a Commodore 64 (which uses the 8-DIN interface) to the monitor simultaneously and then used the switch to select which computer we wanted to use with the monitor. This worked out well. Although occasionally we could hear sound from the unselected system, the

video signals never conflicted.

The monitor has good resolution — it produces a much sharper picture than does a television. Colors are more vivid than on the television, and the sound quality is excellent — clear and resonant. This is not surprising, since sound is a strong point of the Commodore 64.

The 8-DIN Commodore connection provided more brilliant colors and sharper images than the 5-DIN connection. The difference in performance is due to the ability of the 8-DIN, three-jack connection to carry more information to the monitor than does the 5-DIN connector. The sound quality was the same with both connectors.

We experienced much less eye fatigue when we used the monitor instead of the television for text-oriented programs, such as word processors and some adventure games. The monitor gives the characters sharper edges and makes it easier for the eye to focus on them.

The monitor is 14 inches high, 16 inches deep and 15 inches wide and has a 14-inch diagonal screen. The case is made of a tan and black plastic that matches other Commodore computer products. The power cord is about 8 feet long.

All the picture controls are on the front of the monitor, behind a small swing-down panel. The knobs are easy to grasp and easy to turn. Each of the tint, color, brightness and contrast controls has a slight click at its default setting, making it easy to undo overzealous adjustments. The front of the monitor also contains a small power-indicator LED and the power switch.

The only problem we had was with the 8-DIN connection. The plug fitted into our Commodore 64 loosely and moved easily. Whenever we moved the computer, the jack jiggled, and

occasionally the connection was impaired. It was simple enough to push the jack back in, but we found it annoying to have to worry about it every time we adjusted the keyboard position.

The manual is slim but good. It has clear, informative drawings of the monitor and its connections. It does not assume that users are knowledgeable and explains everything, including the purpose of every control, carefully.

The manual's description of the setup procedure is especially good. Excellent pictures identify the different jacks and cables, and the manual explains how inexperienced users can determine which kind of interface their computer has and which kind of cable to use. The manual does not give any technical specifications for the monitor, but most users probably won't miss this information.

The manual has a list of 19 important safety precautions related to installation, use and service. These precautions tell you what you can do to damage the set, what you can do to let the set damage you and when the set needs service.

The monitor, which comes with the standard Commodore 90-day warranty, is not user-serviceable. If any problem develops, the manual states that you should stop using the monitor immediately and take the set to your dealer or a qualified technician. Alternatively, you can ship it to a Commodore Computer Service Center — the warranty leaflet gives two addresses, one in Pennsylvania and one in California. The leaflet also gives a California telephone number you can call for service information.

The 1702 monitor provides you with a much better display for your Commodore computer than does a television. It produces good color and sound and sharp images. Best of all, its price is reasonable. We highly recommend the 1702 monitor.
—*M. A. Olds*

REVIEW

1650 Automodem

The Commodore 1650 Automodem is Commodore's attempt to provide its users with an advanced modem at a reasonable price. We tested the Automodem with the Commodore 64, although you can also use it with the VIC 20. The Automodem's tricky physical connection to the computer and its inadequate documentation make it difficult for us to recommend it wholeheartedly.

The 1650 is a direct-connect modem that plugs directly into your telephone line. It is compatible with any modular-jack telephone, including unitary phones such as the Trimline. Earlier modems for the VIC 20 and Commodore 64 required a telephone with a standard handset, because the modems plugged into the body of the telephone at the handset jack.

The Automodem transmits at 300 baud (about 30 characters a second). It supports half- and full-duplex transmission. It can also send seven-bit or eight-bit words; zero, one or two stop bits; and even, odd, space and mark parity.

If you use it with the right software, the 1650 is capable of automatically dialing and answering the phone, although it cannot answer automatically when you use it with the VIC 20.

Automodem comes with cassette-based, dumb-terminal software for the

InfoWorld
R e p o r t   C a r d

1650
Automodem

	Poor	Fair	Good	Excellent
Setup	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Performance	☐	■	☐	☐
Documentation	☐	■	☐	☐
Serviceability	☐	■	☐	☐

Summary
The Commodore 1650 Automodem is a direct-connect modem that works with the Commodore 64 and VIC 20 computers. It is easy to set up, but the modem's connection to the computer is poor and its documentation is barely adequate. It comes with dumb-terminal software that enables you to set the modem's transmission characteristics and to automatically dial and answer the phone, although the auto-answer feature is only available on the Commodore 64. Although it is adequate for novices, you may want to buy better software.

Features of unit tested
☐ *300 baud*
☐ *Auto-answer and auto-dial*
☐ *Half- or full-duplex transmission*
☐ *Modular telephone jack*
☐ *Term 64 software (on cassette)*

Suggested list price: $149

*Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100*

VIC 20 and for the Commodore 64. This software allows you to set your choice of the modem's transmission characteristics and to use its automatic dialing and answering features. The software transmits characters from your keyboard through the modem and displays the characters it receives on your monitor. It does not allow you to send or receive files, however.

The Automodem is easy to set up. You plug the 1650 unit directly into a slot on the back of your computer, plug your phone line into one jack and plug your telephone into another. An extra phone cord for the modem-to-telephone connection is included with the modem.

Once set up, the modem is simple to use. You load appropriate software, move a sliding switch from T (for telephone) to D (for data), make sure another switch is set at O (for originate), dial up the number you want and transmit your data.

The accompanying software is not much more difficult to use, but that is partly because it has limited capabilities. You make all your choices with function keys and menu selections. All the transmission characteristics are preset to be compatible with CompuServe and other such systems, so inexperienced users don't need to worry about protocols if they just want to call up a commercial bulletin board.

The Automodem software can store several 30-digit numbers in its dialing directory, ten for the Commodore 64 and five for the VIC 20. It is not easy to store numbers for automatic dialing, however. The dialing directory is stored within the body of the terminal program. To store a number, you must list the program and then change a field of asterisks to the desired telephone number. If you enter any characters besides numerals (including DEL if you try to correct a typo), the program will not run correctly later. You must reload

and rerun the program to correct any mistakes. To save numbers indefinitely, you must save the altered copy of the program on tape or disk.

Term 64, the software supplied with the Automodem for use with the Commodore 64, is adequate for beginners. It is just enough to get you started, but if you plan to use your modem seriously, you will need to get better software. Several nice programs are available, but they will cost you at least $40 each.

The modem itself performs well. We tested it by calling up CompuServe. (You get a free, one-hour CompuServe account with the modem). We saw some junk characters that were artifacts of CompuServe's transmission scheme but saw no evidence that the modem made any transmission or reception errors.

We do have one major complaint about the modem, though. If you disconnect from the remote system (hang up) without moving the data/ telephone switch from D to T, the modem tries to keep sending what it hears into the computer. In our case, it caused junk characters to appear on our monitor. Once, however, we disconnected and went into another room, then came running back when the printer started chattering. Somehow the modem had managed to start the printer, and all the junk characters were appearing there. We could just imagine what would have happened if it had managed to start the disk drive! Either the software or the hardware should be improved to prevent this sort of disturbing error.

The modem's physical design is poor. Because the large plastic box (6 × 4 × 1 inches) plugs directly into the computer's main circuit board, it threatens the integrity of the board every time you move the computer even a little bit. Furthermore, the sliding switches are stiff, so that you have to

pin down the modem to slide them. If you don't, you could cause damage while you are wrestling with a switch.

One well-meaning person who was ignorant of the nature of the modem's connection tried to move the modem to a more convenient place by lifting it. Luckily, only the screw holding down the board was damaged as a result. We took the computer to a local Commodore service center to have the board checked, and the technician we spoke to admitted that the Automodem's design was dangerous to the board.

Overall, we think the documentation that comes with the 1650 Automodem is barely adequate. The instructions for setting up the modem are good. Most of the rest of the manual explains how to use Term 64, but it is not always clear which comments apply to the software and which to the modem itself.

This modem is designed for Commodore home computers, and the manual should be written for inexperienced and apprehensive users. It is not. Various transmission characteristics, such as baud and duplex, are mentioned often enough to make you realize they are important, but they are never explained well. The manual's standard advice is, "If you have problems with a transmission, try different combinations of settings." That's easy to say, but inexperienced users will have trouble finding a correct combination.

The manual's appendix contains two short communication programs. The first one is a dumb-terminal program that has no auto-dialing. The program contains so many typographical errors that we were unable to fix it up to run it. The second program can add automatic dialing and answering to an existing communication program. It looked much cleaner, but we didn't type it in.

The modem comes with Commodore's standard 90-day limited warranty. The warranty instructs you to go to your dealer for service. If necessary, you can send your modem to the Commodore Service Center in West Chester, Pennsylvania.

Why would you want to buy the 1650 Automodem? We can think of two reasons — first, because you want to be able to use your modem with any telephone that has a modular jack, and second, because you want to have an automatic-answering capability. This latter feature would allow you to run a bulletin board on your Commodore 64.

The 1650 is the least expensive modem for the Commodore 64 that offers automatic answering. If this capability is not important to you, then you can buy less expensive, less elaborate modems to use with the Commodore 64, but if you want the Auto-Answer feature, the Automodem is worth the money. We do think, however, that you'll need better software than the included Term 64.
—*M. A. Olds*

REVIEW

STX-80 Printer

The STX-80 is a thermal dot-matrix printer for computers that have a Centronics port. Its compact size and quiet operation make it an excellent printer for the hobbyist. The STX-80 is inexpensive, easy to operate and rugged.

The STX-80 measures only 3.9 × 13.9 × 7.5 inches and weighs only 7.7 pounds. Because you can store

InfoWorld

Report Card

STX-80

	Poor	Fair	Good	Excellent
Setup	□	□	□	■
Ease of Use	□	□	□	■
Performance	□	□	□	■
Documentation	□	□	□	■
Serviceability	□	□	□	■

Summary

The STX-80 is an inexpensive, portable, thermal, dot-matrix printer. It weighs under eight pounds, takes up less than a square foot of desktop space and is relatively quiet. It may not have every fancy feature and it may be a bit slow for some people, but its low price tag more than compensates for these drawbacks. If you've got a Centronics-interface computer or the ability to add a parallel interface, consider the STX-80.

Features of unit tested

- ☐ *Thermal dot-matrix printing*
- ☐ *5 × 9 dot matrix*
- ☐ *60 cps (burst speed)*
- ☐ *Bidirectional, logic-seeking printhead*
- ☐ *Centronics parallel interface*
- ☐ *ASCII, international and graphics characters*

Suggested list price: $199

Star Micronics, Inc.
200 Park Avenue
New York, NY 10166
(212) 986-6770

paper inside the printer, eliminating the need for room in back of the printer, the STX-80 is easily portable — you can just put it in a bag and take it with you.

Because the STX-80 is a thermal printer, it doesn't need a ribbon, but of course, you are unable to use normal paper and must use thermal paper instead. This restriction shouldn't be a problem unless thermal paper is hard to find in your area.

The STX-80 has a 60-cps (characters per second) burst speed. This means that the printer can print 60 characters per second, excluding the time (about 110 milliseconds per line) that it takes to do a line feed. This is slower than most printers; on the other hand, most printers cost about $100 more.

The printhead is bidirectional — it prints both forward and backward. It is also logic seeking, meaning that it can figure out the fastest way to print a line. In our opinion, this feature makes the STX's speed acceptable.

The character set of the STX-80 is good. In addition to the standard 96 ASCII characters, you can use 51 international characters and 64 block-graphics characters. The resolution of these characters is good. The character matrix is 5 × 9, the block-graphics matrix is 6 × 6 and the dot-image graphics mode is 8 × 480. If you have a Commodore computer, the STX-80's block-graphics character set matches your computer's graphics character set, which makes it especially easy to print block-graphics pictures with this computer-printer combination.

You select the international characters using the printer's DIP switches, which are located at the bottom of the paper well. This location is convenient enough to get to when you need to, but it's hidden well enough to prevent other people's fingers from toggling the switches. You can also use

the DIP switches to select the type of interface and the page length that you want to use.

The STX-80 also has enlarged characters, but this is the only alternate font available. If you plan to do a lot of word processing on the STX-80, bear in mind that it cannot do subscripts, superscripts, backspaces or underlines.

The STX has a Self Test mode that checks out the printer; it allows you to check the printer without having to turn on your computer. You invoke the Self Test mode by pressing the LF (line feed) button and powering up the printer. The self-test stops as soon as you release the LF button, and the printer then goes back on line. One missing feature on the STX-80 is a form-feed button; this is not a serious handicap, though, because the STX uses roll paper.

Dot-image-graphics commands allow you to print graphics on the STX-80. The dot-image graphics are difficult, but not impossible, to use. Dot-image graphics have many uses, the most common being user-definable characters. You can also use dot-image graphics to plot graphs and charts. The manual shows an impressive sphere image that the STX-80 generated by using dot-image graphics, but unfortunately, it doesn't list the program to generate this image.

The STX-80's few control characters are simple to use. You can instruct the printer to do form feeds, enlarged print, line feeds, carriage returns and printing of dot-image graphics, and you can set line spacing and tabs. Although the STX-80 lacks some of the exotic functions that you can find on other printers, its control characters are adequate.

The bidirectional printhead in the STX-80 has a recommended life of 20,000,000 characters, and the hardware has a mean life between

failure of 5,000,000 lines.

The STX-80's manual is good. It steps you through the use of your printer, and it contains an index and a quick-reference card. It also contains example listings for many popular computers such as the Apple II and II Plus, Atari 400 and 800, Commodore 64 and VIC 20 and Osborne's computers. Because the manual is spiral-bound, you can easily type in these program listings without needing a third hand to hold the manual open.

The STX comes with a 180-day warranty on the printer and a 90-day warranty on the printhead. If you should have any problems with it, you can either take it to one of the many dealers that can fix the STX-80, or you can send it back to Star, and the company will fix or replace it.

The setup of the STX-80 is a snap. You simply plug the printer into your computer, plug the printer into an outlet and turn on the printer. The only problem you might have is that of incompatible cables, but this problem is easily solved if you buy the necessary Centronics cable or interface for your computer.

The overall performance of the STX-80 is excellent for its price. Although it does have a slight problem when it prints multipage documents and listings because it uses roll paper, if you want to print small listings and documents, the STX-80 works well. Its print quality is good, it's small and it's relatively quiet — the perfect portable printer for home hobbyists who can't afford a more expensive one.
—*Kevin Cheung*

REVIEW

Microline 92

The Okidata Microline 92 printer is fast, versatile and easy to use. It offers a broad selection of print qualities, fonts and formats. It would be a good choice for Commodore owners who do a lot of printing or who need economical high-quality printing.

With the Microline 92, you can choose from data-processing-quality printing, emphasized or enhanced printing (two different kinds of boldface) and correspondence-quality printing. Each print style is available in 10 cpi (characters per inch), 12 cpi, 17½ cpi and 5 cpi (double width).

The printer uses the full 96-character ASCII set. You can also use all-points-addressable (APA) graphics to define your own characters. It has true descending characters and full-size superscripts and subscripts. You can also use vertical and horizontal tab settings.

The Microline 92 comes with a fixed-pin feed that accepts 9½-inch-wide tractor-feed paper and friction-feed paper up to 8½-inches wide. You can also buy a roll-paper stand or an optional tractor-feed unit that accepts paper of various widths.

The printer uses a parallel interface. The Commodore 64 is designed to work with a printer that has a serial interface, so you need some sort of adapting interface cable. We attached the printer to a Commodore 64 with The Connection by Tymac, an "intelligent" interface box. We didn't use any of the formatting or control features of the interface but used it only to pass all data straight through to the printer.

The printer is easy to set up for use

InfoWorld
R e p o r t   C a r d

Microline 92

	Poor	Fair	Good	Excellent
Setup	☐	☐	■	☐
Ease of Use	☐	☐	☐	■
Performance	☐	☐	☐	■
Documentation	☐	☐	☐	■
Serviceability	☐	☐	☐	■

Summary
The Okidata Microline 92 is an excellent parallel-port printer that you can use with the Commodore 64, although you do need to buy a separate cable to connect it to the computer's serial interface. This printer is fast, easy to use and produces high-quality print in a variety of fonts and formats. We recommend it.

Features of unit tested
☐ *Impact printing*
☐ *160 cps*
☐ *Bidirectional printhead*
☐ *5, 10, 12 and 17½ cpi*
☐ *Centronics parallel interface*
☐ *Fixed-pin feed*

Suggested list price: Microline 92, $599; tractor unit, $50

*Okidata Corporation
532 Fellowship Road
Mount Laurel, NJ 08054
(609) 235-2600*

with the Commodore 64. The connection box plugs into the back of the disk drive with a 5-DIN serial cable and into the back of the printer with a 36-pin parallel connector.

You need to make only two settings. First, you must set a dial on the front panel to specify what paper length you will be using. To do this, you use the table in the manual to translate from inches to the 0-to-9 scale on the switch. (For 8½-inch-wide paper, you set the dial to 7.)

You must also change one small switch inside the printer's case. This is not complicated, but our thumb-fingered tester didn't find it easy. To remove the case, you insert a long Phillips screwdriver into two, deep, dark shafts in the case and unscrew the mounting screws. After setting the printer to expect external line feeds, to put the case back on, you have to put the screwdriver down each shaft and get it into the end of the screw — no mean feat — and then tighten it.

The instructions for setting up the printer are excellent. All the procedures are laid out in careful lists of steps in the accompanying manual. The instructions are accompanied by diagrams of the printer and all its components, with the relevant parts emphasized.

You can load paper either from the rear of the printer or from the bottom if you have a slotted printer stand. The paper goes in easily either way.

The ribbon for the Okidata is like an old-fashioned typewriter ribbon, with two spools instead of a cartridge. We had some trouble getting the ribbon between the printhead and the ribbon guard. It required several minutes of patient prodding and manipulating and produced ink-covered fingers.

The Okidata printer is exceptionally easy to use. All the operating controls except the power switch are on the front panel. The platen knob is on the right side of the machine, where it should be for right-handed people.

The Microline is a popular printer, so many application programs are designed to print on it as easily as they do on the VIC 1525. You never have to worry about how the printer works if you don't want to.

It is also easy to write BASIC programs that print on the Microline 92 and use all of its capabilities. Control codes, which do not appear on your printout, regulate the printer's features. For example, to turn on 12 cpi printing, you transmit CHR$(28) in a PRINT statement. All the text that the printer receives is then printed in the new size. The manual has detailed examples of each option and a table of all the control codes, and its tutorial leads you gently through the formatting process.

The only trouble we had with BASIC output turned out to be a problem with Commodore BASIC. According to the *Programmer's Reference Guide*, the PRINT statement transmits a carriage return and line feed after the data (unless you turn them off). We couldn't get our programs to transmit line feeds, so we flipped a switch on the interface box to put them in.

The Microline 92 printer's printhead is bidirectional. It prints regular data-processing-quality text at 160 cps (characters per second), so in this mode it can print an entire page in just 45 seconds. Enhanced or emphasized text is overprinted with a half-dot offset; it prints at 80 cps with two passes of the printhead per line. Correspondence-quality prints at 40 cps.

All the faces and fonts produced by the printer look good. Even the "quick-and-dirty" data-processing face is legible and has nicely shaped characters. The printer's correspondence-quality printing is outstanding — it is not quite as sharp

as the type produced by a daisy-wheel printer, but it's not far off. Its graceful typeface has attractive letters; you can even produce different digits, and the zero has no slash through it.

The printer itself is well designed; it's built like a tank — solid and tough. The manual promises 4000 hours mean time between failures and 15 minutes mean time for repairs. We poked and switched but couldn't get anything to go wrong mechanically.

Okidata has taken pains to reduce wear on the printhead, the most vulnerable part of a fast printer. The printhead has a heat sensor that can slow or stop printing if the head starts to overheat. The ribbon for the printer contains a lubricant to extend the life of the printhead. Okidata claims that the life of the printhead is 200 million characters.

We only have two complaints about the printer. First, it is loud; it makes a high-pitched sound that goes right through walls. This problem could be solved with a sound hood. Second, we tested the printer with both 15-pound and 20-pound paper and discovered that the Microline 92 cannot feed 20-pound paper smoothly unless you have the tractor unit (which is available separately). This is not mentioned in the documentation. When we called Okidata's toll-free technical assistance number, a representative told us the printer would indeed accept 20-pound paper if you use the tractor unit, and she also recommended the tractor unit for all users, since it allows varying widths and weights of paper.

The printer is 14½ inches wide, 12 inches deep and 5 inches high. It weighs about 17 pounds and comes with a power cord that is 8 feet long. The case is off-white textured plastic and has a clear panel in the access cover. Tymac's Connection provides about 8 feet of cable altogether.

The printer has a 90-day limited warranty, and extended service contracts are available. You can have repairs made at any Okidata-authorized service center or send the printer to Okidata. The warranty card lists several service centers and gives a number to call for more information.

Okidata encourages you to ask for technical assistance if you need it. The manual includes two numbers (one toll-free) that you can call for help.

You are not likely to need help, though, because the Okidata manual is excellent. It has instructions for all the procedures you will need to perform. It also has reference sections for more experienced (or more daring) users, and a technical appendix gives all the printer's specifications in detail.

The manual is well written and easy to read. It's organized in a straightforward way, so it's easy to find the information you want. The descriptions and instructions are lucid. Its presentation is good: clear typography and design, nice stiff paper, divider tabs, legible diagrams, useful charts and easy-to-spot headings. It is bound in a standard three-ring binder for 5½ × 8½ paper. All these details seem unimportant unless they are missing.

The firm also produces a series of User's Tips brochures that describe the procedures for connecting various computers to the printer. The Commodore 64 brochure describes several different kinds of adapting interfaces that are available.

We recommend the Okidata Microline 92 wholeheartedly if you do serious printing. It's an excellent bargain.

—*M. A. Olds*

REVIEW

Commodore 1526

The Commodore 1526 dot-matrix printer is a a more intelligent device than the 1525, which it supersedes, and its internal microprocessor and memory give you formatting capability.

The 1526's print quality is good. The characters (12 per inch) that it produces are a compromise between regular dot-matrix quality and letter-quality printing. It can print both regular and reverse (white-on-black) characters. The 1526 also supports the full Commodore character set, including the special graphics characters, and can also accept a single character of your own design, such as the Commodore Business Machines' logo.

It has programmable line spacing and allows you to specify standard formats for numerical or alphabetical data. You can also print double-width characters. The printer produces text at a rate of about 80 characters per second, so it takes about 1½ minutes to print a full page.

The 1526 accepts tractor-feed paper from 4½ to 9½ inches wide (including the tractor strips). It accepts friction-feed paper up to 8½ inches wide. Paper feeds smoothly through the printer. The 1526 does not demand precise placement of the input stack of paper, as do some printers.

This printer is not compatible with the Commodore 1525 printer, though, which means that application programs that you can print using the 1525 will not necessarily print on the 1526. Unfortunately, many programs designed for Commodore computers rely on features that the 1525 possesses and that the 1526 does not. For example, the 1526 has no backspace character,

which makes it difficult to produce underlined or boldface text. Word processors must be specially designed to produce underlining or boldface on the 1526, and currently many are not.

This printer is as easy to use as any other Commodore device. If you rely on off-the-rack application programs that you know it can handle, you should have no problems at all.

It is also possible for you to write your own programs that use the 1526. All of the printer's features are reached through the Commodore BASIC OPEN and PRINT statements. This is a clumsy system, though. You control the printer's special features using the secondary address of the OPEN statement. For every feature you want to use, you must issue a separate OPEN statement to open an internal file. Afterward, you must issue a CLOSE statement to close the file. It takes three statements just to reset the printer to its default characteristics. Most of the options require a PRINT statement to transmit particulars, such as number of lines per page. It is especially messy to have to use several formatting features for a single line of output.

The 1526 is attached to the Commodore computer's serial bus, plugging into either the computer or the disk drive. We had trouble getting tractor-feed paper to start through, but it went smoothly once the tractor teeth caught. The ribbon comes in a cartridge and simple snaps in. You don't need to adjust any switches or dials.

This setup procedure is straightforward, apart from one exception: The setup instructions in the manual do not mention the packing material around the printhead. The styrofoam and tape are easily overlooked; once the ribbon cartridge is installed, they may be hidden under it. When you turn the power on, the printhead is supposed to move back and

forth. If you have not removed the packing material, the printhead cannot move, and instead, the power light blinks.

Despite a list of recommended troubleshooting steps, the manual does not mention a blinking power light, much less what to do about it. A Commodore service representative explained that the power light does blink to indicate some errors, such as running out of paper or overflowing the printer's memory.

It is not easy to look up a particular piece of information in the manual. Although it has a table of contents, you may still have trouble finding what you're looking for. The pages are cluttered, and the program examples tend to fade into the background print — they should be in boldface or some distinctive typeface.

The manual fails to document several features of the printer. For example, its introduction mentions that the 1526 accepts friction-feed paper, but the operating instructions contain no reference to this. Two control levers reside inside the printer, next to the platen. One specifies friction- or tractor-feed paper, and the other determines the impact force of the printing (allowing you to print multipart forms). Neither of these controls is mentioned in the manual.

The manual does not explain how you can print high-resolution graphics, although this is possible on the 1526. (For more information on this, contact Commodore's customer-service center or a Commodore users' group.)

The manual does explain how to use the secondary addresses for formatting. It describes each option and the BASIC statements necessary to use it. It gives an example for each option, and an appendix contains more complicated formatting examples. These explanations are good but not inspiring.

The 1526 hardware is well designed. It has only a small number of controls, which includes the power switch. Hardly any of the moving parts are exposed, even when you remove its dust cover. The printer is sturdy and prints smoothly.

The case is Commodore-tan textured plastic, with a translucent-smoke plastic dust cover. The printer is 17 inches wide, 13 inches deep and 5 inches high, and it has a wire paper holder that, if used, adds 13 inches to the depth. The printer weighs 15 pounds. It comes with a 3½-foot serial cable and an 8-foot grounded power cord.

We have only one complaint about the printer's design: the platen knob is on the left side of the printer, which makes it difficult for right-handed people to insert paper.

The printer comes with the standard Commodore 90-day limited warranty. If you have any problems, you can take the 1526 to your dealer or to a qualified service center. You can also ship the printer to a Commodore Computer Service Center — the warranty leaflet gives two addresses, one in Pennsylvania and one in California. The leaflet also contains a California telephone number that you can call for service information, but it gives no toll-free number for technical advice.

The 1526 is moderately priced and prints well, and it is also surprisingly quiet. If the packaged programs that you use support it, it could be a good choice for home use, but if you want to write your own programs that use a printer, the 1526 may not be for you.
—*M. A. Olds*

InfoWorld Report Card

Commodore 1526

	Poor	Fair	Good	Excellent
Setup	☐	■	☐	☐
Ease of Use	☐	■	☐	☐
Performance	☐	☐	■	☐
Documentation	☐	■	☐	☐
Serviceability	☐	☐	■	☐

Summary
The Commodore 1526 dot-matrix printer is a serial-port printer that is more "intelligent" than its predecessor, the 1525. Many programs that run on the 1525 will not work on the 1526, though. This printer works well and is moderately priced, although improved documentation could make it easier for you to use some of its features.

Features of unit tested
☐ *Dot-matrix printing*
☐ *80 cps*
☐ *12 cpi*
☐ *Serial interface*
☐ *Friction and tractor feed*

Suggested list price: $299

*Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100*

InfoWorld
Report Card

Gemini 10X

	Poor	Fair	Good	Excellent
Setup	□	□	□	■
Ease of Use	□	□	□	■
Performance	□	□	□	■
Documentation	□	□	■	□
Serviceability	□	□	□	■

Summary
The Gemini 10X dot-matrix printer is fast, easy to use and reliable, and it performs as well as or better than other printers that are more expensive. It is designed to work with computers that have a Centronics-parallel interface, although a serial-interface option is available.

Features of unit tested
- □ *Dot-matrix printing*
- □ *9 × 9, 18 × 9 and 18 × 18 dot matrix*
- □ *240 × 144 dots per square inch in graphics mode*
- □ *120 cps*
- □ *Bidirectional, logic-seeking printhead*
- □ *5, 6, 8.5, 10, 12 and 17 cpi*
- □ *819-byte buffer*
- □ *Centronics parallel interface, serial interface available*
- □ *Friction and tractor feed*
- □ *ASCII, italic, international and graphic characters*

Suggested list price: $399

Star Micronics, Inc.
200 Park Avenue
New York, NY 10166
(212) 986-6770

REVIEW

Gemini 10X

The Gemini 10X is a dot-matrix printer that works with the Commodore 64 and any other computers that are Centronics-port compatible. A serial-interface option is also available. Its operation is similar to that of other popular printers, but the Gemini has one advantage over those other printers: its price is lower.

The Gemini 10X measures 15.2 × 12.4 × 5.8 inches, so it's small enough to put on a desk with your computer. Its 819-byte buffer means that its memory is adequate to speed you up when you are making small listings. It also has a provision to expand the buffer to 4K or 8K.

The 10X also has the ability to handle a user-defined character set. This is handy if you want to use special fonts and symbols. The character set does not use the same memory as the buffer.

The 10X is a fast printer. When running in normal print mode, it runs at 120 cps; that is, the Gemini 10X prints 120 characters per second, excluding the time needed for line feeds, which take one tenth of a second.

The printhead head is bidirectional and logic seeking. Bidirectional means that the printer prints both forwards and backwards, which saves on carriage-return time, and logic seeking means that it searches for the most efficient way to print a line.

The character matrix of the 10X has a high resolution. Normally the printer uses a 9 × 9 dot matrix to produce each character, but 18 × 9 and 18 × 18 matrices are also possible if it is using emphasized printing. The 10X can also print graphics with a resolution as great as 240 × 144 dots per square inch.

Several character sets are available to you when you use the 10X. It has the 96 standard ASCII characters. but along with these are a set of 96 italic characters, 64 special characters, 32 block-graphics characters, 96 downloadable characters and 88 international characters.

As for font sizes, you not only can use the normal 10 cpi (characters per inch) font but also can choose the elite (12 cpi), condensed (17 cpi) and enlarged (5, 6 or 8.5 cpi) fonts. You can print emphasized characters or double-emphasized (double-strike) characters. The 10X can also print superscripts, subscripts and backspaces and do continous underlining.

Among the 10X's many special features is a self-test mode that allows you to check the operation of your printer without having to turn on your computer. The 10X allows you to define the left and right margins and the tab stops.

This printer supports macro instruction. A macro is a set of user-defined characters or codes that you can call using a single command. At first you might wonder why macro support is such a desirable feature, but you'll quickly see how helpful it can be when you're programming a difficult BASIC printing routine.

When printing, you can set the 10X to skip over perforations. As a result, BASIC program listings are much easier to read.

As for the printhead and the hardware, the 10X can take fanfold paper, roll paper or single sheets. It also has both friction and tractor feed. It uses a standard spool-type ribbon that is much cheaper than a conventional computer printer ribbon. The printhead has a recommended life of 100,000,000 characters, and the hardware has a recommended life (mean time between failure) of 10,000,000 lines.

The Gemini 10X is fairly easy to use. If you have already mastered the use of printer control codes — which are universally difficult to learn — you'll find that the 10X's codes are easy to use. Loading the paper and taking care of paper jams is pretty simple, but, like anything else, it takes some getting used to. It is slightly difficult to reposition the tractor and lock it, but repositioning the tractor is not an everyday occurrence.

The Gemini 10X's documentation comes in an attractive spiral-bound book that has a built-in bookmark. The manual takes you step by step through the printer's special features and operation. It also gives program listings throughout to demonstrate the functions of the printer. If the listings in the main body of the book don't work with your computer, the manual gives equivalent listings for the Apple II and II Plus, Atari 400 and 800, Commodore 64, VIC 20, IBM Personal Computer and Osborne and TRS-80 computers.

On the whole, the manual is well organized and easy to use. The index leaves something to be desired, however. We had a hard time looking up control-code descriptions. The setup guide is also in a strange place — in the back of the manual. None of these are serious flaws.

The Gemini 10X comes with a 180-day warranty, which is more than adequate. We found the 10X to be an extremely reliable printer that has few faults. Its performance is nothing short of excellent. If any problems do arise with your printer, many dealers exist that can fix or replace it. If you are not close to a dealer, you can send your faulty printer back to Star Micronics, and it will fix or replace it.

Setup for the 10X is fast and easy — unpack the printer, plug it into your computer and then into the wall, and it works. The only problem you could possibly encounter would be incompatible cables, and that is fairly unlikely because Centronics cables are available for most computers.

This printer is fast, easy to use and pretty much free from faults. Program listings that it produces are clean and easy to read, and the graphics are superb. This printer performs as well as higher priced, more popular printers on the market and is definitely a cost-effective alternative. If you are considering buying a printer, the 10X deserves a good look.
—*Kevin Cheung*

REVIEW

Gorilla Banana

The Gorilla Banana dot-matrix printer, from Leading Edge, is the cheapest impact dot-matrix printer we have seen for the Commodore 64, but to use this printer with the Commodore 64, you need to purchase a graphics interface. We tested the Gorilla Banana on the Commodore 64 with a Cardco Cardprint +G graphics board. Including the cost of an interface brings this printer into the same price range as that of Commodore's MPS 801 printer, although unlike the MPS 801, you can use the Gorilla Banana with other computers as well. Other inexpensive printers are available, such as the Alphacom 42, but if you want to pay the Gorilla Banana's price, you should be aware that the MPS 801 performs about as well as Gorilla Banana and has marginally better features.

For a little more money, you can buy a faster printer, such as the Epson MX-

InfoWorld
Report Card

Gorilla Banana

	Poor	Fair	Good	Excellent
Setup	☐	■	☐	☐
Ease of Use	☐	■	☐	☐
Performance	☐	■	☐	☐
Documentation	■	☐	☐	☐
Serviceability	☐	■	☐	☐

Summary
The Gorilla Banana is no more useful than other dot-matrix printers in its class and considerably less so than some printers that are only slightly more expensive.

Features of unit tested
☐ *Dot-matrix printing*
☐ *50 cps*
☐ *Parallel interface*
☐ *90-byte printer buffer*

Suggested list price: $199

Leading Edge Products, Inc.
225 Turnpike Street
Canton, MA 02021
(617) 828-8150
(800) 343-6833

80 or Star Micronics Gemini 10X, that produces correspondence-quality output. These printers have features that include boldfacing, underlining, proportional spacing, multiple pitches, italics, subscripting and superscripting, and they have "real" characters (true lowercase descenders) and bit-mapped graphics.

The Gorilla Banana is similar to Commodore's MPS 801. Both are basically the old Commodore 1525 printer in a new case and with increased speed. The Gorilla Banana has the same poor print quality as the MPS 801, and characters do not have lowercase descenders. Characters that appear on the monitor screen in an 8 × 8 dot matrix are translated into a 5 × 7 matrix on the printer.

This printer is as slow as the MPS 801; it, too, prints at a speed of 50 characters per second. Neither printer has bidirectional printing nor a logic-seeking printhead (one that skips over spaces at either margin to reach the location of the first printing character).

The Gorilla Banana also suffers in comparison to the MPS 801. The dust/soundproofing cover of the Gorilla Banana just rests in place and easily falls off — the MPS 801 has a hinged cover. Before you buy this printer, listen to it in operation. It is one of the noisiest we have ever heard. It is considerably noisier than the 801, and the soundproofing cover helps little.

The Gorilla Banana has no paper-advance knob — you advance the paper manually be turning a paper-feed dial at the top. Furthermore, you cannot move the paper backwards, and the printer has no line-feed control. The paper occasionally does not advance a full line after a line feed (at least on the model we tested). The Gorilla Banana has the same paper-feed mechanism as the 1525, so the last problem may be generic; we know of at least one 1525

printer that has a similar problem.

The Gorilla Banana is not as easy to set up as the MPS 801. You plug the interface card into the serial port of the Commodore 64, and you plug the ribbon connector from the interface card into the rear of the printer. Loading the paper is trickier than with the 801 as is loading the ribbon cassette (a somewhat messy project). The continuous-loop ribbon seems to last a long time; we know someone who used the same kind of ribbon for at least nine months of heavy use without changing it, and the printouts were still readable.

In its favor, the Gorilla Banana is compact and lightweight. It weighs less than 10 pounds, compared to the 10½ of the MPS 801, but the 801 is noticeably smaller.

The printer has one external switch: the rocker switch that turns power on and off. It also has a power-indicator light and an error light. You can run a self-test, but to do so, you'll have to take the cover off and change a switch setting on the printed circuit board and then set it back again when you want to do normal printing.

You can set the same set of switches to change the interpretation of carriage returns and to bring foreign-language character sets into operation. The printer does not have the Commodore special graphics characters preloaded into its own memory chips. The Gorilla Banana and the 1525, as well as several other inexpensive dot-matrix printers, seem to be made by the same Japanese firm. Proof of this is that the Gorilla Banana's owners' manual has many similarities (including several identical drawings) to the VIC 1525 manual.

The typeset, illustrated, 29-page manual that comes with the Gorilla Banana carries scant information about setup and nothing about use. Printing modes and control codes are listed in tables. The manual contains no

explanation of how to define your own graphics characters, and it has no index.

This manual has more technical hardware information than the MPS 801 manual, but the information is of use only to repairpersons. The manual was either written or translated from another language by someone whose native tongue is not English. Here is a typical sentence: "With turning No. 3 of the dip switch ON or OFF, the meaning of CR (0, D) can be changed to either NL (0, A) or DC4 (1, 4) respectively."

Nowhere does the manual explain how to dump (make a printed copy of) a graphics screen. If you want to do that, you'll have to figure out yourself how to do it using a program. We called Leading Edge and asked how to do a graphics dump. Our contact responded by sending us ten photocopied pages of a program in BASIC, consisting mostly of data statements, that would have required our typing in correctly literally hundreds of lines, each with 30 or more values.The program did not contain one comment, and several lines were missed when the program was photocopied. We made no attempt to type in the program; instead, we used the Graphics Dump program we wrote for the MPS 801 to test the printer's ability to reproduce graphics.

The Gorilla Banana performed reasonably well when we used it with a word processor. It took 2 minutes and 9 seconds to print one page. Approximately once per page, the unit we tested seemed to lose part of its line-feed instruction, causing one line to print almost on top of the preceding one.

In fairness to this printer, the program we wrote to dump a screen of graphics took 4 minutes to print, compared to the 5 minutes and 17 seconds taken by the MPS 801. We're sure a more efficient program could do a faster dump; we were mainly interested in the comparison of times.

Leading Edge provides a 6-month warranty with each unit. For support you can call Leading Edge's toll-free number.

We found the Gorilla Banana printer to be less useful than Commodore's similar model and to lack many of the features of other printers costing not too much more.
—*Michael Wiesenberg*

REVIEW

Alphacom 42

Who would look twice at a printer that is limited to a 40-character width and that prints on a roll of chemically treated calculator paper? After using the Alphacom 42 for a month, we would recommend it — you don't always need a wide body.

The Alphacom 42 is a lightweight (3 pounds) inexpensive printer that uses 11-centimeter-wide thermal-paper rolls. It includes a power supply attached to the power cord.

All Alphacom printers have a slot in the back for an interface cartridge. Cartridges are sold separately and are available for either Commodore or Atari computers, so by switching cartridges, you can use the same printer on Commodore, Atari or any other machine that Alphacom might decide to support in the future. The cartridge connects to your computer with a cable and contains the necessary circuitry and "personality" to interface with your brand of computer. Since it fits inside the printer's cabinet, once you have installed the cartridge, it is invisible.

InfoWorld
Report Card

Alphacom 42

	Poor	Fair	Good	Excellent
Setup	☐	☐	■	☐
Ease of Use	☐	☐	■	☐
Performance	☐	■	☐	☐
Documentation	☐	☐	■	☐
Serviceability	☐	☐	■	☐

Summary
The Alphacom 42 is an inexpensive lightweight printer that prints on chemically treated thermal-paper rolls. You can use it with both Commodore and Atari computers if you purchase the required interface cartridges. Although it can only print a page 40 characters wide, its quiet performance and good documentation are impressive for the price.

Features of unit tested
- ☐ *Thermal printing*
- ☐ *40 columns*
- ☐ *80 cps*
- ☐ *Dot-image graphics and ASCII capability*

Suggested list price: $119.95

Alphacom, Inc.
2323 South Bascom Avenue
Campbell, CA 95008
(408) 559-8000

The printer's body design is uncluttered — it's clean and functional, with a smoky plastic hood over the paper roll. It doesn't look cheap.

We plugged the Alphacom 42 into the Commodore 64 computer that we use for mathematical and statistical work, such as generating random-number tables or scaling drawings. We quickly discovered that most numerical output fits nicely on a 40-column page. Since the Commdore 64 has a 40-column screen, the page width matches the screen display.

At a speed of two lines per second, the Alphacom 42 produces listings more quickly than conventional dot-matrix printers. If you use a graphics program, it can faithfully reproduce the Commodore graphics. The unit does not seem to emulate the Commodore graphic printer exactly, though. We tried it with a canned graphic program that was supposed to support the Commodore graphics printer, and we could not make it work as advertised.

You control the printer by means of two push buttons labeled Power and Paper Advance. Since no indicator light tells you that the printer is turned on, you must push the Paper Advance button to test for power before you print.

The Alphacom 42 uses a treated thermal paper that is fed by traction. The paper roll rests inside a cylindrical chamber, without any spindle or other support; nonetheless, it feeds smoothly.

Although the paper has a slick texture, this is not the metallic-treated paper that was found on some low-cost narrow printers a few years back. Thermal papers sometimes fade in the light, but this paper produces no perceptible fading. It's probably not archival, but it will last long enough for in-house calculations. (Surveyors have been using computers with similar paper for years with satisfactory results.) Because the system is thermal it has no ribbon to wear out and need replacement.

A well-produced, illustrated, 18-page booklet comes with the machine, and it details setup, checkout and use. The manual does not, however, tell you how to buy paper except through Alphacom. Incorrect paper, it warns, damages the printer and result in bad copy. This warning will probably make most users buy from the company rather than experiment with locally available papers.

The manual is explicit about test and setup procedures. By depressing the printer's two push buttons simultaneously, you can print a test pattern of the machine's total character set. Such detailed documentation and diagnostic system are essential in a machine that is obviously too low-priced to command much dealer servicing and support.

The easiest aspect of using the Alphacom is listening to it. A virtually noiseless system, it doesn't distract you while it is running. Because it is so small, it does not take up the room normally required for a printer and paper.

Don't expect the Alphacom to be a word-processor printer. Its packaging, documentation and features are impressive for the price, however.
—*Ned Heite*

HARDWARE

In this singular category, we have a review of the SX-64, the portable version of the Commodore 64.

REVIEW

Commodore SX-64

Because the SX-64 was announced by Commodore nearly a year before it became available, it was eagerly awaited by Commodore 64 dealers and owners alike. It is a 6502 computer with 64K of RAM, a single floppy-disk drive and a 5-inch color monitor, all neatly packaged in a portable case with the keyboard nestled into its latch-on cover.

Commodore has done an excellent job of packaging this new system. The single-box design is a refreshing departure from the typical Commodore 64 configuration, which requires a dedicated tabletop and many electrical outlets. The keyboard is surprisingly thin — a feature that makes it considerably more pleasant to use than the keyboard of the Commodore 64, especially if you need to use it for long periods. The layout of the keys is the same, but the feel is decidedly superior to that of the standard Commodore 64 keyboard. The carrying handle locks into position to function as a stand to hold the monitor at a convenient viewing angle on a tabletop.

The image on the built-in 5-inch color monitor is crisp and easy to read, despite the small screen size. For applications where a tiny monitor simply won't do, the SX-64 has the same audio/video connector as the Commodore 64 and produces a good display when connected to a Commodore 1701 or 1702 monitor. For the most part, the connectors on the SX-64 match their counterparts on the Commodore 64. The SX-64 uses the same serial-bus, game-port, user-port and cartridge-port connectors as the Commodore 64, although the location of the user port may make some accessories (such as the 1650 auto-modem) difficult to connect because of

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InfoWorld
Report·Card

Commodore
SX-64

	Poor	Fair	Good	Excellent
Setup	☐	☐	☐	■
Ease of Use	☐	☐	■	☐
Performance	☐	☐	■	☐
Documentation	☐	☐	■	☐
Serviceability	☐	■	☐	☐

Summary
The Commodore SX-64 is a one-box version of the popular Commodore 64 computer. It includes a computer, a disk drive and a 5-inch color monitor. The SX-64 appears to be hardware-compatible with the Commodore 64, except that it lacks a cassette port. Software compatibility is less than perfect.

Features of unit tested
☐ *6502 microprocessor*
☐ *64K RAM*
☐ *5¼-inch, single-sided, single-density floppy-disk drive*
☐ *Cartridge, user, serial-bus and game-controller ports*
☐ *5-inch color monitor*
☐ *Keyboard*
☐ *Power supply*

Suggested list price: $999

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

the port's proximity to the power cord.

The big surprise in the SX-64's design is that it lacks a cassette port. Apparently, the designers at Commodore felt that because of the SX-64's built-in disk, a cassette port would be superfluous. Because many Commodore 64 programs are still available only on cassette, that analysis may have been a bit short of the mark. This lack of a cassette port is the single largest contributor to the incompatibilities that exist between the Commodore 64 and the SX-64.

The lack of a cassette interface also means that you cannot use some peripherals with the SX-64 that get their power supply from a cassette-port connector. The most popular products in this category are the printer-interface cards from Cardco.

System setup is easy. The lid that contains the keyboard unlatches and connects to the computer with a single cable. You plug the line cord into the back of the machine and, unless you need a printer or other peripheral, the system is ready to run. If you are using the machine to run prepackaged software in disk or cartridge form, then the SX-64's operation is identical to that of the Commodore 64.

An easy-to-follow users' guide is provided with the system. It is much like the Commodore 64's users' guide, but it includes material about the disk drive and the commands necessary to use it.

The users' guide provides a peek at the corporate indecision that seems to have surrounded this product. The cover of the manual refers to the product as the "Commodore Portable SX-64 Color Computer," but the text inside almost always calls it the Executive 64 Computer. There are also passing references to, and a single sketch of, something designated as the DX-64 computer. This is, we think, a dual-drive version of the SX-64.

According to the manual, "all software designed on disk and cartridge for the Commodore 64 runs on the SX-64." Our initial tests indicate that this is not quite true. Of the 15 commercially produced programs on disk and in cartridge form we tested, only one — the HES version of the Forth programming language — completely failed to run on the SX-64. One other program (the Christmas demo on the disk packed with the SX-64) did run, but it did not produce anything resembling music. When we ran this program on a Commodore 64, it performed normally. The problem appeared to be a defective sound chip in our SX-64 demo unit. There have been rumors of this problem in the Commodore 64 as well, but this was the first case we had been able to confirm. We ran the offending program on two other SX-64s, and it worked normally on both machines. The Forth cartridge, however, failed to run on any of the SX-64s we tried, although it did function on a Commodore 64.

The situation was better when we tested about 20 small, user-written BASIC programs. All of these performed identically on the SX-64 and the Commodore 64. Some of these programs made fairly extensive use of the ROM-based BASIC interpreter, but they performed relatively few PEEKs, POKEs and Kernal (ROM-based monitor program) calls.

When it comes to software compatibility with the Commodore 64, the bottom line seems to be that whatever differences exist between the two machines are subtle. This means that predicting which programs will run and which ones will not is difficult. The best bet for current Commodore 64 owners is to try their favorite software on an SX-64 before they purchase the hardware. If you already own an SX-64, you should test any software you intend

to purchase for your SX-64 before you buy that software.

The users' manual provides no clue as to differences between the SX-64 and the Commodore 64 that would account for the difficulty in running the HES Forth. Indeed, the manual recommends the *Commodore 64 Programmer's Reference Guide* as the preferred technical reference for SX-64 internals. There is ample evidence in the operation of the SX-64 that Commodore attempted to keep its internal software design the same as that of the Commodore 64. Although no way exists for you to connect a cassette drive to the SX-64 system, the Load and Save commands still attempt to load and save programs on cassette tape. This results in an "Illegal Device Number Error" message, even though the device number is not explicitly specified; the system appears to default to the device number reserved for the tape drive on Commodore 64s.

It is a shame that Commodore chose not to provide a smoother integration of the disk into the SX-64's internal firmware. As a result of its firmware, this machine, like the Commodore 64, acts almost as if it were a stand-alone microcomputer to which a disk drive was added at the last minute.

Operation of the SX-64 disk drive is identical to that of a Commodore 1541 disk drive connected to a Commodore 64. Although both the 1541 and the SX-64 disk drives are slow relative to floppy-disk drives on other computers, they do provide a convenient random-access program and data-storage facility. You can use the 1541 drive, which is commonly used as the primary drive for the Commodore 64, as a second drive on the SX-64. If you change the drive's physical address as per the instructions in the 1541 manual, you can plug it into the serial-bus connector on the back of the SX-64 and operate it as the second drive.

In general, the SX-64 is an adequate implementation of a disk-based version of the Commodore 64 in a single, easy-to-handle box. It is, however, considerably more expensive than its functional equivalent, which you can piece together using standard Commodore 64 components. Market pressures will probably rectify this price disparity, as soon as the supply of SX-64s catches up with the demand created by the lag time between the product's announcement and its introduction.

—*Richard A. Milewski*

APPENDICES

Appendix A: Magazines

Magazines for the Commodore 64

The following magazines are devoted exclusively to Commodore computers and are excellent sources of information on the Commodore 64 and the software and hardware designed specifically for use with it. Feature articles, product reviews, program listings and advertisements in these magazines are all focused on Commodore computers.

Commodore Microcomputers
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

Compute!'s Gazette
Compute! Publications, Inc.
P.O. Box 5406
Greensboro, NC 27403
(919) 275-9809

Info-64
Info Dynamics
Rural Route 2
P.O. Box 198-E
Iowa City, IA 52240
(319) 338-0070
(*Info-64* is an unusual and worthwhile publication. It is produced

entirely on a Commodore 64, giving it a unique format. *Info-64* is not available by subscription; you must buy your issues from your local dealer.)

Peek Magazine
(published on cassette)
Peek Magazine
P.O. Box 35167 ·
Cleveland, OH 44135

Power Play
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100
(Each issue includes an exhaustive list of Commodore users' groups in the U.S. and Canada.)

RUN
CWCI/Peterborough
80 Pine Street
Peterborough, NH 03458
(603) 924-9261

Other Computer Magazines

These magazines are not specifically devoted to the Commodore 64, but they often have articles of interest to Commodore computer owners.

Compute!
Compute! Publications
P.O. Box 5406
Greensboro, NC 27403
(919) 275-9809

Dr. Dobb's Journal
M & T Publishing
2464 Embarcadero Way
Palo Alto, CA 94303
(415) 425-0600

InfoWorld
Popular Computing, Inc.
1060 Marsh Road, Suite C-200
Menlo Park, CA 94025
(415) 328-4602

If you have a Commodore CP/M system on your Commodore 64, this publication may be useful:

MicroSystems
Ahl Computing, Inc.
A subsidiary of Ziff-Davis Publishing Company
One Park Avenue
New York, NY 10016
(212) 503-3500

If you are considering connecting your Commodore 64 to a shortwave radio, you may be interested in these two publications:

Ham Radio   *73*
Communications Technology,   CWCI/Peterborough
Inc.   80 Pine Street
Main Street   Peterborough, NH 03458
Greenville, NH 03048   (603) 924-9261
(603) 878-1441

Appendix B: Software Suppliers

The following companies supply software for the Commodore 64. Although this list is far from exhaustive, it is a starting point in the search for specific software products.

Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
(616) 241-5510

Academy Software
P.O. Box 6277
San Rafael, CA 94903
(415) 499-0850

Access Software
925 East 900 South
Salt Lake City, UT 84105
(801) 964-0566

Adventure International
P.O. Box 3435
Longwood, FL 32750
(800) 327-71712

Arrays, Inc./Continental Software
11223 South Hindry Avenue
Los Angeles, CA 90045
(213) 410-9466

Atari Corporation
1312 Crossman Road
P.O. Box 61657
Sunnyvale, CA 94089
(408) 745-2000

Avalon Hill Game Company
Microcomputer Games Division
4517 Harford Road
Baltimore, MD 21214
(301) 254-5300

Batteries Included
17875 Sky Park North, Suite P
Irvine, CA 92714
(714) 979-0920

Behavioral Engineering
230 Mount Hermon Road, Suite 207
Scotts Valley, CA 95066
(408) 438-5649

Bible Research Systems
9415 Burnett Road, Suite 208
Austin, TX 78758
(512) 835-7981

Bizware, Inc.
5014 Highway 29
Lilburn, GA 30247
(404) 925-4686

Blue Chip Software
6744 Eton Avenue
Canoga Park, CA 91303
(818) 346-0730

Blue Sky Software
26 Springdale Road
Cherry Hill, NJ 08003
(609) 424-3337

Broderbund Software
17 Paul Drive
San Rafael, CA 94903
(415) 479-1170

CBS Software
One Fawcett Place
Greenwich, CT 06836
(203) 622-2500

Cimmaron Corporation
Division of Standun Controls
2158 South Hathaway Street
Santa Ana, CA 92705
(714) 241-5600

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

Creative Equipment
6864 West Flager Street
Miami, FL 33144
(305) 261-7866

Datamost, Inc.
20660 Nordhoff Street
Chatsworth, CA 91311
(818) 709-1202

Data 20 Corporation
23011 Moulton Parkway, Suite B10
Laguna Hills, CA 92653
(714) 770-2366

dilithium Software
P.O. Box 606
Beaverton, OR 97075-0606
(503) 646-2713

Eastern House Software
3239 Linda Drive
Winston-Salem, NC 27106
(919) 748-8446

Elcomp Publishing Inc.
2174 West Foothill Blvd., Unit E
Upland, CA 91786
(714) 623-8314

Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
(415) 571-7171

En-Tech Software
P.O. Box 881
Sun Valley, CA 91352
(213) 768-646

Epyx Computer Software
1043 Kiel Court
Sunnyvale, CA 94089
(408) 745-0700

French Silk
P.O. Box 7096
Minneapolis, MN 55407
(612) 871-4505

FutureHouse, Inc.
310 West Franklin Street
P.O. Box 3470
Chapel Hill, NC 27514
(919) 967-0861

Gatos International
218 Rose
San Francisco, CA 94102

Handic Software, Inc.
Fellowship Business Center
520 Fellowship Road, Suite B206
Mount Laurel, NJ 08054
(609) 866-1001

Hayden Software
600 Suffolk Street
Lowell, MA 01854
(617) 937-0200

Human Engineered Software
150 North Hill Drive
Brisbane, CA 94005
(415) 468-4111

Infocom, Inc.
55 Wheeler Street
Cambridge, MA 02138
(617) 492-1031

Inkwell Systems
7677 Ronson Road
San Diego, CA 92111
(619) 268-8792

Jini Micro-Systems, Inc.
P.O. Box 274
Kingsbridge Station
Riverdale, NY 10463
(212) 796-6200

Krell Software Corporation
1320 Stony Brook Road
Stony Brook, NY 11790
(516) 751-5139
(800) 245-7355

Limbic Systems Inc.
560 San Antonio Road, Suite 202
Palo Alto, CA 94306
(415) 424-0168

Mega Software
P.O.Box 2398
Klamath Falls, OR 97601

Micro Systems Development, Inc.
10031 Monroe Drive, Suite 206
Dallas, TX 75229
(214) 357-4434

Microdigital
752 John Glenn Blvd.
Webster, NY 14580
(716) 872-0518

Midwest Micro, Inc.
311 W. 72nd Street
Kansas City, MO 64114
(816) 333-7200

Midwest Software
P.O. Box 214
Farmington, MI 48024
(313) 477-0897

Milton Bradley
443 Shaker Road
East Longmeadow, MA 01028
(413) 525-6411

Mirage Concepts, Inc.
4055 West Shaw Avenue, Suite 108
Fresno, CA 93711
(209) 227-8369

Muse Software, Inc.
347 North Charles Street
Baltimore, MD 21201
(301) 659-7212

PMI
P.O. Box 87
Buckfield, ME 04220
(214) 255-9141

Practicorp International
44 Oak Street
The Silk Mill
Newton Upper Falls, MA 02164
(617) 965-9870

Precision Software, Inc.
3003 Summer Street, Fourth Floor
Stamford, CT 06905
(203) 326-8649

Professional Software, Inc.
51 Fremont Street
Needham, MA 02194
(617) 444-5224

Program Design, Inc.
95 East Putnam Avenue
Greenwich, CT 06830
(203) 661-8799

Psycom Software International
2118 Forestlake Drive
Cincinnati, OH 45244
(513) 474-2188

Quicksilva, Inc.
426 West Nakoma
San Antonio, TX 78216
(512) 340-3684

Scarborough Systems, Inc.
25 North Broadway
Tarrytown, NY 10591
(914) 332-4545

Scholastic, Inc.
730 Broadway
New York, NY 10003
(800) 325-6149

Sierra On-Line, Inc.
P.O. Box 485
Coarsegold, CA 93614
(209) 683-6858

Sirius Software, Inc.
10398 Rockingham Drive, Suite 12
Sacramento, CA 95827
(916) 366-1195

Skyles Electric Works
2316 South Whisman Road, Suite E
Mountain View, CA 94041
(415) 965-1735

Softsmith, Inc.
2935 Whipple Road
Union City, CA 94587
(800) 341-4000

Softsync, Inc.
14 East 34th Street
New York, NY 10016
(212) 685-2080

Spinnaker Software Corporation
One Kendall Square
Cambridge, MA 02139
(617) 494-1200

Stimutech, Inc.
3850 Research Park Drive
Ann Arbor, MI 48104
(313) 761-9027

Sublogic Corporation
713 Edgebrook Drive
Champaign, IL 61820
(217) 359-8482

Systems Management Associates
3700 Computer Drive
P.O. Box 20025
Raleigh, NC 27619
(919) 787-7703

Tamarack Software
P.O. Box 247
Darby, MT 59829
(406) 821-4596

Timeworks, Inc.
444 Lake Cook Road
Deerfield, IL 60015
(312) 948-9200

TOTL Software, Inc.
1555 Third Avenue
Walnut Creek, CA 94596
(415) 943-7877

Tronix
8295 South La Cienega Blvd.
Inglewood, CA 90301
(213) 215-0529

Unicorn Software
1775 East Tropicana Avenue
Las Vegas, NV 89109
(702) 798-2727

Webber Software
P.O. Box 9
Southeastern, PA 19399
(215) 687-5607

Appendix C: Hardware Suppliers

The following companies supply hardware and peripherals that can work with your Commodore 64.

Alphacom, Inc.
2323 South Bascom Avenue
Campbell, CA 95008
(408) 559-8000

Amdek Corporation
2201 Lively Blvd.
Elk Grove Village, IL 60007
(312) 364-1180

Cardco, Inc.
300 South Topeka
Wichita, KS 67202
(316) 267-3807

Chalk Board, Inc.
3772 Pleasantdale Road
Atlanta, GA 30340
(404) 447-6711

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
(215) 431-9100

Databar Corporation
10202 Crosstown Circle
Eden Prairie, MN 55344
(612) 944-5700

Data 20 Corporation
23011 Moulton Parkway, Suite B10
Laguna Hills, CA 92653
(714) 770-2366

Epson America, Inc.
2780 Lomita Blvd.
Torrance, CA 90505
(213) 539-9140
(800) 421-5426

Inkwell Systems
7277 Ronson Road
San Diego, CA 92138
(619) 268-8792

Kantronics, Inc.
1202 East 23rd Street
Lawrence, Kansas 66044
(913) 842-7745

Koala Technologies Corporation
3100 Patrick Henry Drive
Santa Clara, CA 95052-8100
(408) 986-8866

Leading Edge Products, Inc.
225 Turnpike Street
Canton, MA 02021
(617) 828-8150
(800) 343-6833

Microlog
18713 Mooney Drive
Gaithersburg, MD 20879
(301) 258-8400

Microperipheral Corporation
2565 152nd Avenue N.E.
Redmond, WA 98052
(206) 881-7544

Micro Systems Development, Inc.
10031 Monroe Drive, Suite 206
Dallas, TX 75229
(214) 357-4434

Okidata Corporation
532 Fellowship Road
Mount Laurel, NJ 08054
(609) 235-2600

Orange Micro, Inc.
1400 North Lakeview Avenue
Anaheim, CA 92807
(714) 779-2772

Star Micronics, Inc.
200 Park Avenue
New York, NY 10166
(212) 986-6770

Tymac
127 Main Street
Franklin, NJ 07416
(201) 827-4050

Vaisala, Inc.
2 Tower Office Park
Woburn, MA 01801
(617) 933-4500

WICO Corporation
6400 West Gross Point Road
Niles, IL 60648
(312) 647-7500

Appendix D: Bulletin Board Telephone Directory

The following list is a small sampling of current bulletin-board Systems (BBSs) in the United States. (You must use a modem in order to call BBS telephone numbers.)

Aardwolf-Express
Fremont, CA
(415) 651-4147

AVC-Commodore BBS
Indianapolis, IN
(317) 898-5027

Canopus
Greenfield, WI
(414) 281-0545

Commodore BBS
Cheyenne, WY
(307) 632-9132

Commodore Central
Holladay, UT
(801) 277-3913

Commodore Communications
St. Louis, MO
(314) 867-6950

Commodore Public
Bulletin Board
Chicago, IL
(312) 397-0871

C.U.S.S.H.
Milwaukee, WI
(414) 554-9520

CVBBS
Chula Vista, CA
(619) 691-8367

Joe's Computer
Montgomery, AL
(205) 288-1100

Mines of Moria
Aptos, CA
(408) 688-9629

Northwest Commodore
User's Group
Edmonds, WA
(206) 743-6021

Old Colorado City
Electronic Cottage
Colorado Springs, CO
(303) 632-3391

Video King BBS
Lincolnwood, IL
(312) 674-6502

You can find more information on BBSs in the following publications:

BBS Directory
P.O. Box 4215
Beach Station
Vero Beach, FL 32964

*The National Computer
Bulletin Board Directory*
Computer Literacy Press
3352 Chelsea Circle
Ann Arbor, MI 48404

The Computer Phone Book
New American Library
1633 Broadway
New York, NY 10019
(Monthly updates to
The Computer Phone Book
are available by subscription
from Update
The Computer Phone Book
175 Fifth Avenue, Suite 3371
New York, NY 10010.)

Appendix E: Information Utilities

CompuServe, Inc.
CompuServe Information Service
5000 Arlington Center Blvd.
Columbus, OH 43220
(614) 457-8600
(800) 848-8199

The Source
Source Telecomputing, Inc.
1616 Anderson Road
McLean, VA 22102
(703) 734-7500
(800) 336-3366

Dow Jones News/Retrieval Service
Dow Jones & Co., Inc.
P.O. Box 300
Princeton, NJ 08540
(609) 452-1511
(800) 257-5114

Appendix F: Selected Bibliography

The following books provide reading material for Commodore 64 owners who wish to become more familiar with the technical features of their machine.

Anatomy of the Commodore 64. Angerhausen, Michael, et. al. Abacus Software, 1984.

Anatomy of the 1541 Disk Drive, Englisch, Lothar and Szcepanowski, N. Abacus Software, 1984.

Commodore 64: An Intelligent and Intelligible Guide for the Inquisitive Adult. Heil, John A. and Martin, Jack. Banbury Books, Inc., 1983

The Commodore 64 Music Book: A Guide to Programming Music & Sound. Vogel, James and Scrimshaw, Nevin B. Birkhauser Boston, Inc., 1983.

The Commodore 64 Programmer's Reference Guide. Howard W. Sams and Company, Inc., 1983.

Addresses of the publishers of these books are:

Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510

Banbury Books, Inc.
353 West Lancaster Avenue
Wayne, PA 19087

Birkhauser Boston, Inc.
380 Green Street
Cambridge, MA 02139

Howard W. Sams & Co., Inc.
4300 W. 82nd Street
Indianapolis, IN 46258

Glossary

Access. (1) *V*, to read, write or update information, usually on an external memory device such as a disk; also, to reach the data in order to perform a read, write or update operation. (2) *N*, a single one of these operations.

Alphanumeric. Containing both letters and numbers, often including punctuation marks. Also refers to the screen mode that displays only letters and numbers (in contrast to graphics mode).

Amber screen. A type of monitor that displays text and graphics in amber on a black background. Some people prefer amber screens to black-and-white or green-and-black screens; they are popular in Europe. See *monochrome*.

Analog. Pertaining to signals that can take on any value in a continuous range, in contrast to digital signals, which can only vary in steps. Signals produced by physical processes are usually analog and must be translated into digital form by special boards before they can be processed by computers. See *digital*.

Application software. Software programs that are used for specific tasks other than just running the computer or developing other programs. Financial, word-processing and appointment-schedule programs are examples of application software.

Array. A grouped set of values arranged so that you can identify a specific value by its unique position in the group. For example, in an array showing maximum daily temperatures for the month, you could refer to the temperature on the last day of the first week by TEMP(1,7).

ASCII. (AZZ-key) Abbreviation for American Standard Code for Information Interchange. Almost all personal computers use ASCII to encode letters, numbers and other symbols into computer bit strings.

Assembler. A program that translates other programs written by people into a form more usable by the computer. See *assembly language*.

Assembly language. A type of computer language that requires the programmer to specify to the computer the exact machine operations that are to be performed. Programmers can create fast-executing, compact and efficient programs using assembly language, but a lot of detailed time-consuming programming is involved. Testing and debugging assembly-language programs can be difficult. Assembly-language programs must often be extensively rewritten in order to be

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used with types of computers other than the one on which the original program was written. Most programs are now written in one of the more efficient high-level languages that can specify many machine operations with a single program line.

Asynchronous communication. A method of transferring data that does not require the information to be sent at a constant pace. It is the standard method of communicating on most personal-computer networks where you read or send information, including public communications networks, bulletin boards and information utilities such as The Source or CompuServe.

Back up. To make a copy of a file or program in case the original is damaged.

Backup. The copy of a file or program that you make in case the original is damaged. Because computers can erase information even more quickly than they can process it, it is essential to make regular backups as a part of any serious work with a file or program.

Bandwidth. The highest frequency signal that monitors and other displays can accept and show on their screens. A higher frequency indicates finer possible detail, but it may also require special video cards and be more costly.

Bar chart. A chart that uses a series of horizontal or vertical bars to show relative values.

BASIC. A computer language designed for the easy, interactive development of programs. Because the Commodore normally translates and executes a BASIC program line by line, it can show you any problems it has in understanding your commands and get you to fix

your statements. Both the Commodore 64 and VIC20 have BASIC built in to their permanent (ROM) memory.

Baud. A measure of data-transmission speed. In personal-computer telecommunications, one baud is equal to one bit transferred per second. Common baud rates for data transmission over telephone lines are 300 and 1200 baud. In text transfer, the baud rate is equal to ten times the number of characters exchanged per second. Local connections between computers and terminals often run at 9600 or 19,200 baud. The term is also used to refer to the measurement of the speed of data transfer between a computer and a cassette-tape storage system.

Binary. The counting method computers use. Although decimal numbers use the ten digits 0 through 9, binary numbers use only 0 and 1. Each digit in a binary number represents two times as much as the digit to its right, so binary counts with the ones place, the twos place, the fours place, the eights place and so on.

Bit. Abbreviation for binary digit, the smallest unit of information that can be stored in a computer. It can represent a single digit of 0 or 1, a single yes/no answer, a light or dark spot on the screen or one of two colors.

Boot. To start up DOS. If you are running BASIC, you put the DOS disk in the drive and then type "DOS." If not, you put the disk in the drive and turn the computer off and then on again. Booting actually means to run a small program that starts the process of reading in the

rest of DOS and then running it. The term comes from an analogy with "pulling oneself up by one's bootstraps."

Buffer. An area of computer memory reserved for temporarily storing data that is on its way to or from the disk or other device.

Bug. A mistake in a computer program. It is common to make mistakes either in the program logic or in the actual coding (wording) of a computer program when you first write it, so "debugging" is a normal part of writing computer programs.

Bulletin board. A computer-network service shared by people who use it to exchange information. You can call up the bulletin board to leave or read messages. Most bulletin boards are free of charge and are run as personal hobbies or for goodwill purposes by businesses and organizations.

Byte. A data unit of 8 bits. A byte can represent a single character, a computer instruction, part of an address or part of a number.

Cable. In general, a wire or set of wires that runs between various units. Most cables consist only of the wires and the connectors at each end, but some have special shielding or circuitry inside. Cables are often not included in initial hardware packages but are necessary to buy if you need to hook up additional devices.

Canned. Referring to programs that are written for sale to many users, rather than custom-made. Because the cost of developing canned programs is typically spread among many users, they can offer good value. Because they must be written without knowledge of individual users' requirements, however, users

must conform to the programs' ways of doing things.

Cartridge. Small plug-in boxes that hold read/write memory (RAM) or read-only memory (ROM). ROM cartridges tell the computer how to run programs and talk to the keyboard and screen. RAM cartridges provide space for the computer to temporarily store your data and programs that you write.

Cassette interface. A connector on a computer in which you plug the Datasette recorder. Unlike the cassette interfaces on many other personal computers, the Commodore 64 supplies a digital signal, not an audio one, and must be used with a special digital tape recorder.

Chip. Strictly speaking, an integrated circuit (a minute piece of silicon or similar material in which circuits have been formed). Loosely used to refer to the packaged circuit as well.

Color monitor. A display unit similar to a color TV but without the tuner. Because the video signal doesn't have to be changed to a broadcast signal and back, color monitors can show better detail (including more characters per line) than can TV sets.

Compiler. A software package that converts a program or module from the high-level language written by a person into machine-language instructions that the computer can execute. After the compiled program has been saved in machine-language form, it can be used again without retranslation. Developing a compiled program is more difficult than developing one for an interpreter (which translates the program each time it is run), but compiled programs run faster.

Composite video. A video signal that has the picture, synchronization and any color information combined into one signal. Composite video requires only one signal wire, but combining and then splitting out the various parts of the signal causes a loss in fidelity in comparison to separate sync and picture or color information. The standard connector for composite video is the same RCA phono jack used for the connections on most stereo systems.

Controller. Abbreviation for disk controller, the chip or complete circuit that translates computer data and commands into a form suitable for the disk.

Copy protection. One of the various methods that attempts to let the computer read and run a program without making a copy of the program. Manufacturers would like to protect their software to prevent unauthorized copying, but users want to be able to make backup copies just in case something goes wrong with their disk.

CP/M. A trademark of Digital Research, Inc., for its disk-operating systems.

CPU. Abbreviation for central processing unit (the "brain" of the computer). See *processor*.

Cursor. An underscore, box or other special symbol on the screen that shows you where the next character will be displayed.

Daisy-wheel printer. A type of printer that uses a flat wheel with letters on spokes radiating out from the center. This type of printer produces fully-formed, letter-quality output, but it is more expensive and slower than most dot-matrix printers.

Data. From the computer's point of view, anything that is entered into the computer to be stored, manipulated or displayed. The word is often used to mean just the information to be acted on, rather than the instructions and commands that tell the computer what to do.

Data base. A collection of data records organized so it can be updated, sorted and displayed in various ways.

Data-base-management system (DBMS). A program that maintains an organized collection of data records and contains procedures to update, sort and display the records in various ways.

Data bits. As applied to the internal workings of a computer, the number of bits that a computer normally expects for most of its arithmetic and logical operations. For personal computers, this is 8, 16 or 32 bits. As applied to data communications, it is the number of bits used for sending each character, not including the added check and timing bits.

Data capture. In general, the process of entering data into a computer. In most cases, this means typing it in on the keyboard. The term is also used for a feature of communications programs that makes a disk or memory copy of the data that goes in or out.

Data file. A file containing information that the computer will operate on, rather than one containing instructions to tell the computer what to do.

Data transmission. The process of sending computer data either over special communications lines or by way of the ordinary telephone network. To send data by phone, you must route it through a modem to

make it compatible with the telephone network.

DBMS. See *data-base-management system.*

Dedicated. Refers to a computer system that is set up exclusively for a particular use, such as word processing.

Destination drive. In a disk- or file-copy operation, the disk that will receive the copy.

Development tools. Programs that create, test and debug other programs. Some common development tools include program editors, compilers, loaders, linkers, assemblers and debuggers.

Digital. Values or signals that are read as in one of a definite number of distinct states, instead of being any continuous value. Computers operate internally on binary, the digital system with just two states. For input and output, however, they can often work with digital values that have thousands or even millions of distinct possibilities.

Disk drive. The recorder/player mechanism that reads and writes information on disks. A disk drive must match the kind and size of disk being used and the disk controller that connects it to the rest of the computer.

Diskette. A term used by IBM and others for what most people call a floppy disk or flexible disk.

Diskette holder. A plastic box used for holding diskettes while they are not in use. The most popular diskette holders are similar to covered trays and hold from 20 to 100 disks.

Disk-operating system (DOS). A set of programs that tells the computer how to read and write information from the disks, read and execute programs and interact with the user through the keyboard and screen.

DOS. (DOSS) See *disk-operating system.*

Dot-matrix printer. A type of printer that forms each letter out of a pattern of small dots arranged in a two-dimensional grid. Letters produced in this way are less attractive than those produced by printers using fully-formed characters, especially if each letter contains only a few dots. Dot-matrix printers, however, tend to be less expensive, faster and more durable than many other types of printers.

Download. To record on a personal computer a file or program that has been sent by a bigger computer or a remote computer connected by a communications line or telephone.

Drive. See *disk drive.*

Editor. A type of program used to create and revise text files. Editor programs are usually simpler to use than full word-processing systems because they lack extensive formatting commands.

Electronic bulletin board. A computer system that you can call to leave or read messages. See *bulletin board.*

Electronic mail. A service used to send messages via computer networks. One feature of electronic mail is that a message is stored by the network until the receiver is available to receive it. Several commerical electronic-mail networks exist; The Source and CompuServe

information utilities also offer this service.

EPROM. (EEE-promm) Memory chips that normally are only read from and that retain their data even when the power is turned off. They can be erased and reprogrammed, however, using fairly simple equipment.

Field. A group of characters that together are considered as a single value or the space for entering the value. For example, a field may be a blank line in a display for entering your name or a part of a disk record holding the last data accessed.

File. A collection of data stored under a single name. For example, a file may be the equivalent of a single file folder, a file drawer or an entire file cabinet. Files are made up of records equivalent to single forms or entries.

File manager. A program that accepts data according to a format and then prints it out in a list. Also, a term for programs that manipulate collections of files without paying attention to their contents.

Fileserver. On a network of connected computers, a network unit that provides disk file storage and retrieval for the network. A fileserver might be a computer with a hard disk or a special disk unit designed for this purpose.

5-inch. An accepted way of referring to 5¼-inch disks or disk drives. Because there are no other standard sizes between 4 and 8 inches, it is understood that the 5-inch designation is just shorthand for the more precise 5¼-inch.

Floppy disk. A type of computer storage much like a cross between audio recording tape and a phonograph record. Data is recorded in a magnetic coating that rides on a flexible round sheet of Mylar, encased in a stiff but flexible square plastic envelope. Like recording tape, the floppy can be recorded, read and rewritten many times; like a phonograph record, you don't have to play the entire disk to reach information at the end or any other point. Floppy disks are also called flexible disks and diskettes.

Floppy-disk drive. A mechanism for recording and playing back information on floppy disks. Drives come in models for each of the standard disk sizes, and in single- and double-sided varieties (meaning they record on one or both sides of each disk).

Format. (1) As applied to disks, to write the empty track pattern that must be added to a disk before information can be stored on it. This process also permanently erases any existing stored information. (2) As applied to text files, to arrange the text and put in the required printer control characters so the file prints out in an attractive fashion.

Friction feed. A method of pulling paper through a printer that is similar to how paper is pulled through a typewriter. With friction feed, the paper is pulled by rotation of the main paper roller (the platen) and the slight squeezing force between the main roller and a set of guide rollers. Friction feed is best for single sheets of paper (cut sheets), such as letterhead, but tends to slip on long sheets such as continuous forms, rolled or fanfold paper.

Full duplex. Referring to data communications in general, it means that data can flow both ways at the same time. In the setting for terminals and terminal-emulation software, it means the mode in which characters typed on the keyboard are sent along the communications line and are only displayed on the screen after they are echoed back from the other system.

Game port. An input that connects to a joystick or game paddle. The Commodore 64 computer has two game ports, for two-player games. Because the game port design is so similar, the same controllers and joysticks can work on both Commodore and Atari machines.

Graphics software. Programs that either (1) make graphs and charts from existing data or (2) let you draw or sketch on the screen.

Green screen. A type of monitor that shows text and graphics in green on a black background. Some people prefer these to black-and-white monitors, because they seem to have less flicker and less glaring contrasts. See *monochrome*.

Half duplex. In data communications in general, it means that data can flow alternately in each direction but not both ways at the same time. In the setting for terminals and terminal-emulation software, it means the mode in which characters typed on the keyboard are also displayed on the screen, along with any messages sent back from the other system.

Hardware. The chips, circuits, board and cabinets that make up a computer, as distinguished from software, which tells the computer what to do.

Hex. Abbreviation for hexadecimal. The number system with base 16.

This system contains the digits 0 through 9 plus the letters A through F for a total of 16 possible digits. Hex is is easy for people to use, and it is easily converted by the computer to the binary system it uses.

High-level language. A language for writing computer programs that is based on stating the logical operations desired instead of the exact steps the machine needs to do to accomplish the instructions. A single high-level language instruction can cause the machine to execute dozens or even hundreds of machine instructions. High-level languages must be translated into machine language for the computer to execute them, a task done by programs called compilers and interpreters.

Horizontal. As applied to software and also to markets for personal computers, pertaining to activity that is generally part of a wide range of business or leisure activities. Writing, arithmetic calculation, data bases and other information-storage and -retrieval systems are examples of horizontal activities. Software or complete systems designed for horizontal use must be more general and may not solve any particular problem as efficiently as a more targeted solution. Because of their bigger potential market, their cost may be lower and the same effort learning a single package may be used in several applications.

IC. See *integrated circuit*.

Integrated circuit (IC). A semiconductor chip containing a particular combination of memory and logic circuits. The greatly increased power of ICs and their falling relative prices made personal computers possible.

Integrated program, integrated software. A program or series of programs that accomplish several standard functions and share data and general command structures among their various modes. The most popular integrated programs contain a combination of spreadsheet, word-processing, database, and graphing software.

Interface. (1) *V.* To form the connection between two systems or units that cannot be connected directly. (2) *N.* Denotes a program, circuit or card that performs the function of interfacing. One of the most common uses of the term is for the serial and parallel interfaces, cards or circuits that translate data between the internal form used by the computer and the form needed for communicating with printers, modems, networks and other external circuits. See *parallel* and *serial.*

Interpreter. A software package that translates a program from a higher-level language to machine form by translating each line in turn and then executing it. Interpreters make it easy to write and debug programs, because they can be built up from small parts and tested easily, but they take time to retranslate the program every time it is run even if there are no errors.

Joystick. A type of game-control input device. It looks somewhat like a miniature floor-mounted stick shift in a small box. A joystick is used as a direction-pointing device for games and graphic programs.

K. In general, refers to the specific number 1024 (a binary thousand). See *kilobyte.*

Kilobyte (K). 1024 bytes. Program lengths, memory size and disk capacity are commonly measured in kilobytes.

Language. A vocabulary and set of rules for constructing understandable expressions. Computer languages, such as BASIC or Pascal, have a restricted vocabulary and a formal set of syntax rules. Natural languages, such as English or Spanish, are more open-ended and ambiguous.

Light pen. An input device. It looks like a pen with a wire trailing from the top and is used to point to locations on a computer screen so that programs can "read" the indicated location. Light pens are used for drawing programs, for selecting from menus and for computer-aided-design programs.

Local-area network. A system in which computers exchange information within a single building or group of neighboring buildings. Local-area networks allow transfer of files among computers, and they are also often utilized to share the use of expensive devices such as large disk drives or printers.

Logo. A computer language designed to make it easy to learn computer programming; it contains a form of easy, graphic drawing commands. Many people advocate using Logo rather than BASIC as a first language, especially for children.

Machine language. The actual sequence of 1s and 0s used by the computer as instructions for executing a program. All other languages are translated into machine language before the computer runs them. Also called binary form.

Macro. A single word or phrase that stands for a group of computer commands. Some assembly languages provide a macro feature, allowing you to define words to stand for sequences of instructions.

Mainframe. A type of large computer used by businesses, government and other large organizations. These computers actually may be less costly per unit of work done than personal computers, but are less flexible and require a whole supporting bureaucracy.

Mass storage. Mediums such as disk or tape on which the computer can keep data and programs but which are not included in the memory space that the computer's CPU can directly address. Most kinds of mass storage also retain their contents when the power is turned off, so they can be used for storing programs and data between sessions. Although disk drives may seem expensive, both disks and tapes are far less expensive per byte of storage than the main memory (which is made of chips).

Megabyte. Literally, a million bytes. In practice, refers to the binary number that is formed by squaring a binary thousand (1024 squared or 1,048,576). It's most often seen as a measure of the size of memory or of disk-drive capacity.

Memory. In general, any data-storage device; specifically, memory is used to signify the semiconductor RAM chips that form the main read/write storage of the computer.

Memory map. A diagram showing which parts of the possible addresses are used for which purposes in a computer system. Normally, some of

the area is reserved for special uses, such as permanent (ROM) memory, input and output and so on. Part or all of the remaining area contains RAM (read/write memory), and part may not have anything connected.

Menu. A list of choices presented by the computer from which you select the one you want. See *menu-driven*.

Menu-driven. Refers to software that depends heavily on presenting users with lists of choices from which to pick. Inexperienced users generally like this type of software, because they can see their choices clearly each step of the way. More experienced users often prefer skipping the menus and directly specifying their commands.

Modem. A device that changes computer data back and forth into forms that can be more easily transmitted by telephone or other type of communications link. You can hook the VIC Modem to the Commodore 64's parallel user port. Most other brands of modems have to be connected to a serial port. Along with a modem, you need a communications program to send and receive data over the telephone.

Monitor. A display unit that is much like a TV but without the tuner. A Commodore VIC or 64 can use a TV for a display unit, but a monitor produces a sharper picture.

Monochrome. Literally, "one-color." Refers to displays that produce one color and black. Black-and-white screens, amber screens (amber on black) and green screens (green on black) are examples of monochrome displays. Less expensive than color displays, monochrome displays often give a sharper image. See *amber screen* and *green screen*.

Network. A system that lets computers exchange information and/or the use of expensive devices such as large disk drives or printers. Wide-area networks (WANs) or telecommunications networks are linked by phone lines or other long data links, while local-area networks (LANs) serve computers at a single location.

Paddle. Short for game paddle. One of the several types of hand-held controllers that you can plug into the side of the Commodore 64 to move objects or control games.

Parallel. Referring to connections between the computer and printers or other devices, sending data as groups of eight bits at a time, each bit carried by one of eight individual wires. Printers with parallel input are generally cheaper, and parallel connections are usually easy to set up.

Parallel user port. A connector on the Commodore 64 that you can use for a printer or the VIC modem. Besides its eight parallel signal lines, it also contains assorted power and control lines.

Parity. An extra bit added to characters or groups of bits being sent between parts of a computer, stored in memory or exchanged between computers. The parity bit helps check whether the data received is valid by indicating the expected number of 1s in each character or bit group.

Peek. A BASIC function that returns the value stored at a given memory location. The converse BASIC operation that stores a value in memory at a stated address is a Poke.

Pin feed. A method of pulling paper through a printer. With pin feed,

outward-pointing cone-shaped pins stick out from rings at the ends of the main paper roller (the platen) on the printer. When paper is fed through the printer, these pins pull on corresponding holes that are along the left and right edges of the paper. Pin feed is similar to tractor feed, but in the latter case the pins are on a separate shaft. Pin feed does a good job of keeping paper aligned when using continuous forms or fanfold paper, but it cannot be adjusted for different paper widths and is not suitable when the paper must be moved backwards as well as forwards.

Pixel. Abbreviation for picture element. The smallest dot that can be displayed on the screen. Both text and graphics screen images are made up of combinations of pixels. The more pixels per screen, the finer the images that can be drawn.

Portable. A computer designed to be moved from place to place but not necessarily battery-operated.

Power-line filter. A device into which you plug the computer, and which you then plug into the power outlet. Most power-line filters consist mainly of special clipper circuits that chop off the tops of any noise spikes that might come over the power line. The manufacturers of these devices claim that power-line noise is a major cause of unexplained computer-system crashes.

Processor. The part of the computer that interprets the commands, does the arithmetic and logic operations and controls the flow of data. Most Commodore computers use the 6502

microprocessor chip (the same one used in the Apple II family and Atari 400 and 800 series). Processors are often categorized by how many bits of data they can handle at once for their internal operations. The 6502 is an 8-bit processor, as is the Z80 used in most CP/M computers. The IBM PC uses a 16-bit processor.

Program file. A file containing instructions for what the computer is to do, rather than the data or information to be processed. Program files can either be the source-code files written by people, an intermediate form or the machine code (binary code) actually executed by the hardware.

Programming language. An artificial language designed to allow users to write instructions for computers. Unlike natural languages, such as English, programming languages have a definite vocabulary, a completely defined syntax and a clear standard for what is an acceptably formed statement. See *assembly language, high-level language* and *machine language.*

Protocol. A set of rules for the exchange of information over a computer network. Personal-computer data networks generally use simple protocols originally designed for use by teletypewriters, a public-domain protocol called XMODEM or various protocols included in proprietary software packages. See *XMODEM.*

Public-domain software. Software that the author has distributed without charge, though use of public-domain software is often limited to private, non-commericial use. Most users' groups maintain libraries of public-domain software. Some public-domain software is equal or superior to commercial software, but some turns out to have

serious bugs. Wider use of these programs is inhibited by a general lack of documentation and support.

Radio-frequency interference (RFI). A type of disturbance in TV or radio reception that is sometimes caused by computers or peripherals, such as printers. Newer computers must stay within certain limits for radiating the offending signals, but there still may be a problem with older units or where TV or radio reception is difficult. The FCC has set regulations for computers and similar devices limiting the maximum amount of RFI that they are allowed to emit.

RAM. See *random-access memory.*

Random-access memory (RAM). Memory that the computer can both read from and write into. Random access means that the various locations can be read or written in any order, not just from bottom to top.

RBBS. Abbreviation for remote bulletin-board system. An electronic bulletin board accessible by telephone.

Read-only memory (ROM). A type of memory that a computer can read from but not change. ROMs also keep their contents intact when the power is turned off. Most computers use ROMs to tell the computer how to read in the disk-operating system.

Record. A single complete unit of information stored to or read from a disk. A *physical* record is the chunks of data that the disk actually reads and stores. A *logical* record is how the information is assembled for use in programs, and it can be smaller or larger than the physical record. Typically, a logical record

represents a single filled-in form — for example, the work hours of one employee or a single sale in a retail data base. Records are made up of individual fields and are combined into files.

RF modulator. A device that takes the video signal produced by a computer and changes it to the form that a TV set can receive from the antenna. Because of the fidelity limitations of encoding and decoding the video signal, a TV set does not produce as sharp a picture as a monitor. The Commodore 64 has a built-in RF modulator that you can switch to either channel 3 or 4.

ROM. (ROMM) See *read-only memory.*

RS-232. The most common standard for connecting computers, terminals, modems and other equipment by a serial connection. Although a complete standard for this type of connection exists, most computer connections use only some of the approximately half-dozen control lines available — so it sometimes takes some expertise and work to get two of these "standard" connections to work together.

Sector. (1) A section of space along the concentric magnetic patterns written on each disk, or (2) the data that is stored in that section. Using the Commodore 1541 disk drive, 256 bytes are stored in each sector, with 17 to 21 sectors per track.

Serial. As applied to data exchanges, the process that sends each character or group of bits one after another down the same wire. Characters are distinguished either by timing methods or by appending special, longer start-and stop-bit patterns.

Serial interface. (1) A connection on a printer, modem or other device that expects to communicate with a computer by passing data down one wire in each direction. (2) On a computer, the matching circuit and connector that sends and receives data in that fashion.

Serial port. Used as a term for a serial interface, a connection for sending and receiving data over a single wire in each direction (plus a ground and often one or more control wires).

SID. Abbreviation for sound interface device. Usually refers to the sound interface device chip provided on the Commodore 64. It allows you to program three different computer-generated voices for pitch, tone and type of sound.

SIG. Abbreviation for special-interest group, meaning a group concerned with a particular application, machine or language. Many users' groups and clubs have special-interest groups, as do several of the information utilities such as CompuServe.

Simulation software. The type of software that presents you with a set of facts concerning a particular situation or event, solicits your input for what to do next and then calculates the results of your decisions. Simulations are used extensively for industrial training and in educational and game software.

Software. The programs and instructions that are not built permanently into a computer, but that are instead read in from disks or tapes or entered from the keyboard.

Source code. The text of a program as written by a person. The source code is then translated to machine-language form, either by a compiler or interpreter program.

Source drive. In a file- or system-copying operation, the drive from which the information is to be read.

Spreadsheet. A program that lets you work with numbers in chart form, with each value in the chart set either by direct input or as a calculated result of other entries. Because the entire chart can be easily recalculated after any value is changed, these charts are widely used for budgeting and forecasting.

Sprite. A programmable figure or shape that you can create and then move around the screen as if it were on a plane either in front of or behind the other objects on the screen. The Commodore 64 can display up to 8 sprites.

Stop bit. In serial communications, an extra bit added after each character to tell the receiving system that the character has ended and following bits will be part of the next character. Most systems require one, one-and-a-half or two stop bits.

Touchpad. A book-size device that you touch or draw on with a stylus to send a position signal to the computer. Touchpads are especially good for drawing programs, for picking among choices and for some types of games.

Track. An invisible, magnetic circle pattern written onto a disk as a guide to where to store and read information. Standard Commodore disks have 35 of these concentric circles; track 0 is closest to the outside of the disk.

Tractor feed. A method of pulling paper through a printer. Tractors are rollers or tapes that have small outward-pointing cone-shaped pins that mate with holes punched along the left and right edges of the paper. The tractors can usually be adjusted to move the paper position to the left and right or to set the distance between them for different sizes of paper. Tractor feed is the best method for long forms and continuous sheets, such as fanfold paper, but it cannot feed individual sheets, such as letterhead or envelopes.

Users' group. An association of users of a particular computer or software package, or those interested in a particular application of computers. Some users' groups are sponsored by manufacturers, but most rely either on volunteers or entrepreneurs to keep them going. Users' groups commonly have regular meetings and publish newsletters, both of which are important methods for learning about the performance of various systems and software.

Vertical. As applied to software or markets for personal computing, pertaining to a specific type of business or leisure activity — for example, farming, medical practice or pawnshops. Software or complete systems designed for a particular vertical market can be tailored to the needs of that application, but they are likely to be more costly than products intended for a wider, horizontal market.

VIC 20. Abbreviation for Video Interface Computer. The smaller-capacity Commodore home computer. It has a full-size keyboard.

Voice synthesizer. A board or box that you connect to a computer to let the computer produce humanlike speech. Voice synthesizers for personal computers still sound rather machinelike and require programs to translate from text to

the sound codes needed to run the voice-synthesizer hardware. Another term for these devices is a *speech synthesizer.*

Volatile. Used to characterize memory that loses its contents when the power is turned off. Ordinary RAM memory (read/write memory) is volatile, but ROM memory and disk and tape storage are not.

Word length. In character-oriented data communications, the number of bits used to represent each character (sometimes called the data bits). Seven bits are widely used for simple text transfer, but for sending formatted text files or machine-language programs, eight bits are usually required.

Word processing. Using a computer to edit, store and print out text. In the past, word processing could be done only on special systems, but now personal computers can do word processing quite well, with the right software.

Work station. A fancy word for a computer or terminal suited for use by one person at a time.

XMODEM. A protocol (set of rules) for transferring files by telephone. It was originally developed by Ward Christensen and others for use in a series of programs they distributed without charge, and it is now included as an option in most commercial personal-communications software as well. It provides for exchange of both text and program files and for extensive error checking and automatic resending of any sections that have not been received correctly.

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InfoWorld, the authoritative microcomputer newsweekly that has been acclaimed by the *Washington Post* as "indispensable" and by *U.S.A. Today* as "the bible for microcomputer users," brings its insider's knowledge and computer savvy to an exciting series of *Essential Guides.* Each book in this important series focuses on one computer system and offers up-to-date critical reviews of the best hardware, software, and peripheral products available for that system.

INFOWORLD'S
ESSENTIAL GUIDE TO THE COMMODORE 64 ®
by Richard A. Milewski & the Editors of InfoWorld

InfoWorld's Essential Guide to the Commodore 64 is a complete guide to the choice, purchase, and use of the Commodore 64 and the variety of hardware, software, and peripherals available for it.

Beginning with a brief history of Commodore, the book covers the development of the Model 64, comparing it with other Commodores and with competing lines of microcomputers, and looks into the future of both the machine and the company. This is followed by a thorough investigation of why and how to buy a Commodore 64, including what equipment to select for your purposes; how to choose among the cassette, floppy-disk, and wafer-tape options; what to select from the variety of printers and plotters, modems, and exotic peripherals available for the Model 64.

This *Essential Guide* explores a wide range of applications for the Commodore 64, including games, educational programs, word-processing software, spreadsheets, home accounting packages, data-base/filing systems, graphics packages, and communications software. Each section incorporates charts and invaluable tips. Advice on buying software, acquiring free software, writing your own software, and on computer clubs and users' groups, is followed by the renowned, comprehensive *InfoWorld* reviews of products available for the Model 64. A glossary, lists of suppliers and how to contact them, and a bibliography complete the *Guide.*

There isn't a more comprehensive and *essential* guide to the Commodore 64 than *InfoWorld*'s.

Richard A. Milewski is director of Advanced Product Design and co-founder of The Software Works and Trademark Software. He is a past editor-in-chief of *InfoWorld.*

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