

# THINGS TO DO WITH YOUR COMMODORE<sup>®</sup> VIC 20<sup>™</sup>



JERRY WILLIS, MERL MILLER, &  
DEBORRAH WILLIS



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# THINGS TO DO WITH YOUR COMMODORE® VIC 20™ COMPUTER

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by

Jerry Willis

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## CHAPTER ONE

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# Introducing the VIC

A computer can do many useful, interesting, or enjoyable tasks like balancing your checkbook, playing video games, educating your kids, or teaching you computer programming. Computers can't do all this automatically, however. Before a computer balances your checkbook or helps you beat back invading hordes of space no-goodniks, you have to learn a bit about how it works and what it will do. In addition, you will generally find there are many different ways of getting the computer to do a particular job. There are, for example, at least fifteen programs you can buy for the VIC that help you balance your checkbook. There are several hundred video games for the VIC, some that are good, some that are great, and some that are terrible. The VIC also has at least ten word processing programs. You would never want to buy all ten, but it is often difficult to select the most suitable programs for a particular application.

This book should help you make good decisions. It is written for people who own or are considering the purchase of a Commodore VIC computer. We assume the reader is relatively new to computers and would like to know a lot more about what the VIC can do at home, in the office, and at school.

The computer is just like any other machine or tool. The person using it determines how it is used and how much power it has. Contrary to popular belief, computers



## 2 THINGS TO DO WITH YOUR VIC 20 COMPUTER

really aren't intelligent machines that can take the place of humans. There is no more chance that computers will take over than there is that washing machines will rule the world. If you buy a computer for your home, the worst that could happen is that you may waste some of your time or money by using the computer unwisely. Wise use of the computer doesn't mean, however, that every owner learns the same things and uses the computer in the same way. You need to know many basic physics concepts in order to understand the internal workings of your automobile, but you don't have to know any physics at all to drive to the store.

In other words, you can use and enjoy your computer on many different levels. You may choose to regard your computer as you do any other appliance and use it simply as a labor-saving device. Or you may become fascinated with its internal workings; you may continue studying and learning about computers for the rest of your life.

This introductory book is intended to help you use a VIC 20-computer as an appliance. The good news is that you aren't going to have to learn much about hardware, software, bits, bytes, ROM's, RAM's, and other technical things. The bad news is that you will have to learn a little jargon. You have to know some jargon to drive your car. Most of us learned the terms, concepts, and principles needed to drive a car as we were growing up. By the time we were teenagers, the automobile had become a necessity for most families. Terms like ignition, premium gas, gas pedal, and emergency brake were jargon when the automobile was first introduced. Today these terms are commonplace because most of us grew up with cars. The same point could also be made for telephones. Most children learn telephone jargon as they grow up.

The same thing will be true with computers. The next generation will think it normal to have a computer on the

dining room table or in the recreation room. Kids will take terms like RAM and ROM in stride because they grew up with them and they understand how to use computers. Unfortunately, we are part of a transitional generation. We didn't grow up with computers, but we use them because they are inexpensive and useful. We are *automobile literate* and *telephone literate*, but we aren't *computer literate*.

This book will help you become computer literate in three ways. First, as we introduce each computer term, we define it. Second, the last part of this chapter introduces computer terms and jargon. Third, there is a glossary of computer terms in the back of the book. For now, let's start with the two most important computer terms, hardware and software.

## HARDWARE AND SOFTWARE

Before we get into specifics, it is important that you understand these two computer terms. *Hardware* may conjure up visions of eggbeaters or pipe fittings, but it really refers to any piece of computer equipment. The computer itself is a piece of hardware; so are other accessories, such as printers or disk drives (see Chapter Ten).

*Software* refers to the programs that make your computer do specific tasks. The media, particularly newspapers and movies, make it seem easy to get a computer to do what you want it to. Television programs and movies often show people making a computer perform simply by talking to it. As you may have already discovered, your computer isn't that friendly yet. (Actually, we talk to our computers all the time, usually when they don't do what we want, and what we say is often X-rated!)

## 4 THINGS TO DO WITH YOUR VIC 20 COMPUTER

Communicating with a computer today usually involves typing instructions on its keyboard or transferring information stored electronically on a cassette or disk (these are explained later) into the electronic memory of the computer. The instructions a computer follows when it performs a particular task are called software. It takes software to make hardware useful.

A comparison of stereo equipment and records may make the relationship between hardware and software a little clearer. The computer itself is a piece of hardware and is like a stereo. By itself, the stereo cannot create music. The computer can't do anything by itself either. A computer program is like a cassette or record containing music. When the cassette is put in the stereo, the usefulness of the stereo becomes obvious. When a program is put into a computer, the computer also begins to be useful. Just as your stereo will play hard rock, Italian opera, and country music, your computer can play a video game, help you learn a new language, or balance your checkbook. Just insert the correct cassette (or software).

The comparison, however, stops here. A stereo with a cassette deck will play most of the commercially available cassettes, but computer programs are written for specific computer systems. A program written for the Apple computer, for example, cannot be used on your VIC computer without modification. Shopping for computer software is more difficult than shopping for a new music cassette, because software is developed for specific computers.

## “TALKING” TO YOUR COMPUTER

You may have heard that you will need to learn to program the computer before it will do anything useful. It is true your computer can't do anything until it gets a

program written in a computer language it understands, but you don't have to do it.

Computer languages can take weeks, months, or years to learn. Programs (software) that do complicated and useful things take time to write. Writing computer programs is an interesting hobby (or profession) that thousands of people enjoy. You may decide that you want to learn to write programs in a language like BASIC (Beginners All-purpose Symbolic Instruction Code). We'll talk more about BASIC and other computer languages in Chapter Nine. Programming doesn't appeal to everyone who uses a computer, however. Fewer than ten percent of the people who own small or personal computers today spend much of their time writing programs. This means the great majority of people do not write their own software. Instead, they buy software someone else has written. This is what we discuss in this book. This is a software book for the Commodore VIC computer. We'll tell you what software is available to do a variety of tasks, where to get the software, and the strengths and weaknesses we see in the software.

## WHAT CAN YOU DO WITH IT?

Each chapter in *Things to Do With Your Commodore VIC 20 Computer* introduces you to one area of computer application, provides some general information most consumers will need, and then gives some detailed information on the products available in that area. This book is written in a format that allows you to skip around as much as you like. If you are interested in video games, for example, you don't have to read the chapter on business applications. Here is a list of chapters and a short description of their content:

## 6 THINGS TO DO WITH YOUR VIC 20 COMPUTER

Chapter One. *Introducing the VIC*. Explains what a personal computer is, explains what *software* is, and introduces you to the VIC.

Chapter Two. *Fun and Games*. Almost everyone knows that a computer can be used to play games. You can zap invaders from space with your laser ray, play soccer, or hunt for buried treasure in a haunted castle. The VIC is an excellent computer for video games, because it has good color graphics and sound effects. Many video game programs are reviewed in this chapter.

Chapter Three. *Arts and Crafts and the VIC*. Many people are not aware of the tremendous potential of home computers like the VIC in the area of music and visual arts. You may not become a modern day Van Gogh or Bach, but there is more artistic potential in the computer than you might expect. It is more than a number cruncher!

Chapter Four. *The VIC as Teacher*. We talk about two aspects of educational computing—the use of the computer to teach other academic subjects and the computer as a topic of study itself. There are several hundred programs for the VIC that teach everything from use of commas and periods to algebra. Many are described in this chapter.

Chapter Five. *Home Finance and Record Keeping*. Each year it seems family finances become more complex and require more records. The time it takes to keep track of family finances can be cut drastically by computerizing some of these tasks. Several programs for the VIC help you with home finance and record keeping.

Chapter Six. *Tapping into the World: Telecommunications*. Did you know the VIC on your kitchen table can be used to connect you to computers all over the world? You can get all sorts of information, from Italian train schedules to reviews of the latest movies, when you use the VIC as a telecommunications device. Chapter Six shows you how to do it.

Chapter Seven. *The VIC as a Word Processor*. Although the VIC is not likely to replace the \$20,000 word processor at the office, it can be very handy for routine letter writing at home and for helping the kids write that school term paper. Chapter Seven explains how the VIC can be turned into a very smart electronic typewriter and word processor.

Chapter Eight. *Business and Professional Applications*. Regardless of your profession or the type of work you do, there is probably some aspect of your daily activities that could be improved or made more efficient by using a computer. Chapter Eight is a brief overview of the ways a computer can be used on the job. It concludes with a description of some of the business software available.

Chapter Nine. *The VIC's Programming Languages*. Some people want to use the computer to do something. Others want to learn how it operates, how to give it instructions. The art and science of telling a computer what to do is called programming. Programming as well as the various languages available on the VIC (e.g., BASIC, PILOT, FORTH) are described in Chapter Nine.

Chapter Ten. *Selecting and Buying VIC Accessories*. The final chapter in the book deals with the accessories you can buy for the VIC. Disk drives, printers, light pens, extra memory, expansion boards, and more are discussed and reviewed.

## THE ESSENTIAL VIC

This final section of Chapter One should be considered *optional*, because the information is not absolutely necessary to computer users who want to buy programs and start using the computer. However, we do feel that some

## 8 THINGS TO DO WITH YOUR VIC 20 COMPUTER

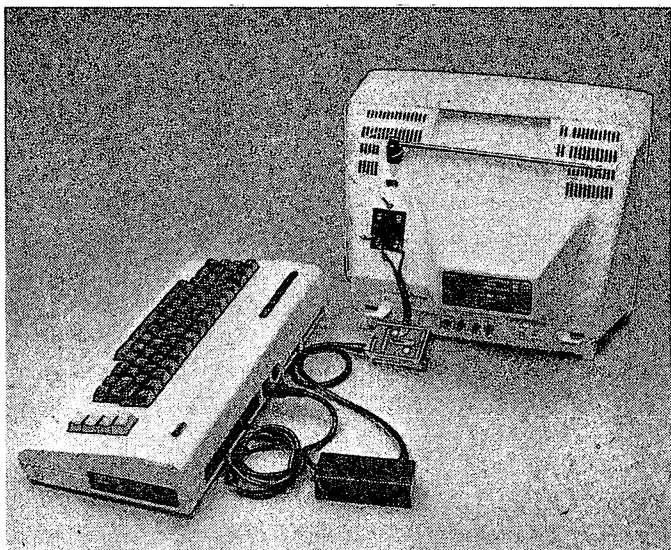
understanding of how the VIC operates and the components that make up the VIC computer system is helpful, especially if you are thinking of buying accessories. Many of the commonly used computer terms are explained in this section.

The VIC, like any other computer, is an electronic device that can be *programmed* to perform a variety of different tasks. That is, if you understand one of the languages the VIC understands, it will be possible for you to develop a set of instructions that you can type into the computer. When you tell the VIC to *execute* the instructions you have typed in, the VIC will load the electronic signals that represent your instructions into a special section of its memory and begin to perform the operations associated with each instruction. The instruc-



Fig. 1.1 VIC 20 computer

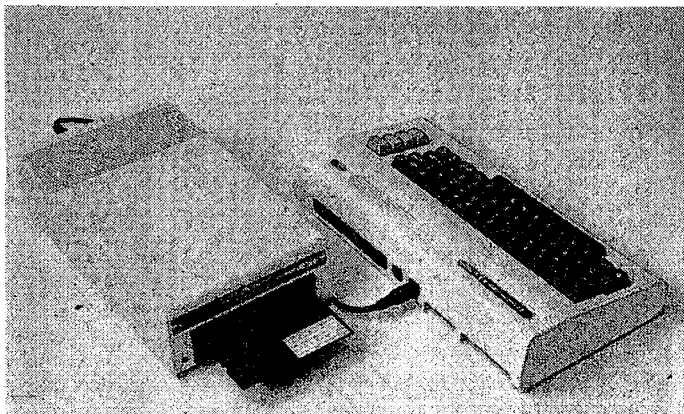




**Fig. 1.2** VIC 20 with a video modulator connected to a TV monitor. Joystick hookup can be seen on the right side of the VIC 20.

tion *PRINT* “*Hello, how are you?*”, for example, tells the computer to print the sentence *Hello, how are you?* on the video screen. The programs you buy and use on the VIC are really sets of instructions written by programmers. Sets of instructions that do a particular job, such as play a fast game of Blackjack, are called *programs*. The general term *software* is also used to refer to computer programs.

Software or computer programs can be written by the computer owner or purchased. Store-bought software is available in several different forms. Much of the video game software for the VIC, for example, is sold in cartridge form. The instructions that turn the VIC into a game machine are stored permanently in circuits inside the cartridge. When you insert a cartridge into the slot

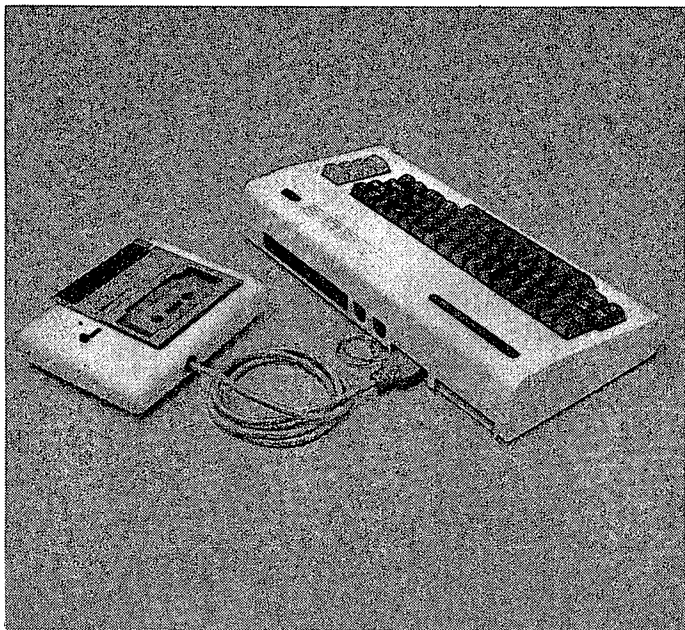


**Fig. 1.3** VIC 20 with single disk drive (VIC 1541) and floppy disk being inserted.

on the back of the VIC and turn it on, the computer will read the signals stored in the cartridge and follow the instructions it finds.

Software for the VIC is also available on cassette. Cassette software is no more than the electronic codes that represent the program's instructions recorded on a cassette in much the same way music is recorded on cassette. The VIC understands several instructions that let it *listen*, electronically speaking, to the signals on the cassette and to convert the signals into instructions that are stored in the computer's memory. If you buy a program that comes on a cassette, you will need to *load* the program into the memory of the computer through a cassette recorder and then to tell the computer to begin executing the program's instructions.

A third way you are likely to buy software is on a disk. Disks are flexible platters of coated mylar plastic enclosed in a protective envelope. Disks look a lot like 45 RPM records. The coating on these disks is magnetic, and a special device called a disk drive can record in-



**Fig. 1.4 Back view of VIC 20 with Commodore cassette recorder.**

formation on the surface of the diskette or read the codes stored there.

If you learn to program the VIC, you will be able to use a cassette recorder or disk drive to save the programs you write for use later or to load a favorite program back into the computer's memory.

The tremendous versatility of a computer comes from the fact that it can understand and use thousands of different programs. The computer is not at all prejudiced about what it does. If you write or buy a program that helps you keep track of the names and addresses of everyone who belongs to your civic club, the computer will execute that program just as happily as it executes the

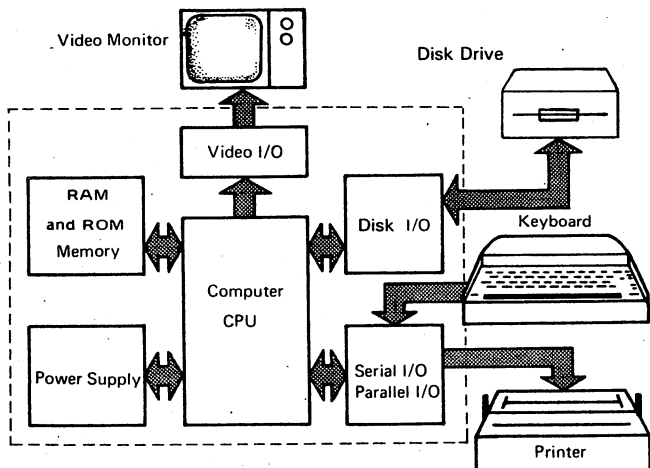
## 12 THINGS TO DO WITH YOUR VIC 20 COMPUTER

instructions in your teenager's favorite video game cartridge.

Software is what makes a computer versatile, but hardware, the nuts and bolts of the computer, is what most of us think of when we talk about computers. Figure 1.5 is a block diagram of the VIC computer's hardware. Everything inside the dotted square comes with the computer. Everything outside the dotted line is optional except the keyboard.

### The Power Supply

The VIC power supply is a small black box that plugs into a wall outlet. It converts the 120-volt AC house current into direct current (DC) voltage. Most of the VIC's internal circuits operate on five volts DC.



**Fig. 1.5** Block diagram of the VIC's computer hardware.

## I/O Ports

I/O is an abbreviation for input/output. If a computer is to be of any use to you, it must be able to receive information and communicate its response back to you. This basic function is called input/output. The places on the computer circuit board where I/O occurs are often called *ports*. The VIC has several ports that allow you to communicate with it and it with you. The keyboard is your primary means of giving information and instructions to the computer. When you press a key on the keyboard, the keypress is converted into a pattern of electrical signals. Each key has a unique signal or code that is transmitted to the computer. A single key has, in fact, many different unique codes. The key with the letter A on it, for example, has a code for a capital A and for two different graphics symbols. These codes are often represented as a pattern of eight ones and zeros (for instance, 00101101), but inside the computer they are really the presence (1) or the absence (0) of an electrical signal. The VIC interprets the signals it gets from the keyboard as instructions to do something (for example, pressing the DEL key deletes a character from the screen) or as a code for a letter, number or graphics symbol.

The keyboard on the VIC is a very good one, particularly when it is compared with the keyboards on other computers in its price range. The video I/O port on the VIC is not quite so impressive. This computer can create very good color graphics, but it is limited to a display of twenty-two lines of twenty-three characters. You are likely to find yourself wishing the VIC's video circuits had a bit more capacity.

In addition to the I/O ports for the keyboard and the video display (a television or monitor), the VIC has provisions for connecting a tape recorder, a disk drive, print-

ers, and two joysticks or game paddles. The game connectors can also be used to attach a light pen. (If you are unfamiliar with any of these devices, they are described in Chapter Ten.)

There are two more I/O ports on the VIC. One is the *expansion port*, which is on the back. This port lets you insert cartridges that work just like cartridges on video games. These cartridges contain additional memory. Some cartridges contain a type of memory that can be used to store programs and data created by the user. Others have *preprogrammed* memory that contains instructions for the computer.

The last port on the VIC is the *user port*, which is also located on the back of the keyboard. The user port is called an *expansion bus* or *expansion port* on some computers. It is a convenient means of connecting several types of accessories to the computer.

## Memory

When you press a key on the keyboard or load a program into the computer from a cassette or disk, there must be somewhere to put that information. Each letter or number you type on the keyboard is converted to a code and stored in the memory of the computer. All computers convert characters into ones and zeros (On and Off electrical signals). The letter A has the code 01000001. Such a set of eight digits is called a *byte*, and each of the ones and zeros is called a *bit*. Seven of those bits are used to define the code for each character the VIC can understand, and the eighth is usually added to the character code so the computer can check for errors. This process, called *parity checking*, will not be discussed here. Bytes, the eight-bit patterns, are the fundamental code units for the VIC and for most small computers.

Memory inside the computer is also divided into bytes. One byte of memory can hold the electrical impulses that represent eight ones and zeroes. Every letter, digit, graphic symbol, and punctuation mark the VIC can understand has a unique code that is one byte (eight bits). That means there is no place in the computer where an *A* or *B* or 7 or + is stored. Instead, each of those symbols has its own one byte code. That code is what is stored in the memory of the computer.

The VIC's memory is organized into bytes. The unadorned VIC comes with several thousand bytes of memory, but not all of it is available for general use. There are actually two different types of memory in the VIC: RAM and ROM. ROM stands for Read Only Memory. This type of memory is generally programmed at the factory. The contents of ROM cannot be changed by the user. The VIC ROM contains thousands of instructions for the computer. The instructions that allow the computer to speak BASIC, a popular computer language, are in ROM. When the VIC is switched on, it automatically goes to the section of ROM where the instructions for BASIC are stored and prepares to speak BASIC with you.

Not all computer memory can be ROM, however. Much of the memory in the VIC is RAM, or Random Access Memory. RAM is general-purpose memory that is available for use by the computer operator. The standard VIC has a little over 5000 bytes of RAM. Since each byte can store the code for one character, the 5000 bytes can hold up to 5000 characters. The VIC uses almost 1500 bytes of RAM for its own housekeeping work, however, which means you have around 3583 bytes of memory available for use. The VIC can use a maximum of slightly over 32000 bytes of RAM. Extra RAM is added to the VIC by plugging in cartridges to the expansion port.



RAM is also known as *volatile* memory. It is general-purpose memory. You can store data or instructions in RAM, tell the computer to use the information you've stored there, and then replace the material in RAM with something new. You can put data in RAM (write the memory), and you can determine what is stored there (read from memory). You can only read ROM. The biggest problem with RAM is the fact that whatever is in it disappears when the computer is turned off. If you need to save something in RAM for use later, it is necessary to store it on a cassette or disk before turning the computer off. Material in ROM, on the other hand, remains there essentially forever but cannot be changed or modified.

You will see ads for 3K RAM, 8K RAM, and 16K RAM cartridges for the VIC. Memory is often referred to in terms of K. Each K of memory is 1024 bytes. Thus 16K would be 1024 times 16 or 16384 bytes. Just multiply the number of K by 1024 to determine the number of bytes of memory.

## The CPU

The CPU, or central processing unit, is the heart of a computer system. Although most CPUs are smaller than a half dollar, the electric components they contain would have filled a room a few decades ago. Large-scale integration technology permits manufacturers to cram thousands of circuits into tiny silicon chips that work dependably and use less power than an electric razor. There are several popular CPU chips today with names like Z80, 8088, 6502, and 68000. There are real differences among these chips, but the differences are mainly of interest to computer designers, experienced programmers, and to users who need the special capabilities of some of the chips, such as the ability to use large amounts

of memory or to work very rapidly. The VIC uses a 6502 CPU, the same chip used by the Apple II and the ATARI computers. This particular chip is a relatively old chip (nothing is really that old in this field, however). Its primary limitation is that it can, using normal procedures, handle no more than 64K of RAM and ROM memory. Newer chips can handle well over 500K of memory and work much faster than the 6502, but this CPU is still a fine chip. In addition, because the 6502 has been on the market for several years, thousands of programs have been written for computers with 6502 CPUs. Unfortunately, just because both use the 6502, that does not mean that Apple programs will run on the VIC. Converting programs to operate on other computers is easier, however, if both the original and the destination computer use the same CPU chip. Many video games, for example, are available in Apple, ATARI, VIC, and Commodore 64 formats because all these computers use the 6502 or a compatible CPU.

In many computers the CPU chip does all of the processing work inside the computer. Data is processed in the CPU, the video display is updated by the CPU, and memory is written to and read from by the CPU. The Timex Sinclair 1000 computer, for example, keeps its CPU so busy that when it operates in the *fast* mode, it must neglect the video display (which goes blank) anytime it must process data. The VIC computer was one of the first personal computers to give the very busy CPU chip some help. In the VIC computer the 6502 chip is assisted by another chip, the VIC 6560 chip from which the computer derives its name. VIC is short for *Video Interface Chip*. The VIC 6560 chip is a specially designed chip that does most of the work required to create and produce the computer's color video display and sound effects. Between them, the 6502 and the 6560 chips do most of the actual computing work inside the VIC; the

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rest of the circuits all play supporting roles.

All the components that make up the VIC—the I/O ports, and the power supply, the memory circuits, keyboard, and CPU—constitute one of the least expensive, fully functional computers available today. There are more expensive computers, but few give you so much computing power for each dollar you invest.

# Fun and Games

Does it make sense to spend several hundred dollars on a machine that will be used for fun? Is recreation a legitimate use of the computer? In a word, yes. People pay thousands for a boat or camper that is used only a few weekends a year. Several of our friends have more than the price of two dozen VICs tied up in dune buggies, motorcycles, or hunting gear. It makes sense to buy a VIC for recreational use if it is worth it to you. There is no better justification than that.

If we could peek into all the homes where personal computers live, we would see computers being used for a wide range of purposes. But the number-one purpose, the one that occupies more time than any other, is recreation. This is not difficult to understand. Arcade games, which cost a quarter to play, are extremely popular. Several of the video games available for the VIC are well-executed versions of the same games that gobble up your quarters in shopping malls, restaurants, and recreation centers.

The VIC is a very good game computer. It displays fast-moving, high-quality color graphics on a television screen; it generates a variety of sound effects; it costs far less than the early pong games; and it allows you to run literally hundreds of different game programs. The VIC also has a built-in joystick connector.

Joysticks are essential accessories for many video

games. A joystick is a device that connects to the computer. It is used to control the direction of objects on the screen. For example, joysticks are used to move Trashman around on the screen. We do not recommend you buy the joystick made by Commodore for the VIC. Although it's inexpensive, we feel its quality will take something away from the enjoyment of playing the game. Joysticks that fit the Atari video games and computers also fit the VIC, and there are at least 30 different models available. Pick one that is comfortable for you and is easy to use.

We'll talk about several different types of computer-based games. The first category, board games, consists of computerized versions of popular games such as chess. The second category, games of chance, includes card games like poker and blackjack as well as programs that act like slot machines.

The third category, simulations, may not be as familiar to you as the first two. Simulations involve the creation of a make-believe environment. The environment may be a simulation of something real, for example, a football game or a country at war. It may even be a fantasy environment with rules and regulations developed specifically for that simulation, for instance, PAC-MAN-type simulations or space-oriented action video games.

There is something fascinating about simulations. Most people enjoy taking on a new and different role in a simulation. You may get totally engrossed in a life-and-death struggle with invading space monsters or a mission to rescue people from some natural disaster like a burning building or a volcanic eruption. We have divided simulations for the VIC into two categories: *adventure simulations* and *action/adventure simulations*. The adventure simulations require you to think and to analyze a situation. The action/adventure simulations are more like ar-

cade games. They require sturdy wrists, a firm grip on the joystick, and quick reflexes.

*A Word of Caution:* We have not attempted to review every, or even most, of the games available today for the VIC. First, there are too many of them, and second, quite a few are so poor they do not deserve mention. It would take an entire book to review all the bad software for the VIC. Therefore, we decided to use the space in this book to describe software we found acceptable, if not excellent. Even with that limitation, however, we were not able to describe all the good software that was available when this book was written. We hope this chapter will at least give you an idea of the type of recreational software you can buy for your VIC.

## WAYS TO BUY COMPUTER GAMES

Game software is available in four different forms. The least expensive software comes out of books and magazines. Programs are printed and included in the price of the book or magazine. The biggest drawback to buying software in this format is the time it takes to type in the program yourself. You have to type the program into your computer from the printed listing, and then you have to make it run. This can be very difficult, especially if the program is long. Fortunately, most good "book" software is also available on cassette or disk at a reasonable price.

Cassette software is the least convenient form because you must use the relatively slow cassette recorder to load the program into the computer each time you use it. Programs on a disk are easier and faster to load but tend to cost more than cassette-based programs. Cartridges are

the most convenient form for recreational software, and as you might expect, they are also the most expensive. Cartridge games generally sell for between \$25 and \$65.

We'll review a representative sample of the game programs that are available for the VIC.

## Board Games

Several companies offer computerized versions of popular board games such as checkers, chess, and Tic Tac Toe.

These games all operate in a similar way. The color graphics features of the computer are used to display a picture of the chess, checker, or whatever board on the screen. The computer then takes the role of your opponent, and you play *against* the computer. In some games, the computer plays as well as it can. In others, you can decide how smart you want the computer to be. Chess programs usually have at least three levels of play. Even on its lowest level of intelligence, the computer is likely to win when we challenge it to a game of chess. But it is still nice to be able to choose a novice, intermediate, or advanced opponent.

Commodore has a version of one of the most popular computer chess programs, Sargon, for the VIC. The video screen becomes an electronic chess board on which you and the computer make your moves. To move a piece, you specify the current location of the piece to be moved and then indicate the place where it should move. The computer can be set to play at different levels of intelligence. At the highest level, the VIC will take quite a bit of time to consider what move to make. It is a friendly opponent: it will even suggest a move for you if you get stuck, or it will swap sides and show you how it would try to get out of the position you've gotten yourself into.

Friends who are chess buffs tell us this program can compete well against a novice or intermediate player. If you need a polite, ever-ready chess partner, consider Sargon.

## Games of Chance

The VIC will also play games like poker, roulette, and craps. If you have visited Las Vegas or Atlantic City, you may have noticed the old mechanical slot machines are being replaced with electronic versions. The new units have a microcomputer inside that generates a sharp color display. A screen replaces the old revolving cylinders that used to give you an occasional row of three cherries.

You probably will not be able to duplicate the operation of the specially designed slot machines on your VIC, but there are several programs that do take advantage of the sound and color graphics features on the VIC. We will review one of the more interesting ones.

### Draw Poker

(Commodore, cartridge—\$29.95). This cartridge was developed in Japan. When the computer is switched on, the screen displays its title screen. If you don't begin playing immediately, the program goes into an *attract mode*. In this mode, the computer displays hands of poker on the screen in very good color graphics.

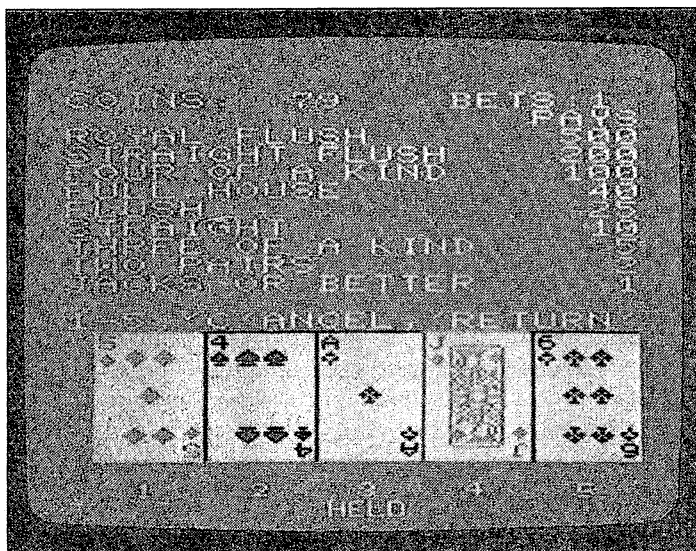
One display in the attract mode urges you to push the F1 key, which starts the game. The game begins with a screen of instructions that disappear from view once you begin playing a hand. The *B* key lets you place bets, *C* cancels your last order, and the RETURN key tells the computer to deal the cards. When you win a hand, press the RETURN key to add your winnings to your pile of



## 24 THINGS TO DO WITH YOUR VIC 20 COMPUTER

money. The *D* key tells the computer you want to *double up*. If you decide to double up, the computer will ask you if you think the next card will be higher or lower than eight (press *H* or *L* to indicate your choice). Then the next card is dealt and you either lose your winnings or double them. (If it is like Las Vegas, you will lose more than you win.)

You begin with a stake of eighty coins to bet. The screen lists the odds of each type of poker hand. A royal flush, for example, occurs in an unlikely one in 500 times. Having these odds in front of you is a nice feature of this computerized draw poker. To play, you decide how many coins to bet (one to nine) by pressing the *B* key. Then



**Fig. 2.1 Draw Poker:** When *C* is pressed to continue, the Ace is held and four new cards are dealt for the ones not held.

the computer displays your hand at the bottom of the screen. Once the five cards have been dealt, you either keep some or all of them by pressing 1,2,3,4 or 5. Or you press C to get five new cards. The computer then deals new cards for the ones you did not keep and decides whether you won or lost. You must have at least a pair (jacks or higher) to win. If you don't, the computer takes your bet and starts another hand. However, if you do win, the computer highlights the number of coins you won on the screen and lets you choose between taking the payoff or playing Hi-Lo. Choosing Hi-Lo means all your winnings for that hand are on the line. If you say the next card will be higher, and it is actually eight or lower, you lose your winnings for that hand.

Draw Poker is not a great game, but it is an above-average game of chance. It has only one mode of operation: you against the computer. Other poker games, for other machines, can accommodate as many as three or four different players. These versions may also play a more action-oriented game with several opportunities to draw cards and change bets.

Commodore also has a game called *SuperSlot* (cartridge—\$29.95) that creates a video version of Las Vegas slot machines. We may be prejudiced against such games, but video slot machine games for personal computers get very boring. The VIC Casino Style Blackjack program, also available from Commodore, lets several people play blackjack against the house (the computer). It has more action than Draw Poker, gives you most of the player options available in real blackjack, and has good color graphics.

## Adventure Simulations

Adventure simulations are strategy games. You must think your way through the simulation rather than act

your way through. You need excellent eye/hand coordination, fast reflexes, and good peripheral vision to be a success at most of the arcade video games that use joysticks or game paddles. You don't need these attributes for most adventure simulations. Many of the adventure simulations do not even have graphics displays. They rely primarily on text displayed on the screen.

An adventure game is likely to begin with a paragraph that sets the scene for the simulation: *You are standing on the edge of a forest. There is a narrow winding road that leads out of the forest and winds through the hills to a large stone house. The house stands on the edge of a cliff and is shrouded in fog. You see a footprint!*

All adventure simulations put you in a particular environment (forest, cave with many chambers, castle with many rooms, maze), give you a task to perform (stay alive, get out, find the treasure, rescue the prisoners), and put all sorts of dangers in your way (monsters, cliffs, sorcerers, enemy soldiers, bombs).

Two final ingredients of an adventure simulation are *incomplete information* and *ways of getting that information*. This means that you begin the adventure without all the information you need. However, there are ways to learn more about the simulation's environment and how to deal successfully with the adventure. Most adventures require you to move about through a series of *rooms*. The term room really refers to different segments of the simulation such as rooms, cities, chambers in a cave, and so on.

Adventure simulations let you move about the *rooms* by giving the computer instructions like GO AHEAD, TURN LEFT, CLIMB STAIRS, DIG OUT. Depending on the adventure, it may understand only a few instructions or several hundred. Some games even let you create your own characters and move them about the simulation independently. You can endow different characters with

different powers and send them against foes they are likely to overcome, for instance, a sorcerer against a wicked magician and a powerful Samson type against a giant. However, things do not always work out as you hope, and it is not unusual to lose some of your characters in the adventure.

Adventure simulations take time and patience. Some games take several hours, even days, to learn, and playing a complete game through to its conclusion can take at least ten hours, if not longer. Because they take so much time, some of the hundreds of adventure simulations that are available today let you *save* your positions in the game. You can play for several hours today, save the game at that point, and continue playing later at the point where you stopped. If you like strategy, enjoy solving intricate puzzles, and have time to devote to it, playing



Fig. 2.2 Adventure series developed by Scott Adams

adventure games can be a pleasant addiction. One of the popular adventure games for the VIC is described here:

## Voodoo Castle

(Commodore, cartridge—\$40). This is one of the several hundred adventure games developed by Scott Adams, one of the best-known adventure simulation creators. If you play it successfully, Voodoo Castle takes quite a bit of time. Fortunately, you can save your current position in the game on cassette and play again later. The game does not have any graphics. Text only is displayed on the screen, but there is speech. If you have a Votrax *Type and Talk* speech synthesizer for your VIC, instructions and warnings will be spoken as well as displayed on the screen.

When you start the adventure, you are in the chapel of the castle with a closed coffin nearby. The computer asks *What shall I do now?* You have several one- and two-word commands you can give. If you type *E* and press the RETURN key, the computer takes this as an instruction to go EAST. The computer responds with O.K.

Here is how the adventure might proceed. The instructions you give are in lowercase while the computer's responses are in uppercase.

O.K.

1 (the instruction for LOOK)

I'M IN A TUNNEL. BLOODY KNIFE. MASSIVE  
STONE DOOR WITH A SAPPHIRE SET INTO IT.  
WEST (this means you can only proceed west from  
this point)

I SEE NOTHING VERY SPECIAL  
WHAT SHALL I DO NOW?

w

O.K.

WHAT SHALL I DO NOW?

1

I'M IN A CHAPEL. CLOSED COFFIN.

NORTH, SOUTH, EAST, WEST (you can proceed  
in these directions from this point)

get coffin

BEYOND MY POWER TO DO THAT  
WHAT SHALL I DO NOW?

open coffin

O.K.

enter coffin

THERE'S NO ROOM IN THERE FOR ME!

examine coffin

A SIGN HERE SAYS: COUNT CRISTO'S BEEN  
CURSED! THERE'S ONE WAY FOR HIM TO FLEE!  
FIND IT, AND HE'LL GO FREE. THERE'S A MAN  
HERE WEARING A SAPPHIRE RING

north

O.K.

WINDOW JUST SLAMMED SHUT

This is how the adventure might begin. There are many instructions the program understands such as climb, drop, enter, examine, leave, light, look, move, pull, push, read, take, get, wear. If you find something you think will be useful later, you can tell the computer to get that object; for instance, you could say GET SWORD. Later you can type *I* and get an inventory of everything you are carrying. This adventure has several dangerous sections. If you pick up the wrong things, they can do you in, and if you enter the wrong area, you can be trapped there forever. In addition, there are both hostile and helpful beings scattered about the castle. You can also get powerful magic that will help you overcome some of the obstacles.

The instructions that come with this adventure strongly recommend that you make a map of your travels through the castle. Unless you have an excellent memory, it is almost impossible to master this adventure without a map. There are many rooms to explore and many dead ends or dangers you will want to avoid.

Voodoo Castle is only one of several adventures that run on the VIC computer. As we noted before, these games are not for everyone, but many people find them so fascinating they spend hours unraveling the puzzle. Other Adams adventures for the VIC include Pirate Cove, Mission Impossible, and the Count Dracula adventure.

## Action Adventure Video Games

Games in this category are a sharp contrast to the adventure games described earlier. Action video games, or arcade-type games, place an emphasis on sophisticated, animated graphics and sound effects. Many of the video games for the VIC are actually converted arcade games. These games have earned millions of dollars, a

quarter at a time, for their developers.

Almost all the popular video games are *real time* games. That is, things are happening on the screen whether you do anything or not. Doing nothing is generally disastrous, but quick responses are highly rewarded. Whereas adventure games in the Scott Adams tradition generally call for a considerable amount of careful thought and analysis, arcade-style games are mostly action. You can quickly learn the rules of these games, but you earn high points only if you can respond quickly and accurately to changing events on the video screen. Manual dexterity, fine motor skills, and the ability to coordinate visual information with fine motor responses (you must aim and fire photon torpedos at rapidly approaching Klingons) are all essential ingredients of high-caliber video game play.

Some countries have outlawed video games on the grounds that they lead children into bad habits. That seems silly to us. Like almost anything else, it would probably be possible for video game playing to crowd out other healthy experiences children need to develop properly. However, that seems unlikely in most cases. In addition, the skills they develop playing video games and adventure simulations may be useful in other areas. It will still be difficult to convince the IRS that the \$300 you spent on video games last year was a medical expense. Enjoyment is the primary reason for playing video games.

## VIDEO VERMIN

(UMI, cartridge). This program is based on the arcade game Centipede. Like many of the personal computer copies of arcade games, this one is actually quite good. Your video *garden* has been invaded by all sorts of video vermin, from sneaky snails to flashy fleas and ants. You have a mobile vermin eradicator that can be moved, by



means of the joystick, around the bottom fourth of the screen. The garden is filled with mushrooms that sometimes block you from shooting the invading vermin who drop, crawl, or slither through the garden. You must shoot them before they get to bottom of the screen, or they will take over your garden and get the gardener. Shooting down the vermin earns points, from 1000 for a snail to 1 for a mushroom. The game is very fast paced. You must move quickly to control the pests, and if you get good at the initial level, the game escalates the conflict to a more difficult level.

This is a good game, one that is likely to hold your interest over quite a few sessions. The magazine *Computers and Electronics* called it "one of the best VIC... games we've seen so far."

## GORF

(Commodore, cartridge—\$20). This game is a version of the arcade game of the same name. You need a joystick to play it. In the first phase of the game, you control a shooter at the bottom of the screen. The shooter can be positioned anywhere along the bottom of the screen. When you press the fire button on the joystick, you launch a projectile toward the hordes of little invading meanies from the top of the screen. About a fourth of the way up the screen there is a white shield that protects you from shots fired by the meanies, but it also blocks your shots at them. The shield gradually falls away as it is hit by both you and the enemy.

If you survive the first phase, a second phase called Laser Attack begins. Two enemy ships, each with several small ships, attack you. You must avoid their fire and shoot down the invaders. A third phase, which we rarely reach, is a completely different game. Called Space Warp,

it puts you at the controls of a small space fighter. The video display provides a view of approaching ships in the Star Wars tradition. You can steer your ship so that the enemy ship is in the center of your screen. You fire when the enemy is in your sights and destroy them. The fourth level is called Flag Ship. The mothership of the bad guys flies over the top of the screen and shoots at you. You must avoid the missiles fired at you and shoot down the mothership. At least that's what we think happens. We were never good enough to get to the fourth level.

GORF is a popular game for good reason. It is really four different games rolled into one. The graphics and sound effects are good. It is a good, playable game because beginners can manage the first level, while experts will have plenty to keep them busy in some of the later phases.

## TRASHMAN

(Creative Software, cartridge—\$40). This program puts you at the wheel of a garbage truck that travels around a maze collecting trash. Players must avoid big flies that menace the trash. Trashman is clearly a PAC MAN with a different underlying premise. It plays in almost the same fashion as PAC MAN. The sound effects for the game are good but not as good as those on the original PAC MAN. The rendition of taps it plays when the flies get you is good. The same can be said about the graphics. They are good, but not great. We also found it much harder to identify with the little yellow garbage truck than with PAC MAN and felt the premise of the game lacked natural appeal—garbage trucks and giant flies just aren't in this year. The action on this game on the easiest level is quite a bit slower than PAC MAN. However, for many

people that is a positive point. Some children (and adults too) find it difficult to play the original game because it is so fast paced.

Trashman has seven different levels of play and will be an enjoyable, lasting game for many. *Creative Computing* ranked it as one of the top twenty games for the VIC computer.

## APPLE PANIC

(Creative Software, cartridge—\$40). On the surface, Apple Panic is similar to Donkey Kong, the popular arcade game. You are a little man walking about in a multi-level maze. The maze has a floor and five additional floors made of yellow bricks. Each floor is connected to the ones above and below it by two or three violet ladders that the little man can climb if you push the joystick to the up position. The joystick actually lets you move the little man in any direction in the maze. As he moves, a little tune plays in the background. The tune changes tone but not melody as the man climbs a ladder. There are several apple monsters who wiggle about the maze. If they touch the man, he dies and is replaced by another man. You have an allotment of three men per game.

The graphics for Apple Panic are excellent, and the sound effects are good. The object of the game is to capture the apple monsters. You do this by *digging* holes in the brick floors of the maze. When the man is standing on the spot where you want to dig a hole, you press the fire button on the joystick. This creates a hole in the brick floor. It is a little unclear how the joystick controls movement and hole digging. Through trial and error we found that pushing the joystick once in the direction you wanted the man to go would send him merrily off in that direction. He would continue in that direction until he came to a natural barrier or until you could stop him by pressing

the stop button. Digging holes was another matter. There are actually several images of the little man. You can dig a hole only when the image of the little man is holding a shovel (it looks more like a stick).

The apple monsters are rather dumb creatures who roam around the maze aimlessly. They are also relatively slow, which helps you avoid them while you're digging your holes. When one falls into a hole, you must go over and pound it through the floor. You do this in the same way you dug the hole in the first place. Holes can also be *undug* by placing the man beside them and digging again. In addition, the man can escape from the apple monsters by jumping down a hole. He is not harmed; he simply drops to the next lower level of the maze. This game can be played at several different levels of difficulty. The difficulty level is determined by the number of apple monsters roaming around.

This game is not as fast-paced as most, a blessing for those of us whose reflexes have slowed a bit over the years (or never were that fast in the first place). Others will find the game too slow for their taste. It was one of our favorites.

## ASTROBLITZ

(Creative Software, cartridge—\$40). This is similar to the arcade game called Defender. You are the pilot of a rocket plane at the top of the screen. A city landscape lies along the bottom of the screen. It *scrolls* to show different scenery as you fly to the right or left. In the sky around you, there are all sorts of dangers, from UFOs to flying fish-like creatures called Guppies. There are also gun towers on the surface at the bottom of the screen. Your job is to shoot down all the flying bad guys and destroy all the gun towers. You can move your rocket plane in any direction by moving the joystick, and you

fire missiles by pressing the fire button.

The sound on this game is adequate, the graphics are good, but not even close to the quality of Defender graphics. Astroblitz has several levels of play, but even the first level requires quick reaction times. We were destroyed by ground fire or flying bombs within a few seconds for the first several times we played the game. It was a fun game after we got the hang of it, but not one of our favorites. Several preteens who were experienced arcade game players gave it low marks because it wasn't fun to play. However, quality in video games is a matter of taste. Gregory Yob, who has reviewed hundreds of games, called it "My favorite game for the VIC" in a *Creative Computing* article.

## DEADLY DUCK

(Sirius Software, cartridge—\$34). Deadly Duck is similar to Space Invaders in that you control a well-armed duck at the bottom of the screen and must shoot at all sorts of crabs who drop bricks relentlessly from the sky toward the duck's pond. There are also squadrons of buzzing beasts who drop little pods that splatter like shotgun pellets when they near the surface of the pond.

The game has several levels of play, good color graphics, and good animation. You can move the duck back and forth across the bottom of the screen and shoot at the creatures coming down at it by pressing the fire button on the joystick. The bricks dropped by the crabs are deadly, so you must avoid them at all costs. You can destroy the bricks as they fall by shooting them. If the bricks miss you and hit the pond, they remain where they fall for a few seconds. When this happens you can't move your duck freely along the bottom.

The range of levels for this game are excellent. Beginners will not be frustrated by level one, and even the

most jaded video game buff will have to work hard to survive at the higher levels. This is one of the few video games that executes an established game pattern and does it as well as or better than the original.

## TURMOIL

(Sirius, cartridge—\$40). The most striking feature of this game is the fast pace at which it operates. The package says, "If you are faster than a speeding bullet, if you can turn off the lights and be in bed before the room gets dark then YOU are ready for Turmoil." You don't have to be quite so fast to play Turmoil, but speed is of the essence. The game screen has an open channel in the middle, with seven corridors branching off the channel on each side. You pilot an *intergalactic fighter* that can move quickly up and down the channel. The fighter is equipped with rapid fire blasters that shoot when you press the fire button on the joystick.

As you move up and down the center channel, aliens move across the screen. There are five different kinds of enemy ships to shoot at. Colliding with one wipes you out. There are also white arrows that, if allowed to move all the way across the screen, turn into tanks that are difficult to destroy. You must shoot them from behind. To make things a little more complicated, a Prize will occasionally appear at the edge of the screen. You can capture your Prize by moving your fighter up into the corridor where the Prize is located, but you must get out of the corridor quickly before one of the ships shoots you.

There are nine levels of play in this game, but we never got past the third one. This game has good graphics, excellent if you consider the speed at which the screen changes. The sound is good. If you like speed, this is a game to play. The adults rated it excellent but taxing

because of the speed at which it is played. The kids rated it outstanding; several thought it was the best game they had ever played on the VIC.

## SERPENTINE

(Creative Software, cartridge—\$40). Like the Apple computer version, this program puts you in the role of a short blue snake in a maze where several other snakes live. The red snakes are longer than you are and will kill you if you meet head on. However, you can devour them if you approach them from the back. That is a little difficult, because the snakes move about the maze at a fairly rapid clip for slitherers. Your objective is to survive long enough to lay eggs and raise your young. You accomplish this by staying out of the way of red snakes or

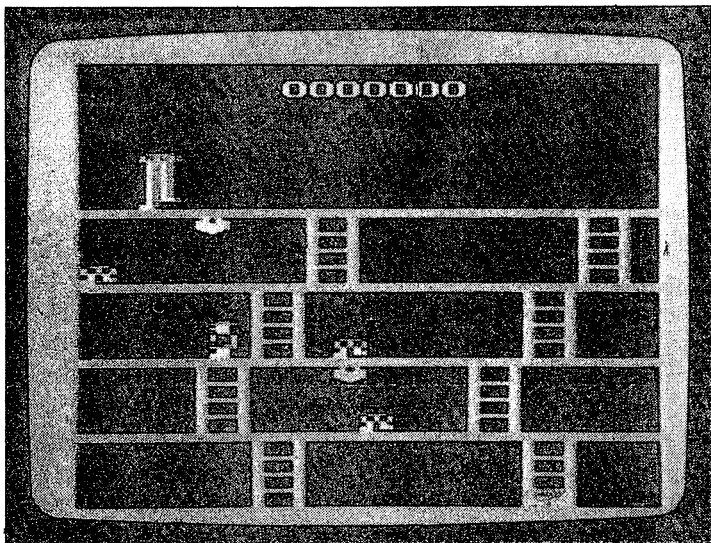


Fig. 2.3 Fast Eddie

by eating them. You can lay an egg when you are more than two segments long, but you lose a segment for each egg you lay. You gain segments each time you eat frogs or a segment of another snake. Points are also earned for things like eating a frog, part of another snake, or a spotted egg.

The graphics and the sound effects are both good. The game is fun to play.

## FAST EDDIE

(Sirius, cartridge—\$39). Fast Eddie is a cute version of another game called Donkey Kong. The game display is a multi-level maze with ladders that lets your man, Fast Eddie, move from one level to another. Fast Eddie is controlled by the joystick. He is a short little fellow who scurries about the maze in time with several different sound effects. Fast Eddie's purpose in life is to capture the prizes that float on the ceilings of each level of the maze. Fast Eddie accomplishes that by positioning himself right under the prizes and jumping up to touch them (press the fire button). Capturing a prize earns points. While earning points, you must avoid the *sneakers* who prowl the maze. Eddie can move away from the sneakers or jump over them when necessary. You must time the jumps well, or Eddie will land on the sneaker instead of jumping over it. One big sneaker called High-Top is at the top of the maze. High-Top is too big to jump over in the beginning of the game, but gets smaller each time you capture a prize. Finally, a key appears over the top of High-Top and Eddie can jump high enough to capture this key. The key moves you into another level of difficulty. There are many different screens and levels of difficulty in this game.

Fast Eddie is difficult to describe in words. There is something about the screen display, the way the game is



played, and the way Eddie scoots about the maze that draws you to this game. It is a cute, well-designed, fun-to-play video game. It was one of our favorites.

## CHOPLIFTER

(Creative Software, cartridge—\$40). You are a pilot of a helicopter that must fly behind enemy lines to pick up hostages who are under attack. The helicopter is controlled by joystick movements and is accompanied by realistic sound effects. Helicopter movement is excellent, as are the graphics. You must fly the helicopter into enemy fire from planes and tanks, let those hostages climb aboard, and return to the base. Not everyone can be taken in one trip, so you may have to leave some behind to be killed by the enemy. Staying on the ground too long to pick up more people means you, the helicopter and those already on board will be killed by enemy fire. Hostages left on the ground wave as you fly away.

This is a technically excellent game, one that has received high praises in several reviews. You may not feel comfortable with the plot because it is too close to the reality of Vietnam and Iran. Unlike the television show *M\*A\*S\*H\**, this game is not a humorous simulation of events that really did take place. The seriousness of this game's plot may detract from its playability.

You'll find your VIC great for playing the games we've described. If you can tear yourself away from your computer long enough, you can discover many more games in magazines and stores.

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## CHAPTER THREE

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# Arts and Crafts and the VIC

If you have ever watched an excellent video game demonstrated, you were probably impressed by two things: the quality of the color graphics and animation, and the sound effects. How can they create such startling visual and auditory effects on a computer that costs less than \$100? We aren't going to tell you that in a weekend of study you can create a video game that will sell millions of copies. That requires a considerable amount of knowledge about how computers operate, as well as some creative and artistic genius that most of us just don't have. Many of the people who write video games, however, began by buying a computer and learning how it operates. They did not necessarily have formal training or college degrees in computer science or engineering.

Creating video games is not the only way you can take advantage of the VIC's video and sound features. Several programs let you concentrate on creating color pictures or figures yourself, and many of the better programs for the VIC depend heavily on the computer's ability to generate color graphics and sound. When it was introduced, the VIC redefined what we can expect from an inexpensive computer in terms of color, graphics, and sound. Few of the first generation computers for home or personal use are as good at generating sound and visual effects.

Today computers are much easier to communicate with, and they have the power to respond in many different

ways. When the occasion calls for it, today's computers, including the VIC, can display print material in upper and lower case, talk through a speech synthesizer, and put all sorts of color pictures, figures, and charts on its screen. In addition, the VIC can do a decent job of creating lots of sound effects and music through the speaker of your television or monitor.

However, there is a *gotcha* in the color graphics and sound capabilities of the VIC. The computer is designed for easy use by experienced programmers. This can make some things more difficult. Other computer manufacturers modified the language their computer speaks (usually BASIC) to make it easier for new computer owners to create their own color graphics and music. If you want to draw a big red heart on your video screen and then create a little plane that pulls a sign across the screen that says HAPPY VALENTINE MARSHA while playing Marsha's favorite song, the VIC can do it, but you will find it is not a very easy thing to do. That same task on an ATARI or Coleco Adam computer would be much easier.

All is not lost, however. Commodore has some optional software and hardware that take care of some of the inherent shortcomings in the basic VIC. In addition, there are many other companies who have recognized the shortcomings of the unexpanded VIC and have developed their own programs and accessories. If you are willing to spend some money, there are many ways to spruce up your VIC.

## THE UNADORNED VIC

When you buy a VIC and take it home, you have a powerful graphics and sound machine. The standard VIC screen is divided into three parts. The border is blue, the

display area is white, and the characters that are typed in the display area are light blue. The VIC lets you change almost any of these. If you want a yellow border around the display area, you can tell the VIC to change its border. If you want purple characters on a green background, you can tell the VIC to adjust the screen to your particular tastes.

Standard VIC display features also include a set of graphics symbols, such as a small heart, tiny circles, and lines of several sizes. Symbols for card suits, like clubs and spades, are included. These graphic symbols are the same size as regular letters and numbers, and they can be typed just like an A or 3 by pressing the correct keys on the keyboard. These symbols are used to create relatively crude pictures on the screen in much the same way you may have created a Christmas tree image on a typewriter by typing lines and lines of X's and I's in the pattern of a tree.

Letters, numbers, punctuation symbols, and graphics characters can also be displayed in *reverse* image. That is, instead of a dark blue A displayed on a lighter background, the A will be a light image inside a dark square. Because of these options, visual displays on the VIC need not be boring, even when they contain only text material. A programmer has many different ways to display even the simplest message on the screen.

The VIC creates all the color graphics by dividing the screen into twenty-three lines of twenty-two characters. The great graphics you see in games like Apple Panic don't use that format, however. They take advantage of the VIC's ability to generate HIGH-RESolution color graphics. HI-RES graphics don't deal with the screen as a set of 506 squares (twenty-three lines of twenty-two characters). In the normal, low-resolution, display mode, the computer tells the video display what to exhibit in each of those 506 little squares. A particular square may

have a capital A, a lowercase h, a comma, or a graphic symbol like a heart in it. What the computer actually displays on the screen is a set of dots. Each character square on the screen is made up of a table of dot locations. A character square on the VIC is eight dots wide and eight dots deep. If you look carefully at the information on the screen, you can probably see that each letter and character is not really a solid image. Instead, it is made up of a pattern of closely spaced dots. The VIC creates all its low-resolution graphics and character displays by sending patterns of dots to the screen. Each of the 506 possible locations on the screen can display anything from a square where all of the sixty-four dots (eight rows of eight dots) are *off* (a blank square), to a square where all sixty-four dots are *on* (a solid square). By turning some of the dots *on* and some *off*, the VIC can create patterns for all sorts of letters and graphic symbols.

The disadvantage of low-resolution graphics is that you must use the characters the VIC already understands to draw pictures. That means you have to deal with sixty-four dots at a time. With high-resolution graphics, each dot on the screen is controlled independently. If the picture you are creating calls for one particular dot in a square to be turned on, high resolution lets you turn that one on and leave the other sixty-three off. High-resolution graphics thus lets you individually control 32384 dots on the screen. You can create some surprisingly detailed pictures with that many dots. You can turn each one on or off, and you can control the color of each dot.

High-resolution graphics on a standard VIC are possible but not easy because of the way you must write programs that control each dot. They are also difficult to do without extra memory. If you need to control 32384 different dots, there must be a lot of memory in the computer to store the instructions. Extra memory and programs that give you some help in creating color graph-

ics are essential for all except the most masochistic programmer who wants to push the VIC to the limits of its color graphics ability.

You may think that a picture made up of dots on the screen can't really be that good. Remember that the image you see when you watch a regular television program is really a pattern of dots. Television displays are made up of even more individual dots than the VIC can control, but the principle is still the same. When we look at a bunch of dots, our minds do their best to see them as a meaningful whole, as a picture.

If you would like to experiment with high-resolution graphics, there are two magazines, *Compute!* and *Commodore Gazette*, that regularly publish articles on VIC graphics. The December 1983 issue of *Compute!*, for example, has an article titled "Understanding VIC High Resolution Graphics" by Roger Trendowski. It is a good introduction to what can be done with the VIC. It includes several demonstration programs you can use on a standard VIC. Another article, "A New Character Set for the VIC-20," by Mike Bassman, was published in the August 1982 issue of *Micro*, another popular magazine that frequently publishes articles on the VIC computer. This article shows you how to write programs that modify the set of characters the VIC displays. You could, for example, create a Russian, Greek, or Japanese character set and have letters from those alphabets appear on the screen when you press keys on the VIC.

These magazines regularly publish articles and programs that take advantage of the high-resolution graphics features of the VIC. In the July 1983 issue of *Commodore Gazette*, Alan Crossley published a program called *Skydiver*. This program, which can be typed in on a regular VIC, is an arcade-style game that lets you control the landing of a parachutist who jumps from an airplane and tries to land safely on one of three landing pads. The

pads are of different sizes. Safely landing on the smallest pad earns you the largest number of points. In the same issue, Daryl Biberdorf published *Snake Escape*, another arcade-style game. This game, like *Skydiver*, takes full advantage of the color graphics on the VIC. You control a snake that is slithering through a garden of over 150 poisonous plants. You must guide the snake through the garden to the escape hole before time runs out. Also included in this issue is a program by Michael Wasilenko called *Alfabug*, which helps preschoolers learn the alphabet, and a program called *VIC Marquee* by Louis Mendelsohn that lets you send moving messages in large type across the screen.

Each month, magazines like *Micro*, *Compute!* and *Commodore Gazette* publish many programs that are interesting, useful, educational, and/or entertaining. To use these programs, all you have to do is type them in and tell the computer to execute the instructions you have typed in. You can then save the programs on a cassette or disk and use them whenever you want without typing them in again. By subscribing to some of the better magazines that regularly publish programs for the VIC, you can take advantage of many of the advanced features without learning how to program yourself.

An inexpensive program that helps you tame the graphics features of the VIC is *Grafix Designer* (Midwest Micro Associates, cassette—\$15). This program makes the task of designing custom characters easy. It draws a large eight-by-eight table on the screen and lets you tell it if a dot will appear in each of the VIC locations. With this program, you can create an entire set of characters for games or foreign languages. There are several convenient ways of editing the characters and even a way of changing the orientation of the characters. For example, if you are creating a tank figure that turns on the screen, you only have to design the character for the tank once. You can

tell the program to rotate the tank image so that it faces a different direction. Thus you might have one character for a tank that faces west, one that faces east, one south, and one north. This program makes an otherwise complicated task easy.

Another, more expensive, program is also helpful for creating VIC graphics. Commodore's *SuperExpander* cartridge is \$70. It gives the VIC enough extra memory to store slightly more than 3000 characters, and it adds a whole set of extra words to the dialect of BASIC spoken by the VIC. Any computer language has a set of *keywords* the computer interprets as instructions to do a particular thing. The new keywords added to the standard ones in VIC's BASIC make it far easier to use both the color graphics and the sound features of the computer. Here are some of the keywords you can use if you have the SuperExpander plugged in:

**GRAPHIC**—This instruction tells the computer you want it to get ready to work in one of the graphics modes. GRAPHIC 2, for example, creates a graphic screen with 160 individually controllable dots (pixels) on each of 160 lines. You can do all sorts of high-resolution graphics on this screen.

**COLOR**—This instruction lets you set the screen, border, and character colors without all the complications involved in doing the same thing on an unexpanded VIC. The numbers that follow this command determine the colors on the screen.

**DRAW**—This command lets you draw a line from one point on the screen (specified by a number that follows DRAW) to another point on the screen (specified by another number).

**CIRCLE**—This keyword can be used to draw a circle, ellipse, or arc at any location on the screen. The size can vary depending on the number that follows the instruc-



tion. Creating a circle in standard VIC BASIC is possible, but it takes several lines of complex instructions to do it. The SuperExpander cartridge doesn't let you do anything that can't be done without it. The difference is in the ease of doing it.

**PAINT**—You can *fill in* or add color to a section of the screen like a circle with PAINT.

If you plan to use the VIC to create high-resolution graphics, we strongly recommend you consider buying the SuperExpander cartridge.

Remember that you don't have to learn to write programs in high-resolution graphics to take advantage of these features of the VIC. Many of the commercial games for the VIC use HI-RES, and there are special programs that let you enjoy HI-RES features without actually writing programs yourself. One such program is *VIC-PICS* (Midwest Micro Associates, cassette—\$20). This program is actually a set of remarkable pictures that were created by converting the images from a television camera into a pattern of codes the VIC can use to create screen displays. VIC-PICS has everything from pictures of a pixie to American eagles and mountain landscapes. These extremely detailed pictures are made up of pixels or dots. The density of the dots determines the texture of the picture. Since the pictures are made up of dots, the program will print out any of the pictures on a compatible dot-matrix printer. The Commodore printer for the VIC, for example, can be used to get printouts of the pictures.

You can use the program to draw high-resolution color pictures yourself (or modify the ones that come with the program) using the keyboard and a joystick. The pictures you create can also be printed or saved on a disk or cassette.

Another program, *Grafix Menagerie*, is also from Midwest Micro Associates (cassette—\$15). It has several demonstration programs on it that show what the VIC

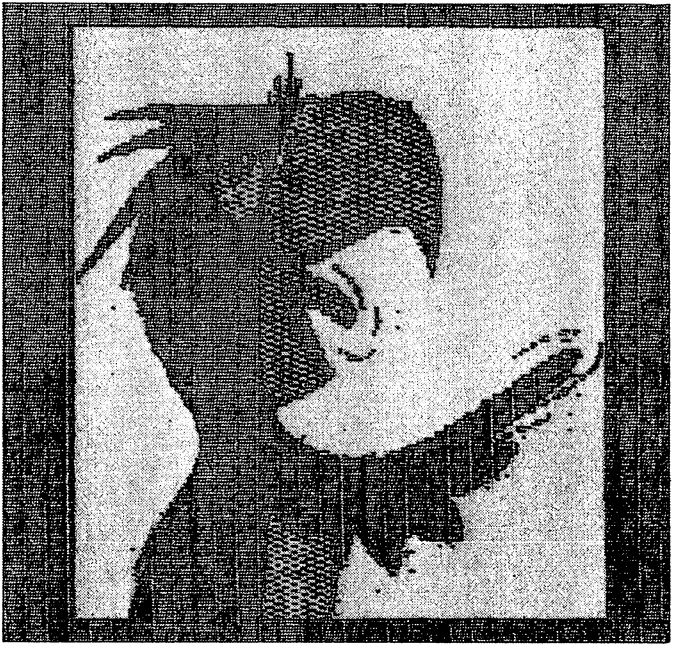


Fig. 3.1 VIC-PICS

can do with high-resolution color graphics. There are screens of arcade critters, a musical staff, and custom character fonts. *Grafix Menagerie* is not a program that lets you create your own graphics. It simply shows what can be done by an experienced programmer.

Several new programs are also designed to help you fully utilize the HI-RES graphics on the VIC. We were not able to evaluate these products, but several seem particularly promising. *Colorcraft* is a program (cassette—\$25, disk—\$30) that is available from Sim Computer Products. It is a *graphics animation* program that helps you create color designs that can be animated. An-

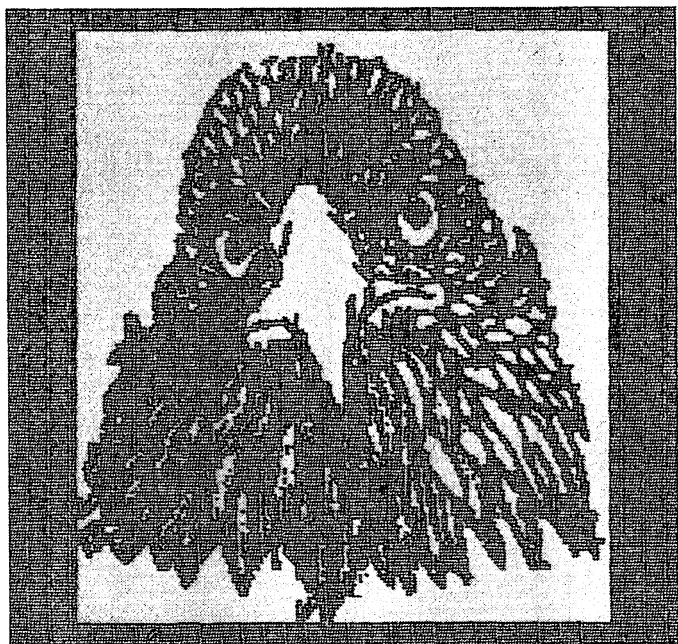
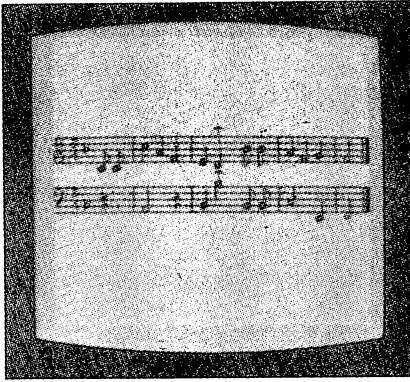


Fig. 3.2 VIC-PICS

other program you may be interested in is *VIC-Graph*, a \$50 cassette program that lets you create high-resolution graphs of business, statistical, or mathematic functions. You can get it from Data Equipment Supply of Downey, California.

HES, a well-known software house that has many programs for the VIC and 64, has a cartridge (\$45) for the VIC that gives you the ability to create *Turtle graphics*. Turtle graphics is one aspect of a popular computer language called Logo. Logo is available for computers like the Apple, ATARI, and Commodore 64, as well as for the VIC. A major reason for the language's popularity



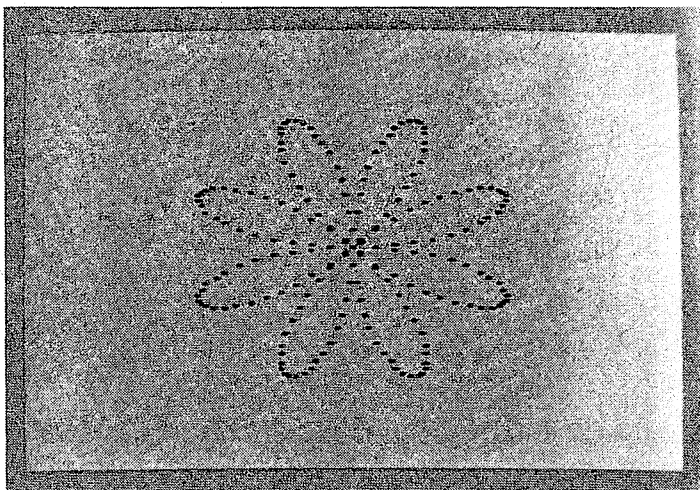
**Fig. 3.3 Musical staves and notes from Grafix Menagerie**

is its use of a special set of keywords that let you control the movement on an electronic *turtle* on the screen. You can create all sorts of animated color shapes and geometric designs with the keywords in Turtle graphics. The HES cartridge makes those keywords available to VIC owners.

## THE SOUND OF MUSIC ON THE VIC

Any sound, musical or otherwise, has several characteristics:

- *Pitch* is determined by the frequency (cycles per second) of the sound. We hear cycles or waves created by vibrations in the air. These are measured in cycles per second, or Hertz. The typical human can hear sounds between twenty and 15,000 Hertz. Notes on a piano or any other musical instrument are organized by pitch. All of the sound created by a piano is organized into several



**Fig. 3.4 Grafix Menagerie**

*octaves*. A piano has slightly more than an eight-octave range, from deep or bass sounds to high-pitched notes. An octave is a group of eight sounds, rather than a single sound. An octave might begin with the C note and progress up through notes D, E, F, G, A, and B. The next note ends that octave and begins the next highest octave. Composers and musicians have created a complicated system of naming sounds of different pitch and duration, but the primary difference between one note on a piano and another is the pitch (the Hertz of the sound).

- *Amplitude* or loudness of the sound. We experience this as variations in the volume of the sound.

- *Duration* is the amount of time the sound is made. There are symbols that tell the musician exactly how much time to play each note in a composition.

- The *envelope* of the sound is the variation of loudness

over the period it can be heard. Different sounds have different *attack* and *delay* patterns. Some reach their maximum loudness gradually and then trail off. Others begin at maximum loudness and stop abruptly. The pattern of changes in loudness of a tone helps determine the *timbre*.

- *Timbre* is a musician's term for the complexity of the sound. Some sounds are pure tones, which means they have only one pitch. Others have a major tone at a particular frequency and many harmonic or secondary frequencies that add a richness to the sound. These secondary sounds are part of what gives each musical instrument its own personality.

The VIC has a very good, but not outstanding, music and sound synthesis system. It is a four-voice system, which means it is capable of generating up to four independent sounds at once. Three of those voices can generate a variety of relatively pure musical tones, and the fourth is a noise or sound-effects generator that produces complex sounds with many harmonics. The VIC can control the volume of the tone and the pitch. The pitch range covered by the VIC sound generator is five octaves wide. Timbre is crudely controllable by using either one of the musical voices or the sound effects voice.

As you might expect, it's not easy to create complicated sounds on the VIC. Again, there are several ways of getting around the problem. If you want to begin using the VIC as a keyboard music generator, there is a program to help you do that. It's one of over twenty on a diskette of software available from Micro Computer Applications. This program is a piece of public domain software that you can get for the cost of duplicating the disk with the programs on it. (There's information on other public domain software in the chapter on educational applications.)

This program generates a musical sound each time you press a key. The note continues to be played until you

press another key. Pressing 0 stops the sound. This program was produced in the Netherlands by members of the PET Benelux Exchange.

In the first part of this chapter, we described how the Commodore SuperExpander cartridge makes it easier to create HI-RES color graphics on the VIC. The same program has quite a few new keywords for making sounds. Keywords and special symbols let you define which note should be played (C, D, E, F, G, A, or B), whether the note should be a sharp or a flat, the duration of the note, and the volume.

Several other programs were created to help you generate sound and music effects. Some programs, for instance, let you create and play back your musical compositions. You can even save your composition and load it back into the computer to play it later.

Thorn EMI, one of the more active producers of video game software, sells a program called *VIC Music Composer*. This program is sold on a cartridge and also gives you the ability to create, play back, and save musical compositions. This program uses standard musical notation: a plus if you already know it, a problem if you don't. When you insert the VIC Music Composer and switch on the computer, the program's main menu is displayed. You have a choice of composing, playing, saving, or loading music. The program lets you create music by displaying a standard musical staff on the screen. You use the keyboard to type in the notes you want to play. The duration and volume of each note can also be specified. As you create music by typing on the keyboard, the program displays the notes on the screen in proper musical notation. You can change compositions and save them on a cassette or disk. When your creation is played, the computer uses the speaker on the television or video monitor. Although the manual for this program is brief,

it does include a section that introduces the reader to the theory of music and notation.

You may decide to learn how to program the VIC yourself, you may use some of the programs that help you create pictures or music, or you may just enjoy the sound effects and graphics in VIC's video games. In any case, the results are likely to be satisfying. The VIC has good graphics and sound.



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## CHAPTER FOUR

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# The VIC as Teacher

Much is made of the ability of small computers like the VIC to function as educational devices in the home and classroom. However, the computer is only the last in a long list of technological inventions that were supposed to revolutionize education in the twentieth century. At least ten *new* methods or technologies have been hailed as answers to the problems of modern educational systems. In spite of the attention computers are receiving in the educational press, we do not believe they are likely to revolutionize the little red schoolhouse overnight. However, there is good reason to expect that education will evolve or change rather quickly in the coming years. There are two main reasons for this.

## THE DESCHOOLING OF LEARNING

For most of the twentieth century, education has been institutionalized. Learning was something children did in a classroom supervised by one or more adults. That model will still be an important aspect of education through the end of this century, but by the year 2000 it is likely to play a much smaller role in learning than it does today. More people will spend a significant amount of time learning at home, in the office, at the factory, and at adult learning centers. Increasingly, our society is view-

ing learning as a lifelong task rather than something children do to prepare for adulthood. That view is being accepted today because we live in a time of accelerated change. Information is outdated quickly, and new information seems to appear at a faster and faster rate.

In an earlier time, young people could learn a trade or profession and earn a livelihood for the rest of their lives with the skills they acquired. Today almost every job is being changed or eliminated by new information, new social trends, or new technology. Physicians, for example, cannot continue to practice medicine for years without keeping up with new discoveries in medicine. Other jobs do not simply change; they disappear and are replaced by new ones. Like the buggy whip factory that converts to making hubcaps, many of us will face the necessity of learning a radically different profession or trade at least once in our lifetime. Most of us will find ourselves studying regularly throughout our lives to keep up with changes that affect us, or we will return to some sort of adult training program to retool for a new profession.

Even if your job stays relatively stable, many other aspects of your life will change. To cite a relatively common example, changes in the federal income tax laws can mean families with modest incomes pay out thousands of dollars more to the government. Failure to keep up with the changes in income tax rules and regulations can be an expensive oversight.

We are making two points. First, we must continue to learn, regardless of our age, if we are to cope with the demands of life today. Second, learning will occur someplace other than public school classrooms. In the future all of us are likely to spend more and more time in learning activities in our homes and workplaces. Fortunately, small computers like the VIC came along at a

time when they can be particularly helpful in both traditional and non-traditional learning environments.

## THE SMALL COMPUTER AS A LEARNING MACHINE

Currently most public school students and many university students have no contact at all with a computer during their educational careers. We feel that will change drastically in the coming years, because computers are becoming integral parts of thousands of jobs in this society. In the future, few people will be able to find jobs that are not influenced, in one way or another, by computers.

### Computer Literacy

This fact brings us to the first use of a computer: as a means of becoming computer literate. Although children tend to take to computers naturally, many adults are not at ease with computers. We sometimes feel strangely uncomfortable around them and do not look forward to the time when computers are a regular appliance in the home and office.

Buying and using a computer like the VIC is one effective way of getting over that initial feeling of discomfort and of learning how the computer operates, what it can do, and what it can't do. Becoming computer literate is perhaps the most important *educational* benefit of owning a computer.

You may feel that computer literacy seems silly because it implies that understanding computers and being able to use them is like learning to read. Reading is such

an obviously essential skill in this society, while computer literacy has never been essential, so the comparison seems silly to many. However, the universal need to be able to read is a relatively modern concept. Two hundred years ago well over ninety-nine percent of the world's population could not read, yet they were able to deal with the day-to-day demands of making a living. Arguing that everyone should be taught to read probably sounded silly in the 1600's. We believe society teaches the next generation to read today because the society we live in requires it. You cannot deal with life today as a responsible adult without that skill.

In the near future, the shift from an industrial to an *information* society is likely to continue. That development may well bring us rapidly to the point where computer literacy is just as essential to success as reading literacy..

## Computer-Assisted Instruction

Computer-Assisted Instruction (CAI), Computer-Aided Learning (CAL), and Computer-Aided Instruction (CAI) are all terms that refer to the use of a computer in education. We will use the abbreviation CAI to refer to several types of computer-based teaching approaches that give at least some of the responsibility for teaching to the computer. There are three general types of CAI: drill and practice, tutorial, and simulations.

### Drill and Practice

The simplest type of computer-assisted instruction is drill and practice. Drill and practice programs don't really teach you anything; they just give you practice in something you learned in some other way. A relatively common program, for example, gives the student practice in

using basic math skills. The computer generates a problem and asks the student to type in the answer. When you select the answer, the computer checks it for accuracy and lets you know whether the answer was correct or incorrect.

A more sophisticated type of drill and practice program will keep track of the student's errors. Errors are explained, help is provided; and new problems adjusted to the student's current needs. Some drill and practice programs select the difficulty level of problems on the basis of the student's performance during earlier sessions; they remember errors and give the student extra practice on particularly difficult areas.

## **Tutorial Programs**

A tutorial program does more than just give you practice on something you already know. It actually teaches. Educational programs that use the tutorial format rather than a drill and practice method are much more difficult to write. You must teach the skill as well as evaluate learning. Because of that, there are few good tutorial programs for the VIC.

## **Simulations**

When you drop a quarter into an arcade game and take control of an interstellar fighter with laser guns and force field shields, you are spending your money on a computer simulation. Many of the more successful arcade games are, in fact, simulations that allow you to take a role in an imaginary, or simulated, environment.

Simulations are models or descriptions of often complex events or conditions. They allow you to take a role in the simulation and help determine what happens next by the decisions you make. They operate under a set of

rules made up by the people who programmed the computer. Educational simulations let you take a role in the imaginary environment (for instance, as king of an ancient kingdom, or president of a large manufacturing company, or operator of a small retail business). The decisions you make determine what happens next in the simulation. For example, there is a VIC version of a popular simulation called *Hammurabi*. In this simulation, you are the ruler of an ancient city that has 1000 acres of land for cultivation, 100 citizens, and 3000 bushels of grain in storage. As ruler you must decide how much grain to give the people to eat, how much to save for seed, and how many acres to plant. Your decisions determine whether the kingdom starves or grows and develops (and requires more grain next year).

Simulations are widely used in business and industry. Nuclear and chemical plant workers are trained by computer simulations. It is much less expensive to have a trainee blow up a make-believe plant on the screen than to make a real mistake while training in a real plant. Simulations are useful in teaching basic skills (such as which valves to turn in a chemical plant), concepts (such as the concepts of programming in BASIC), and attitudes (such as how a company president feels toward unionized labor and vice versa). Simulations are not only effective training tools, they are also fun. Many of the computer and arcade games that are so popular today are simulations designed for fun rather than for learning. As noted in Chapter Two, however, there are some educational aspects of many of the popular video games.

## **Other Educational Applications**

Computer literacy, drill and practice, tutorial programs, and simulations account for the great majority of computer applications in education today. Another ap-

proach, Computer Managed Instruction (CMI), uses the computer as a manager or overseer of learning. For example, students may be given a series of assignments to read certain sections of a text and do some work in the library. As each assignment is finished, the student sits at the computer and takes a test over the assignment. A "pass" means the student can go on to the next assignment; otherwise the computer gives suggestions for further study. CMI requires quite a bit of work from the teacher to set it up, but does not require the teacher to actually write programs that teach the student. Teachers can use *authoring languages* to develop CAI and CMI programs. There is no need to learn how to program the computer in a language like BASIC. In addition, the PILOT language, which is available for the VIC, is often used by teachers who want to develop their own CAI or CMI.

We should mention one other educational use of a computer before we move on to specific examples of VIC educational software. The computer can be a versatile *tool* in the classroom or at home. We use many tools in our efforts to learn: pens, pencils, tablets, rulers, and protractors. These are all important tools. Specialized classes like chemistry, biology, or typing also have their own set of tools: Bunsen burners, test tubes, and typewriters are all frequently used. The computer is likely to be an important educational tool in the future. High school students use its word processing power to write term papers and reports, students in physics and chemistry can use it to calculate complicated formulas, and math students are likely to find it integrated into many of the math courses. The computer's role as an *educational tool* is likely to grow in the future.

So you can see there are several ways the computer can serve educational objectives: it is an important topic of study itself (computer literacy), it can help us learn

about other subjects (CAI), it is sometimes used as a supervisor of learning (CMI), and it is likely to become an important educational tool. Now we'll take a look at some of the educational software you can get for the VIC.

## A SPECIAL WORD ON PUBLIC DOMAIN SOFTWARE

Before reviewing commercial educational software, we would like to introduce you to one type of software that deserves special attention. Most of the programs reviewed in this book are commercial products developed and marketed to make a profit. There is certainly nothing wrong with that. Another type of software, public domain software, is also available in reasonable quantity for the VIC. Several groups have gathered a large number of programs written by VIC owners and users groups. The creators of public domain programs have donated them to the public. That is, they do not expect to be paid for the software. Generally, you only pay a small handling and media fee to get copies of the software. A typical fee would be \$10 for a diskette containing ten to twenty programs. The quality of public domain programs varies from terrible to great, but that's the same range you find in commercial software. The major difference between public domain and commercial software is the general lack of documentation with public domain programs. You will often find it necessary to spend some time figuring out how the program works, while commercial software generally comes with some sort of instructions. Some public domain software is available in every category reviewed in this book. There are hundreds of public domain educational programs for the VIC. Many of the



larger Commodore computer users groups have vast libraries of public domain software. Usually this software is free to members of the group. Here are several sources of public domain software for the VIC:

*Toronto PET Users Group* is one of the most active user groups in the world. Membership in TORPET is only \$20 a year. You get monthly issues of their excellent magazine, *The Torpet*, and access to over 3000 public domain programs, many for the VIC, from the club's library. The group regularly publishes descriptions of these programs in its magazine. Prices are \$10 a diskette to members. We recommend this organization highly.

Harold Montover is the owner of *Microcomputer Applications* and an active Commodore dealer with a special emphasis on the school market. Mr. Montover has collected thousands of public domain programs for Commodore computers and distributes them for \$10 a diskette. His collection includes hundreds of educational programs. Some programs in this collection have instructions in Dutch or German, but you can generally figure out how the programs work.

## DRILL AND PRACTICE SOFTWARE

*Typing Tutor and Word Invaders* (Academy Software, cassette—\$22). You get two programs for the price of one on this tape. Typing Tutor is a drill and practice program that teaches you how to touch type. It has eight levels of difficulty and is a colorful, well-written typing tutor program. The program displays a set of letter exercises on the screen. You type in the letters while the computer keeps track of speed and accuracy. There are

eight levels that give you several different types of practice (for instance, working with the home keys, you practice the A finger while keeping the F finger home). We recommend it for any VIC owner who wants to learn to touch type. The program keeps track of your errors and typing speed, and it highlights in red all the letters you typed incorrectly in an exercise.

Word Invaders is an excellent game that lets you practice your typing skills in a video game environment. Lines of words come marching down the screen toward the bottom. You must type them correctly to erase them from the screen. If any lines of words reach the bottom, you lose. The program keeps track of your speed and assigns a game score based on speed and accuracy (assuming you are not destroyed by words that reach the bottom of the screen). This is an excellent program that makes typing practice an enjoyable pastime instead of boring drudgery. The program was highly rated by *Creative Computing* magazine. We strongly agree.

*Arithmetic* (dilithium Press—\$20 for the book of programs or \$35 for the book and software). This program is one of thirty-eight programs listed and described in the book, *More Than 32 BASIC Programs for the VIC-20* by Tom Rugg, Phil Feldman, and Clarence Wilson. Versions of this book are available for most popular small computers, and it has received positive reviews. The authors list programs you can type in and use on your VIC. Seven of the programs are educational, mostly the drill and practice variety. Arithmetic gives elementary school children math practice. You may select problems at any of three levels of difficulty. You can also decide whether the problems will be addition, subtraction, multiplication, or division. When you have selected the type of problems you want, the computer displays three problems on the screen. You type in the answer to each problem, press

the RETURN key, and the computer checks the answers for correctness. It tells you if an answer is right or wrong. No help is given when your answers are wrong. When you have answered fifteen problems, the computer reports your success and asks if you want more problems.

The book also has a *Flashcard* program that you can use to create your own set of flashcards. To practice French vocabulary, for example, you would type the French word on one side of the electronic flashcard and the English equivalent on the other. The computer displays what you typed on one side and waits for you to type in the same word, or words, on the other side.

*Hamcode* turns the VIC into a drill and practice device for learning Morse code. When you press a key, the computer generates the dit-dahs for that letter or symbol. The program also generates a code and lets you type in the letter or symbol it represents. There are also programs to help you learn to read faster, a drill and practice program on metrics, and a program to teach preschoolers number concepts.

## TUTORIAL SOFTWARE

As we said earlier, there are fewer good tutorial programs than any other type. Commodore does offer two tutorial programs called *Introduction to BASIC, Part I and Part II*, that teach you how to program the VIC computer in BASIC. These tutorials explain the material and give some examples. Once a concept is presented, the computer stops and asks one or more questions. If you answer the questions correctly, the computer moves on to the next concept.

We may be prejudiced, but most of the tutorial soft-

ware currently on the market seems rather limited. You are locked in to the speed and format developed by the people who wrote the tutorial software. We would rather learn BASIC with a good book on programming in BASIC written specifically for the VIC. We do recognize that as authors of books, our opinion may be somewhat biased. Still we suggest you watch a demonstration of a tutorial in the store before buying it, even if you want to learn the information covered by the tutorial.

## SIMULATION SOFTWARE

Several of the programs discussed in Chapter Two are simulations with educational value. Here are a few more educational simulations:

*Spills and Fills* (Creative Software, cartridge—\$30). This program is really a video game with an educational purpose. It uses color graphics and sound effects to keep your attention while it teaches about *conservation*. Young children can watch you take water from a short, thick beaker and pour it into a tall, thin beaker. When you ask them which beaker can hold the most water, they tell you the tall one does. They have not yet learned *conservation*. That is, material can change its shape (going from a short, fat beaker to a tall, thin one) and still be the same amount (conserve its volume). This program helps students master that concept. The object of the game is to fill the beakers (displayed on the screen) of different sizes from a master beaker. You can tell the computer to *fill* a particular beaker until the liquid is almost to the top. If you overfill it, the computer counts it as a *spill*. There are two levels of difficulty in this program. This is one of the first of a second generation of computer simulations

that combine the intrinsic attraction of video games with a legitimate educational purpose. We are likely to see more and more programs of this type in the future.

*Pipes* (Creative Software, cartridge—\$30). In this program, you install a series of water pipes from the main water tower in the town of Gilroy to all the houses in the town. You are the person in charge of the project, and you will be held responsible for performing the job successfully and without wasting material. There is a limit on the amount of pipe you can buy, and you must buy pipe of varying lengths to do the job. Making a mistake could mean you waste money or don't have enough of the correct length of pipe. This game has good color graphics and sound effects. It is designed for children six to fifteen. It teaches general problem solving or planning

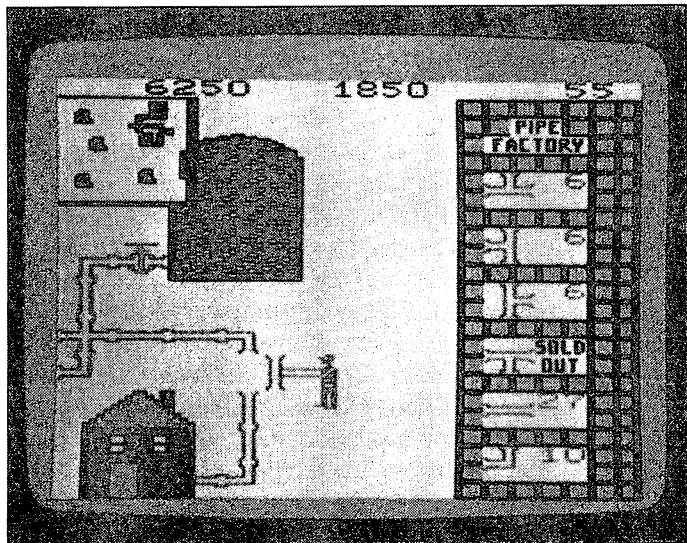


Fig. 4.1 Pipes

strategy as well as spatial relationships.

If you would like information on other educational software, the Commodore Software Encyclopedia (Commodore, \$10) lists over 200 pages of educational software.

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## CHAPTER FIVE

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# Home Finance and Record Keeping

Like it or not, most families today aren't rich enough to hire an accountant and bookkeeper. Unfortunately, we still need to keep all sorts of complicated financial records. The most popular piece of equipment that helps families keep track of financial records is probably the shoebox, and a very full shoe box at that. On April 16th, each year millions of families vow to make next year different. They will keep good records and organize them so that any piece of information can be found quickly. Between January and April 15th each year, those same families go through the familiar routine of looking high and low for lost receipts, boxes of cancelled checks, and medical or insurance records that definitely were in the bureau drawer only last week. Several computer programs can help you bring a little order to your tax records.

Keeping organized tax records is not the only way a small computer can help a family. Here are some more ways:

*Keep a Record of Tax Deductible Expenses.* On last year's income tax, did you remember to deduct your automobile expenses for taking the kids to the pediatrician? Did you include all the prescriptions that came from the drug store that doesn't send you a record of drug expenses at the end of the year? Were all the non-prescription but doctor-recommended expenses remembered and deducted? Most of us simply aren't good at remembering the \$3 bandage expense for the middle daughter's

soccer practice accident last spring. There are literally hundreds of other deductible expenses that occur in small amounts but add up over the year. They can make a sizeable difference in the amount of income tax you pay each year, *if* you keep an accurate record of the expenses.

Some people even keep track of the sales tax they paid, because they find the IRS tables drastically underestimate the sales taxes they actually paid. Are there deductible expenses you miss each year because you don't keep a record of them?

*Keep Records of Expenses and Income from Rental Property.* Many families own rental property at one time or another. Rental property is a good investment. The property depreciates for tax purposes while it actually appreciates in real value and earns rental income. If you must drive over to your rental property to repair a leaking pipe, the travel expense can be deducted as well as the cost of the repairs. Minor repairs, trips to the property, interest paid on the mortgage, fees to agents who handle the rental, and many other expenses incurred to earn income from the property are deductible. You just need to remember those expenses and keep accurate records. Record keeping is a boring, time-consuming activity; the computer can help you with it.

*Bank Account Management.* Each month millions of people sit down with their cancelled checks, their check stubs, and the printed record of transactions from the bank. For many, balancing the checkbook is an art form that rarely turns out satisfactorily; for others it is a precise mathematical science in which a lost penny deserves at least an hour's search. In either case, a computer with a check balancing program can speed up the process. It can help you find errors (banks actually make quite a few errors, but most of us don't have records accurate enough to find them), it can alert you to checks that were written



but have not been cashed, and it can keep a running record of the amount of money you are spending in each category. Did you know the Chevette had \$456 of repairs in the last five months, or that you spent \$132 on video tape rentals since January? The computer doesn't generate new information for you, but it does organize what you have so that you can take advantage of the information.

*Investment Management.* Families today may have money in several different retirement funds because the funds didn't transfer when someone took a new job. There may also be an Individual Retirement Account or two, and investments in anything from a money market fund to a cable television joint venture. Some of these investments draw a set rate of interest each year until you retire; others produce income that varies from year to year; and still others appreciate in value without producing much, if any, income each year. A computer can help you keep track of your investments, the income they are producing now, and the income they are likely to produce in the future.

If you make your own decisions about what to invest in, there are several programs that assist you in the evaluation process. There are programs that evaluate stock purchases and some that compare the after-tax income produced by different types of investments (for instance, comparing a tax-free bond with a lower interest rate versus a bond with a higher interest rate but no tax advantages).

*Home Inventory.* You don't expect a natural disaster or a fire to destroy your home, and you don't plan to be burglarized. But if you were, would you be able to provide insurance companies with the information they require before they let you collect all your insurance? A computer program makes it easy to keep an up-to-date, accurate record of your possessions.

Inventory programs also help you keep track of where

things are. As the years pass, families tend to accumulate a large number of items that are used only occasionally. Where is that big plate your great-grandmother passed on to you in her will? If you have a large collection of records or tapes, do you have a Harry James record that features the saxophone player you like so much? Is the first edition novel you bought in Paris in the downstairs library, or is it stored in the attic in a box? An inventory program helps you keep track of such items.

*Data Base Management.* Data base programs are generally associated with business rather than home computing, but there are many home uses for such programs. Suppose you keep in touch with friends and distant relatives. If you want to find the address of your nephew who moved to a little town in California to become a potter several years ago, you might have to search through several boxes of old Christmas cards and letters. Is it in the address book? Is it written on last year's list of people to send graduation announcements to? A simple data base management program lets you type in names, addresses, and characteristics (for instance, whether it's a relative, friend from college days, business associate) and have access to that information any time you want. Even a simple mailing list program lets you specify whether the address is for a friend, relative, customer, and so forth. Then if you want to send a letter to all your relatives, you can print out a set of mailing labels in much less time than it would take to write out all the addresses by hand.

*Financial Decision Making.* American car makers have offered so many different inducements to buy one of their cars that most of us have come to expect some sort of rebate or special financing program when we buy a new car. Suppose you buy a car that has financing options. You can get a reduced interest rate on the loan for the car, or you can get a cash rebate of several hundred dollars

and make your own financing arrangements. Which option is better for you? Several programs help you analyze such options and select the one that's best for you.

Creative financing options on home loans are also in vogue in many parts of the country. You can get programs that let you analyze the actual cost of different financing options. You will even be able to ask *what if* questions. What if you select a variable rate mortgage, and interest rates go up five points in three years? What if you select a fixed-rate mortgage with a two-percent penalty for early repayment, and the interest rate drops six points in three years? You could do all the calculations to answer *what if* questions on a pocket calculator, but the time and effort it takes usually discourage all but the most tenacious question-asker. Computer programs make it very easy to compare alternatives.

## VIC SOFTWARE

Home finance and record keeping software is not abundant, but there are some good programs. We'll review several. You may also want to read the chapter on business and professional software and the chapter on word processing, because you can also use the software described in those chapters in home computing. The software reviewed here was written for a specific purpose, such as checking account management or loan analysis. In the business chapter, two types of programs, data base software and electronic spreadsheets, let a computer owner *roll their own* software. These programs are a little like blank ledger sheets or record books. They allow you to customize the program to meet your own particular needs, without learning how to program the computer. All you

need to do is learn how to run the software you want to customize.

New software for record keeping and financial decision making appears almost daily. There are many excellent programs. Unfortunately, there isn't space in this book to review all of them.

*Household Finance* (Creative Software, cassette or disk—around \$20). *Household Finance* is a set of four different programs that help you manage family finances and make financial decisions. The programs provide you with an organized approach to record keeping. They do all the math for you and thus reduce the chances of a careless error. They can also create graphs and charts that turn all those figures into easy-to-understand visual aids.

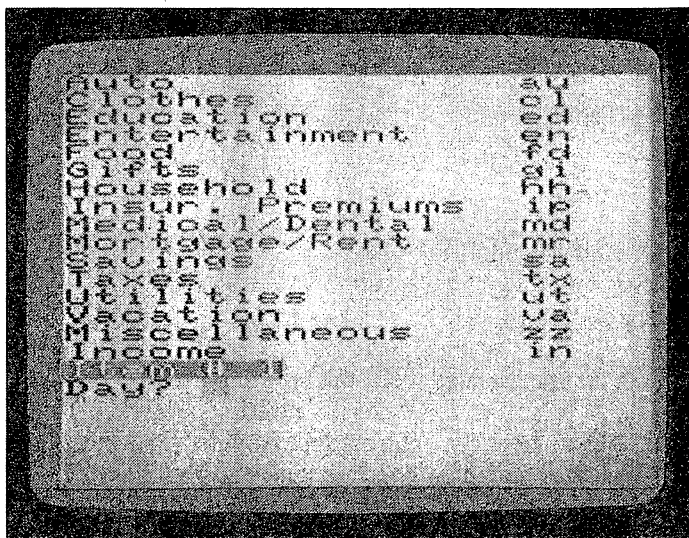


Fig. 5.1 Household Finance

You use Household Finance once a month when you sit down to pay bills. As you tell the program how much you paid, to whom, and how much you earned, it records the month's financial activity in its memory. It then saves that information on a cassette or disk when you finish. Later, if you want information on spending patterns for several months, the computer will retrieve the monthly information from the tape or disk and use it to create informative charts for you.

The first program in Household Finance is called Entering and Updating Income and Expenses. This is the one you use monthly. When you execute the program, it asks you for information on each transaction. The screen prompts you for information such as date of transaction, amount, payment method (such as cash, check number, charge), deductible status (can it be deducted from your income tax?), description (a fifteen-character, or fewer, description), and code. Code refers to the program's sixteen categories of expenses. Here are the categories:

Auto	Entertainment	Gifts
Mortgage/Rent	Education	Household
Clothing	Food	Insurance Premi- ums
Medical/Dental	Utilities	Income
Savings	Vacation	Taxes
Miscellaneous		

On an unexpanded VIC, the program has only enough memory to accept forty entries at a time. However, it is possible to save the information provided thus far on a tape or disk and then continue entering the month's activities. If you add extra memory to the VIC, you will find all your transactions can be typed in at once.

This program lets you check the information you type in before entering it into the file, but it still requires

caution in use. With so little memory available in a standard VIC, there was little room to build error correction procedures into the program. If you do discover an error after the information for a month has been transferred to tape or disk, it is still possible to recall the data, correct the error, and then save it again. However, that process takes quite a bit of time and effort.

The second Household Finance program uses the monthly data to create visual representations of your spending habits. You can get a summary of one month's spending pattern, for the year to date, or for an entire year. In any case, the program creates a spending profile graph on the screen that shows the percentage of expenditures in each category. The program also gives you a chart of expenditures in one category (for instance, entertainment or automobile expenses) across all the months of the year.

The third program in this series lets you create a family budget, which is then compared with the actual expenses you have during the month. The fourth program helps you look at deductible expenses in each category.

Household Finance is not as sophisticated as some of the other family finance programs for other computers. It is also not as expensive, and it will run on an unexpanded VIC. When you take that into consideration, the program actually accomplishes quite a lot for the price.

You can get a similar program in the *Home Calculation 6-Pack*. The Home Calculation 6-Pack is a \$60 set of programs, produced by Commodore on cassette. The six-pack includes two personal finance programs, a home inventory program, a loan analysis program, a simple word processing program, and a program that helps you create graphics on the VIC. Commodore also sells these programs in smaller, less expensive combination packages.

*CheckEase* (T&F Software, cassette—\$25). We were

not able to evaluate this program, but it appears to be a good check register program that works in much the same way as the Household Finance program. It also lets you keep track of more than one checking account, it has sixteen different budget categories, and it has several options for getting printouts of information (for instance, a printout of expenses organized by check number or a printout of tax deductible expenses).

*Loan Analyzer* (Creative Software, tape—\$15; disk—\$20). Not long ago, making a major purchase consisted of shopping for the best buy and then filling out the application for credit. Today many people spend as much time shopping for the best loan value as they do the product. *Loan Analyzer* helps you make comparisons between different financing options. It also gives you information on alternative purchases. For example, if you are considering the purchase of an \$80,000 house that has an assumable eleven-percent mortgage and a \$90,000 house that has a twelve-percent mortgage, the program will give you comparative data on the two mortgages.

*Loan Analyzer* has two parts. One part can be used to print out amortization tables for loans. The other lets you analyze loans. The program can deal with all loans that involve monthly payments whose interest rate is between .01 percent (don't we wish) and 99.9 percent (it could get to that). The term of the loan can be anywhere between one and 999 months. The maximum loan the program can work with is one million dollars. The only other limitation is that the program can only handle *fully amortized* loans, that is, the computer calculates the figures to pay off the loan completely within the term you specify. If you have a *balloon* payment loan, the manual gives instructions on how to use the program anyway.

To use the program, you type in the information on how much you want to borrow (principal), the monthly payment, the annual percentage rate (APR), and the term

of the loan. Type in three of the four above and the program will calculate the other. Once you have the loan information, the program will print out a complete amortization table for you, if you have a printer connected to the VIC. The amortization table tells you how much of each payment goes to interest and how much to pay off the principal, the total interest paid to that point, and the loan balance as of that payment.

Although there is nothing flashy about this program, it is a handy one you'll probably use more often than you think.

*Home Inventory* (Creative Software, cassette—\$15; disk—\$20). Many families do not realize the value of their possessions. The replacement cost of furnishings, home electronic equipment, clothes, art, jewelry, and appliances can easily run as high as \$100,000 or more.

The Home Inventory program helps you catalog possessions and keep the list current. A list of possessions can be worth thousands of dollars should you need to file an insurance claim. It also makes estate planning much easier. The program lets you divide your inventory into as many as 100 categories (for instance, appliances, stereo equipment, art works, china, sports equipment). You can enter the serial number, date of purchase, purchase price, current value, and description for each item. You can store your inventory data on either a cassette or disk. You can also get a printed copy of the inventory at any time. If you go to the trouble of creating a home inventory, you should put the current printed copy in a safe place like a safe deposit box.

*Horse Race Handicapping Program* (3G Company, tape—\$20). Yes, we know you don't think betting on the horses is a *family finance* topic, but this is the only place in the book we could think to put it. We don't follow the horses and thus cannot vouch for the usefulness of this program. It accumulates data on ten different fac-



tors that help predict the outcome of a race. It uses information from the *Daily Racing Form* on each horse in the race and calculates the odds of each horse winning the race.

There's a discussion of data base programs and of electronic spreadsheets in the business chapter. Both types of programs have several home applications. We suggest you read the business chapter even if you do not plan to use the computer for your business or profession.

# Tapping into the World: Telecommunications

You already know the video game potential of personal computers. You also know that those desktop marvels that play PAC MAN, Frogger, and Fast Eddie can do an honest day's work as word processors, accounting machines, and educational tools. However, the subject of this chapter is not so well known. Getting your home computer to communicate with other computers by phone lines is called telecommunication. Your computer becomes a link to hundreds, perhaps thousands, of other computers that have been programmed to provide various services. You can sit back in your easy chair, get a comfortable grip on your VIC keyboard, and do everything from pay bills to read weather reports for Colorado ski resorts.

Telecomputing is, in fact, one of the fastest-growing areas of personal computer use. Many VIC owners regularly use their computers to talk to other computers. To telecompute with your VIC, you must connect your computer to a special device called a modem. The modem is connected to your phone line. You dial another computer's number, and when it *answers*, you *talk* to the other computer by typing on the keyboard of your VIC. The computer on the other end of the phone line responds to your requests by sending information. This information is displayed on the television or monitor screen.

Because most people may not be familiar with telecommunications, we'll give you a somewhat extended introduction to the topic. We explain the concept of telecommunication and give specific examples of services VIC owners who have modems can get. We also tell you exactly what equipment and software you need to get started.

It is a little difficult to explain exactly what telecommunications is. There are so many aspects of it and so many ways you can take advantage of the services that are available. It is a little like trying to explain reading and talking. The skills of reading and talking are really *tools* that, if you have them, let you do many different things. For instance, you can read the morning paper or decode the assembly instructions that came with the Christmas bicycle. Telecommunication gives you many ways to get and use information you couldn't get otherwise. Over the last century, the development of wireless communication technology, such as radio, television, and satellite transmission systems, has changed the way we get much of our information and the kinds of information we get. Today many homes with cable television are able to tune to an all-news channel and get information immediately on current news stories. Cable channels now available or in the planning stages will provide specific types of information in areas like health and nutrition (Cable Health Network) and business news.

Cable-based information systems all share one problem, however. You are a passive viewer. You have no direct control over the material you view. Yes, you can tune to the channel that provides health and nutrition, but there may or may not be a story on the particular topic you want to hear about.

Telecommunications lets you take a much more active role in choosing information. This chapter shows you how to tap into the world.

## MAJOR TELECOMMUNICATIONS APPLICATIONS FOR HOME COMPUTERS

### *Local Area Networks and Computer Bulletin Boards.*

There are hundreds of local computer *networks* now operating in this country. Many use regular phone lines for communications. They're run by universities and colleges, by computer clubs, amateur radio clubs, and special interest groups. Members of the sponsoring organization (or, in some cases, anyone who knows the phone number) interact with the network's computer. Some systems limit your use to reading the local electronic bulletin board; others let you use a large computer system's power from the comfort of your home.

Usually a computer club sponsors a local network. The club pays for a phone line connected to a computer owned by the club. That computer answers the phone electronically when you call its number and often asks what information you want. There may be options like reading the latest issue of the club's newsletter, browsing through want ads for used equipment, or looking at material written by other VIC owners about new products or problems. The type of network and the services offered vary greatly from one place to the other. Local computer stores and computer clubs usually are aware of the networks operating in the area and what they offer. Many local networks are the electronic equivalent of the bulletin board down at the laundromat or at the factory. You can often find notices of events, want ads, offers of free puppies or kittens, and descriptions of new computer equipment on local networks.

In addition to local computer bulletin boards, several

national systems (some with toll-free numbers) are available for the cost of the phone call. National bulletin boards are generally intended for a special audience, and some may actually charge for their use. For example, HEX (Handicapped Education Exchange) can be reached by dialing (301) 593-7033. Individuals and organizations use it to exchange information on how technology can be used to help the handicapped. There are also national networks for owners of a particular brand of computer. We'll tell you about Commodore's network later in this chapter.

If you would like to get information on all computer bulletin board systems (CBBS), you can do so electronically. Novation, one of the larger manufacturers of modems, has a bulletin board of its own. Novation service gives you information on the hundreds of free CBBS across the country. When you have your VIC set up with a properly connected modem, you can dial (213) 881-6880. When Novation's computer answers the phone, press the RETURN key on your VIC once or twice and Novation computer responds with:

### LOGON PLEASE

Most systems have some method of signing onto the system. In this case, all you need to do is type CAT (Novation makes CAT modems) and press RETURN. You are then given access to this CBBS. It has a list of hundreds of other CBBS organized by area code. The system has many other services, such as games you can play. Remember that the call is long distance for most people and could get expensive.

## Recreational Games

Later in this chapter, you will learn about CompuServe and The Source. You can play games on either of these *utilities*. Dial the proper phone numbers, type in your personal identification code, and you can play thirty to forty different games. Most games are the adventure or strategy type with little or no graphics. It is difficult to transmit graphics quickly over phone lines and almost impossible, without lots of specialized software, to transmit usable graphics to all the different models of personal computers on the market today.

## Downloading Programs

Several networks sell programs by *downloading* them to your computer and billing the cost to a credit card. Normally, when you telecompute, you are using a program on the other computer. Downloading is different. When a program is downloaded to your computer, the program itself is sent to your computer. After you receive the program, you can save it either on cassette or disk. Some services even let you try the program first; if you like it, it's yours for a small fee. Before you can download programs, you must buy a special program that lets you store the programs you buy on a cassette or disk. Finding a program like that for the VIC may be difficult. In addition, most of the programs you can get today are for older, more established computers like the Apple II and the TRS-80. In the future, it may be possible to dial up several services and buy VIC software over the phone. You can't do that now, however.

## Information Utilities

If you need to know the current price for IBM stock or the time of the next plane to Lubbock, you can get this information—and much more—from one of the many information utilities that are accessible by computer. Both The Source and CompuServe have extensive data banks. A doctor can check on a recommended treatment for a new disease, a farmer can get predictions on the wheat crop in South America, a consumer can locate a store that sells a particular item.

Some writers predict computerized information utilities will replace traditional sources of news and information, such as newspapers and television newscasts. We doubt that. Newspapers are sources of general information that is professionally packaged and conveniently presented. We think information utilities are likely to be added to our existing sources of information rather than replacing them.

The reason for our view is that information utilities are not that easy to access: it takes some effort to get information from them. In addition, they are not very convenient sources of general information. What information utilities do is provide us with access to specific information. Suppose you are a member of a local group that was formed to fight for modifications in local laws governing waste disposal near the subdivision where you live. One task your group must do is to write a booklet on the problem. You will then distribute the booklet to citizens and local officials. You want the paper to be technically accurate, and you want to include information on what has happened in other areas that faced a similar problem. It is possible to gather background and support information by going to the library and searching through the relevant indexes for articles and books on the topic.

A hand search, however, will take several days of hard work at the library. And because of the time it takes to do the search, it is not likely to be as comprehensive as you really need. An alternative is a computerized search through one of the data bases available from DIALOG (described later). A DIALOG search will provide you with a list of articles (with abstracts or summaries of the article) and books on the topics you're interested in. A typical DIALOG search takes far less time and is more comprehensive than a hand search. Even a DIALOG search is unlikely to point you to recent news stories on the topic. Those stories can be accessed through one of the information utilities. Suppose you want a summary of all the federal court cases relevant to the particular type of pollution issue you are concerned with. There is a data base that provides that for you. By using a computer to find the information you need, you reduce the time and improve the quality of the search.

There are hundreds of data bases available by computer that are of interest to professionals in virtually every field. You can use your VIC to find information on new metallurgical patents, federal court cases, space games, college scholarships and much more.

## Banking and Shopping

Several banks, led by the now defunct United American Bank of Knoxville, have systems that let customers transfer funds and pay bills by computer. Dial the bank's number, type in your account number, then type in the instructions on how much to pay and whom you want to pay it to. Chemical Bank of New York will even let you make major purchases like airline tickets. The tickets are mailed to you and debited to your account. Some experts foresee banking by computer as a commonplace activity



in the future. At present it is limited to the few areas where it is being test marketed.

Shopping by computer, however, has caught the public's eye. There are several shopping services that let you order items, which are charged to your credit card and mailed to your home or office. Both The Source and CompuServe have shopping services that will be discussed later. In addition, many services provide consumer information of various types, like movie and book reviews.

## Electronic Mail and Teleconferencing

Electronic mail means different things to different people. A large corporation may have computers that store messages written in the Dallas office that need to go to the staff in the Chicago office. Late at night, the Dallas computer automatically calls up the Chicago computer and transmits the messages. When recipients of messages arrive at work the next day, a flashing light on their computer console indicates there is a message waiting in the computer's memory. This is one form of electronic mail.

Public access electronic mail is a little different, though. After you type a message on your keyboard, the message is sent to a company that handles electronic mail. It transmits the message to the city where the recipient lives. The message may then be printed out and delivered by the Post Office the next day. In the future the recipient may have a home computer that is always connected to the phone line. Messages may be transmitted directly to your home and printed out on a printer attached to your VIC.

That is in the future. Today, a form of electronic mail is possible through the information utilities. Each person

who has an account with a utility such as The Source has a user number that is also an electronic address. If you need to send a report to a friend or colleague who lives across the country, you can transmit the report (which you did on a word processor) from your copy on a disk or cassette through the computer to The Source. When your friend next uses The Source, it will indicate that a message is waiting. The report is then transmitted from The Source to your friend, who can transfer it from the computer's memory to a disk or cassette.

## MAJOR INFORMATION UTILITIES

Currently there are two established national general-purpose information utilities: The Source and Compu-Serve. Both can be used by anyone with a small computer, a credit card (so they can bill you monthly), and a telephone. Calls to the two major networks are local calls in many major cities. You are connected to them through special electronic communication networks—usually Telenet or Tymnet.

### The Source

The Source is a service of Source Telecomputing Corporation. If you want to sign up with The Source, you can do so through the mail or at many computer stores. As with cable television, there is an initial hookup charge of \$100. After that, The Source charges \$7.75 per hour of use during non-business hours. Late night use is less, \$5.75, and access during office hours is \$20.75. There is a minimum monthly charge of \$10, whether you use the system or not. The phone call to The Source is local in over 300 cities.

Few people will want every service offered by The Source, now a subsidiary of Reader's Digest, but it's nice to know they're there. We'll describe some of the most interesting services.

- *Consumer Services.* With The Source, you can check airline schedules worldwide and make hotel, car rental, and airline reservations. There is a classified ad bulletin board where you can check for bargains from all across the country (or sell a bargain yourself). In addition, there is a discount buying service that lets you select brand-name products from the service and pay for them with your credit card. The service also has restaurant guides and reviews for most large cities and a movie review section. There is even a real estate service that helps you buy or sell your house.

- *Computing Services.* You can write and run programs in a variety of languages, including BASIC, COBOL, Pascal, and FORTRAN. The Source also makes available quite a few canned programs. Many are free; some involve a small extra charge. These programs include games, business software, and software for special applications such as statistical analysis. You cannot buy these programs and run them without being connected to the service. In essence, you *rent* them by connecting to The Source and typing in the name of the program you want to use.

- *Data Bases.* Many subscribers are likely to use the data bases available through The Source. One of the more popular data bases is the United Press International (UPI) wire service. It is possible to tell The Source to put the UPI output on the screen and watch the news scroll by a line at a time. However, that is an inefficient way of finding the news you're interested in. From your computer you can tell the UPI data base exactly what stories you want to read. If you want information on what is

happening in the latest crisis country, you can do so by typing in the name of the country. All of the recent stories filed with UPI about that country are displayed. It is easy to get in-depth reports on any subject you are interested in. Best of all, you can have up-to-date information any time you want it. The UPI data base is only one of a large number of data bases available on The Source. It takes some effort to learn how to use them effectively, but the effort is well worth it.

Many of the data bases on the system are oriented toward a particular topic. If you are interested in the stock market, for example, you can get detailed news and background information about particular companies you are interested in. There are data bases on commodities, stocks, bonds, precious metals and more. There is, for example, an electronic version of the magazine *U.S. News and World Report*, as well as abstracts of articles from magazines like *Forbes* and *Harvard Business Review*.

- *Electronic Mail.* In addition to the method of electronic mail described earlier, you can also dial a toll-free number and dictate a letter over the phone. Your letter is put in the electronic mail file and is available to the recipient the next time he or she signs on. Special interest groups can also use the electronic mail feature by placing information in a sort of electronic bulletin board that can be read by subscribers with similar interests. There is also an electronic equivalent of junk mail. You can type in a letter or report and tell the system to send it to as many Source subscribers as you want.

- *Educational Applications.* The Source has quite a few drill and practice programs on a variety of topics that are suitable for both children and adults. In addition, there is a directory of financial support possibilities for college students and a job service that lets you type in your resume so prospective employers can review it. There is also a jobs-available listing.

## CompuServe

The major competitor to The Source is CompuServe Information Service, now a subsidiary of H & R Block. There are many similarities between the two major information utilities and some differences. CompuServe charges an initiation fee of around \$30 and \$5 per hour during non-business hours. CompuServe is not available during normal working hours because H & R Block uses its computers to serve commercial customers during that time. The call is local in over 260 cities.

CompuServe offers services similar to those of The Source. Instead of UPI, CompuServe uses the Associated Press newswire, and it has electronic editions of papers such as the *St. Louis Post-Dispatch*. There are also electronic editions of popular magazines like *Computers and Electronics*, *Better Homes and Gardens*, and *Popular Science*. You can get a newsletter sponsored by Commodore for Commodore computer owners. It is one way to get up-to-date information on the VIC and other Commodore computers.

CompuServe also offers information on topics as diverse as home repair, personal health, and recipes. Like The Source, it has book and movie reviews as well as a sports information service. There is even a file of computer art that can be copied on your printer if you have one.

Like The Source, CompuServe has a number of financial data bases that you can use to investigate and track the performance of stock and commodities. There is also electronic banking on CompuServe. In addition, CompuServe has an electronically searchable version of the *World Book Encyclopedia*, a program that helps you

select a college, and a service called *Refundle Bundle* for coupon clippers.

You can get CompuServe sign-up kits from several sources, including Radio Shack stores, and from CompuServe. The base fee is \$30, but most people buy at least \$10 worth of manuals to help them learn how to use CompuServe. A CompuServe Starter Kit, which includes manuals and several hours of time, is \$40.

Both CompuServe and The Source add new services regularly and both offer value for the money you pay.

## Other Data Bases

In addition to the general purpose information supermarkets, there are many specialized services that offer a more limited range of services. A financial data service like *Dow Jones News/Retrieval Service*, for example, may not have information on Paris fashions, but it can provide detailed information on the performance of thousands of corporations. Current stock prices and stock performance patterns are only a starting point. There is deep background information that covers the corporate history, as well as recent news items relating to the corporation's products, management policies, merger possibilities, and technological status. The Dow Jones service may not be a good example of a specialized service: it is rapidly adding new features to its base of financial information and analysis services. There is now a sports and weather information feature, a method for purchasing consumer items, movie reviews, and an on-line encyclopedia. Information on signing up for Dow Jones is available at many Apple and Radio Shack dealers or from Dow Jones News/Retrieval Service.

Another special service is *DIALOG*, a division of

Lockheed Missile and Space Company. Graduate students and professors in many academic disciplines have used DIALOG for some time. Most major universities offer DIALOG services through their libraries. DIALOG is not really one data base, but over eighty. There are data bases for chemists, patent attorneys, philosophers, special education teachers, anthropologists, physicists, and many more. DIALOG lets you define a topic and use the DIALOG computers to search through relevant journals and magazines for articles on the topic. If you use a data base like DIALOG only occasionally, you may find it easier to go to a library and get a specially trained librarian to talk to DIALOG on your behalf. DIALOG uses a rather complicated but powerful system of instructions to find exactly the information you need. When you use the system, you must first tell it which of the many data bases you want to search. Then you can tell DIALOG exactly what you need. As you work with DIALOG, you can bring up abstracts of articles on the screen to see if they indeed cover the topics you're interested in. Abstracts and references to articles can be copied on your printer if you have one. You can also have DIALOG print out the results of your search and mail it to you. DIALOG is not cheap: connect time averages around \$50 an hour and can be much higher, depending on the data base you use. Recently, however, Lockheed created a new evening and weekend service called *Knowledge Index*. This service gives you access to some, but not all the data bases available on DIALOG. Connect time on the Knowledge Index is \$24 an hour, about half the cost of DIALOG time. You can get more information on the Knowledge Index by writing to Knowledge Index. There is a one-time sign-up fee of \$36.

A service similar to Knowledge Index is *After Dark*, an information service developed by BRS. BRS is short for Bibliographic Retrieval Services, an established sup-

plier of computer-based information services. The base cost of After Dark is \$6 per hour (after a \$50 sign-up fee), but the cost can be higher, depending on which of the data bases you use. After Dark plans to add several new services and may well turn out to be more like The Source and CompuServe than DIALOG and Knowledge Index.

## GETTING ON LINE

Do any one of the possibilities in telecommunications arouse your interest? Would you like to use your VIC to connect yourself to a bulletin board or information utility? It really isn't that difficult to get on line with the VIC. To use the VIC for telecommunications, you need a modem and a telecommunications software package.

A modem (short for modulator demodulator) takes the signals from your computer and converts them into tones that can be reliably transmitted over phone lines. It also converts tones transmitted to your computer into signals the VIC can process.

Modems can be connected to the computer in two ways. Some plug directly into the computer; others plug into a serial port. Since the VIC does not have a standard serial port, the least expensive way to attach a modem to the VIC is to buy one that connects directly. Commodore's VICmodem does just that and costs around \$100. This is an excellent price. The VICmodem is a direct connect model on the phone end as well. Acoustic modems, the ones with the cuffs where the phone receiver sits, don't work as reliably as direct connect modems, which plug directly into the phone outlet as if they were another phone. Noise in the room, for example, may be picked up and transmitted as data by acoustic modems.



HES, a software company with many VIC and Commodore 64 programs, also has a direct connect modem (\$80) for the VIC, but we have not had a chance to test it. Both the HES and the Commodore models transmit data at 300 bits per second (BPS). That is the standard speed on most national systems such as The Source and CompuServe, but there is likely to be a shift to higher speeds sometime in the future (e.g., to 1200 BPS). However, modems that transmit and receive data at 1200 BPS generally cost between \$400 and \$600. If we were buying a modem for the VIC today, the choice would probably be one of the under-\$100 models that work at 300 BPS.

In addition to a modem, you need software that turns the VIC into a telecommunications device. Communications software lets you send instructions to another computer over the phone and receive information from the other computer. Incoming information is displayed on your television or monitor. It may also be sent to your printer, stored on cassette or diskette, or placed in the memory of the computer for use later.

Both the HES and Commodore modems come with communications software, but there is a problem. A major limitation of the VIC as a communications computer is the twenty-three-line by twenty-two-character video display. It just cannot display enough information at one time to function effectively, and the software that comes with the HES and Commodore modems do nothing about that. However, there is an excellent program that does. Terminal-40 is a \$30 program from Midwest Micro Associates. It creates a forty-character by twenty-line display screen (upper and lower case characters). With it you can telecompute with ease. You will no longer have hassles with a jumbled screen that is difficult to read because there are so few characters on each line. Terminal-40's manual is well written and informative. The program itself has a number of nice features too. The

function keys on the VIC, for example, are used to control special program features. Incoming material is stored in a *buffer* (a special section of memory). It can be retrieved from the buffer and viewed or printed. Terminal-40 has a color or black-and-white option that lets you select the correct video signal for the clearest, sharpest image. Midwest Micro also sells a more sophisticated program called SuperTerm-40 that, among other things, lets you store material in the buffer on tape or diskette for use later. We recommend you purchase one of Midwest Micro's communications programs or a similar one if you plan to use your VIC to talk to other computers.

If you would like more information about modems, see Chapter Ten. With a modem, the necessary software, and phone lines, you can use your VIC to communicate with other computers many miles away almost as easily as calling Uncle Henry and Auntie Em.

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## CHAPTER SEVEN

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# THE VIC AS A WORD PROCESSOR

When you think of a computer, you may think of numbers, numbers, and more numbers. Are computers *number crunchers*, machines capable of performing thousands of calculations a second? Yes, they are, and in the next chapter, on business and professional applications, we will talk about how the computer can manipulate and massage all sorts of numbers for you.

Computers are also for word people, though. In fact, we feel that computers, particularly personal computers, may well turn out to do more work with words than with numbers. The preceeding chapter on telecommunications, for example, showed you how to harness the power of the computer for all sorts of jobs that involve acquiring and communicating information. That is called *information processing*. This chapter will focus on the role of the computer in helping you create written documents—from a quick note to the folks back East to that great American novel you always wanted to write. Using the computer to help you write your own material is called *word processing*.

In the past eight years we have used word processors exclusively to write and edit over twenty books about computers and related topics. That experience, you would think, should give us an excellent perspective from which to evaluate the relative merits of the VIC as a word processor and to critique various word processing programs. There is one problem, however. We probably use

our computers an average of eight to ten hours a day, day after day, for word processing. That professional use places rigorous demands on the machine and the software. We did not use the VIC to write this book, much as we would like to say we did. The VIC is simply not a satisfactory computer for professional word processing.

## WHAT MAKES A GOOD WORD PROCESSING COMPUTER?

*Large Capacity Screen Display.* The more you can see on the screen at once, the easier it is to compose and edit a document. A good word processor has at least a forty-line by eighty-character display. In addition, it must have special printing codes that underline words, print words in boldface, and so on. Most importantly, it must be able to do sophisticated editing.

The best word processors run on machines that have easy-to-view screens. Video screens that are green or amber produce less eye fatigue than standard black and white screens or color televisions. Amber is a particularly good color for screens. It is required in many European countries on computers that are to be used in office environments.

You can use the VIC's twenty-three-line by twenty-two-character screen for word processing, but you will tire of it quickly. There are accessories that give it a larger capacity (see Chapter Ten), but we still don't see the VIC as a computer to choose for professional word processing.

*A Keyboard With Many Function Keys.* We wrote this book on an Eagle PC computer. The Eagle keyboard uses a standard typewriter-style keyboard layout. Most of the

keys are in the same position they are on an IBM Selectric typewriter. The Eagle computer also has twenty-four programmable function keys used by the word processing software that comes with the computer. It is possible, for example, to delete a character, word, sentence, or paragraph by pressing one key. The more function keys there are, the easier it is to learn a word processing program. Without function keys, you may have to remember a complex routine. For example, to save something you have written on a Radio Shack Model III computer using the Scriptor word processor, you must first press the BREAK key. Then you type an S, a space, and the name for your document. Then press RETURN. Each operation in that word processor requires several steps because the computer has no programmable function keys. On the Eagle you press the SAVE key, and the computer asks you what you want to name the document. You type in a name and press RETURN. There is less to remember and fewer keystrokes.

The VIC keyboard actually is not a bad keyboard. It has a good feel, and it has both upper and lower case letters (some allow only capitals). It is better for word processing than keyboards like the Apple II because there are four programmable function keys. Each function key can have two functions assigned to it (one for the unshifted mode, another for the shifted mode). It also has several preprogrammed function keys for word processing. The insert and delete keys are heavily used in most word processing applications. More function keys and four rather than two cursor control keys would make it better.

*Fast, High-Capacity, Reliable Mass Storage.* Word processing programs for the VIC use either the cassette recorder or the 1541 disk drive to store data and word processing files for use later. A cassette system is very slow and has a limited capacity. The present 1541 disk

drive is one of the slowest disk drives we have used, although rumor mills tell us a much faster version of the disk is in the works; it was not available when this was written. Expensive business computers let you plug in superfast, high-capacity hard disks that are nice, but expensive. The 1541 drive can store a maximum of just over 170,000 characters on each floppy disk. Commodore's ads say this is *fast, high-capacity storage*. It is only if you compare it to a cassette system. Other disk drive systems let you store as much as 700,000 characters on a disk, and they work much faster than the 1541.

The 1541 is not fast or high capacity, and Commodore does the public a disservice by saying it is. However, the 1541 is one of the most reliable drives we have ever used. It works, and works consistently. It is also one of the least expensive disk drives for personal computers. You can get by with a slow, reliable disk drive better than you can with fast, high-capacity unreliable drive. We like the 1541 but not for the reasons touted in Commodore ads.

*Plenty of RAM.* This may or may not be an issue for you. If you type material that isn't very long, you don't need lots of memory. If you type term papers, reports, magazine articles or books, however, it is very inconvenient to work on a computer with limited RAM. A twenty-page report, for example, might have to be broken into five or six parts because there is not enough RAM to store the entire report at one time.

The standard VIC has very little RAM available for general use. Unless your word processing program is in a ROM cartridge, the available RAM will have to hold the word processing program as well as the document you are working on. Plan on expanding the memory in the VIC if you intend to use it for word processing. Fully expanded, it can handle over 32,000 characters in RAM. That is quite a bit, especially if you use a cartridge-based

word processing program. The VIC, like all the other Commodore computers, uses *intelligent* disk drives, which means there is no need to load a program called a *disk operating system* into RAM memory if you plan to use the VIC with the 1541 disk drive. Some computers, like the Atari 400 and 800, use standard disk drives that require you to load a disk operating system (DOS) into RAM before using the drive. The disk operating system takes up over 15,000 characters of storage.

*Freedom from Glitchitis.* Glitchitis is a disease commonly found in all sorts of electronic equipment. Glitchitis generally strikes when a malfunction will do the most damage. It frequently occurs for no known cause and cannot be duplicated when you try to figure out just what happened. Worse yet, it is least likely to happen when you are trying to explain the problem to someone who can fix it. It will happen again, of course, if you use the computer for an important task (for instance, for typing the term paper at one in the morning when it is due the next day at nine A.M.).

The Vic is remarkably free of the glitchitis disease, while some of its competitors are particularly prone to it. With the exception of a problem with some optional memory boards, difficulties with interference on some early models, and heat-related failures on some versions, the VIC has a reputation for reliability.

There are other features to look for when you shop for a professional word processor, but these are enough to illustrate the point that the VIC falls short of the mark when it comes to professional word processing. When price is not considered, the VIC is inadequate. In the real world, however, price must always be considered. The Eagle PC we used to write this book costs \$3500, while the VIC sold for \$88 when this chapter was written. We should not expect the VIC to compare favorably when

you can buy over 40 VICs for the price of one good word processing computer!

The VIC is a remarkable computer when you consider its price, and it seems particularly suited for home recreational uses, for computer literacy, and for some limited home financial uses. If one of those is your primary use, it makes sense to consider using the VIC as an occasional word processor. Can it help you compose the almost-annual four-page newsletter that goes out to all the people in your graduating class? Yes. Can your daughter who is in junior high school use it to write a six-page paper on the agricultural products of the high plains of the United States? Yes. Will it serve you well as a word processor for writing letters to friends and relatives? Yes. Can you use it to prepare monthly sales reports? Yes. Can you use it to prepare daily sales reports, write magazine articles, write books or anything else your income depends on? No, but you can use it for word processing if you use it for small jobs and not very often. With an inexpensive word processing program and a suitable printer, the VIC will do the job.

## WHY USE A WORD PROCESSOR?

If you are an accomplished typist and own a manual or electric typewriter, why should you learn to use a word processor? If you type documents that are used only once, and you always type them perfectly, there is little reason to learn word processing. If you make errors, if you find yourself typing the same thing several times (for instance, a letter that is to be mailed to several people), or if you must regularly revise and retype documents, then a word processor can help you do more work in less time.



A friend of ours is the chairman of a scholarship committee that awards eight college scholarships each year and receives between 50 and 150 applications. Each year he must send out eight letters congratulating those who received the awards, eight different letters to the alternates who might still get the award if some of the first eight decide not to attend college, and a variable number of letters to the people who were turned down. He has three standard letters that he modifies slightly each year. Before he began using the word processor, he or his secretary had to type each letter, check them for errors (there were often errors), retype if errors were found, and finally sign and mail each one. With a word processor, he tells the program to load the file containing the sample letter into the computer's memory. The computer then displays the letter on the screen. He edits the standard letter to reflect the current year's competition and adds any personal messages he wants. Then he types the correct address at the top of the letter (actually at the top of the screen) and presses the keys to tell the computer to print out a copy on a *letter quality* printer. A letter quality printer has print that looks as good as that produced by a standard office typewriter.

Once the current version of the letter is in the computer's memory, it is only necessary to add the address and salutation and any individual comments for a particular student. If eighty percent of the letter remains the same, that eighty percent need not be retyped for each person who receives the letter. That means you don't waste time typing the same thing over and over, and you don't increase the likelihood of making a typing error by retyping material that has already been typed correctly.

As our friend adds comments and the address to the standard letter, he occasionally makes a mistake. On a typewriter he would have to stop and correct the error. If he used a self-correcting typewriter, he might be able

to make the correction cleanly and quickly. But if he leaves out a line or wants to add a word or two in the middle of a sentence, he would have to retype the entire letter. Fortunately, he doesn't have to do any of this because he has a word processor. With almost all word processing programs, you can *insert* and *delete* material electronically. If you typed *Tkhis* when you wanted *This*, it is very easy to use the cursor control keys (the ones with the arrows on them) to move the cursor over the top of the *k* in *Tkhis*. Press the DEL key and the *k* disappears. In addition, the word processor fills in the space. Instead of *T his* you have *This*. Most word processors let you delete material a character at a time, and some allow deletion of words, sentences, even paragraphs by pressing one or two keys. The insert function works much like the delete function. If you type *Your application was one of the best* and then decide that you want to add the word *very* after *the*, it is a simple matter on a word processor. Move the cursor to the space just after *the* and press the INSERT key. Most word processors then create a *window* at that point on the screen, and you can type in anything you want. When you've finished, press INSERT again, and the window closes around the new material. The same task on a typewriter would require you to type the entire letter again.

We find the ability to insert and delete material electronically does more than speed up the writing process. Because the process of editing and changing material is difficult on a typewriter, our manuscripts gradually turned into a mass of red pencil marks, pencilled-in additions, and marked-through paragraphs. Arrows surrounded paragraphs and pointed toward locations where the next draft should move that material. Eventually the draft became unusable because it was difficult to follow all the changes and corrections that were marked on it. In addition, we often rejected the idea of going through another draft and

retyping the document yet another time because of the time it took. With a word processor, you make corrections as you go along. There is no need to have the document retyped to see how it reads with revisions. If you want to move a paragraph from page two to the middle of page eight, most programs let you mark that paragraph and tell the computer to transfer it electronically to a new location. You make insertions, deletions, and block moves with a few keystrokes, and you see the result of your editing immediately. Some programs even have an *undo* command that lets you go back to the way the document was before the last change, just in case you decide it was better the way it was. We are able to do our revisions more quickly, and we can do more of them because the boring manual labor has been reduced. Now you can concentrate on the editing process rather than worrying about having the time to retype that report yet another time. If ninety percent of the report was just fine, there is no need to retype the ninety percent just because you made changes in the other ten percent. A sentence that was typed correctly the first time need never be retyped even if the document goes through five revisions!

The ability to edit without needing to retype the entire document is an advantage to people who must file reports periodically in a standard format. Professors, for example, generally must turn in an annual report so they can be considered for merit raises. More than sixty percent of each report remains the same from year to year, but the entire report must be retyped if it is prepared on a typewriter. With a word processor, you can tell the computer to load last year's report into memory from the cassette or disk where it was stored. Once the report is in the computer's memory, you can make whatever changes are necessary and print several copies. This year's version can be saved for use next year. A friend of ours uses word processing with her resume. She prints a dif-

ferent copy of the resume for each job application. She rearranges the resume and adds, expands, or deletes material to emphasize the skills that are most important to the particular job for which she is applying. It takes only a few minutes on the word processor; it would take hours with a typewriter.

## DESIRABLE WORD PROCESSING FEATURES

Hundreds of word processors are available for small computers. The price range starts at about \$10 and goes up to well over \$1000. Programs for the VIC are generally priced in the low end of that range. Most are under \$100. There are a lot of new or revised programs coming on the market all the time. That means by the time you read this, there may be many good programs that are not even mentioned in this chapter. For this reason we will give you a brief checklist of features to look for in a word processor. This is not an exhaustive list, but it will alert you to many of the features to look for.

### Delete Modes

This refers to ways you can delete text from the screen. Some simple programs permit nothing more than deleting material a character at a time. Others have many options. Here are the common options:

- Delete character.
- Delete word—deletes material separated by spaces on each end.
- Delete sentence—deletes material from a capital letter preceded by a space to a period.

- Delete line—deletes a line of text on the screen. A poor substitute for delete sentence, since lines on the screen rarely correspond with sentence length.
- Delete partial line—deletes from cursor to end of line, for example.
- Delete paragraph—deletes from beginning of indented sentence to beginning of another indented sentence.
- Delete block—see section on blocks for explanation.
- Delete everything—deletes everything in the memory of the computer.
- Delete undo—Save me from the error of my ways because I didn't really mean to do that.
- Delete verify—If instructed to delete a lot of material, the program checks (it asks REALLY Y/N? or tells you to PRESS RETURN TO DELETE DOCUMENT) before executing the instruction.

## Insert Modes

This refers to the ways you can add or insert material in an existing document.

- Destructive Insert—replaces material by typing over it.
- Non-destructive Insert—*pushes* material out of the way as new material is typed in or creates a *window* of blank space where new material can be typed.

## Block Modes

A block is a section of text that you have marked electronically. You might press the down-arrow key at

the beginning of a section and press it again at the end of that section. The computer can then be told to perform different operations on that block of text. Blocks of text can be moved, deleted, or duplicated. Duplicating a block means you can put the same material in several places in the text. Reports, for example, often contain many complicated tables that have the same format but different numbers. A complicated table can be typed once, marked as a block of text, and inserted at any point in the text where you want the table. Once the table is in place, all you have to do is fill in the numbers.

- Delete block—Can a block be deleted?
- Move block—Can a block be moved from one location to another?
- Duplicate block—Can a block be duplicated somewhere else in the document without erasing it from its original location?
- Multiple block—Can more than one block be marked, or is the program limited to one marked block at a time?

## Cursor Control

The cursor is a solid or blinking rectangle that tells you where material you type will appear on the screen. It also tells you what will be affected by an instruction to insert or delete material. You must, for example, move the cursor over a letter to delete it in most programs. Simple word processing programs let you control cursor movement with arrow keys that point in the direction the cursor will move. On the VIC, most programs use the two cursor keys on the bottom left of the keyboard. Pressing an arrow key moves the cursor in one direction, holding down the shift key and pressing the same key moves the cursor in the opposite direction. Using the

shift key to control direction saves Commodore the cost of adding two keys to their keyboard, but it is awkward for word processing because the cursor keys are used so often.

- Move by character—The cursor moves one character at a time.
- Move by character, auto repeat—Hold down a key and the cursor keeps going until you release the key.
- Move by word—The cursor moves to the first letter in the next word.
- Move by sentence—The cursor moves to first letter after an ending punctuation mark.
- Move by paragraph—The cursor moves to beginning of next paragraph.
- End/Beginning of Line—The cursor moves to end or beginning of line.
- Home—The cursor moves to home position, the top left corner of screen.
- Beginning—The cursor moves to beginning of document.
- End—The cursor moves to end of document.
- Fast Scroll—The cursor *jumps* forward or backward in document several lines at a time.

## Search and Replace

If you misspell a word throughout a document, can you tell the computer to find and correct the error? If you have a large document in memory, can you find a particular section by telling the computer to search for a word in the beginning of that section? There are several variations on the search and replace theme:

- Search for keyword—looks for a word you type in and moves cursor to point where it occurs.

- Replace, once—finds the target word and replaces it with a new word you specify.
- Selective Replace—finds the target word and asks if you want it.
- Global Replace—finds multiple occurrences of the target word and changes them to the replacement word you specify.
- Selective Global Replace—same as selective replace but checks entire document.
- Wild Card Search—lets you specify the target word with *wild card* letters. Telling it to search for Th#mes, for example, means words like Themes and Thames would be found because the third letter is a wild card. Any letter is acceptable in that position.

## Page and Printing Features

- Programmable Page Parameters—Can the number of lines, the length of line and the amount of space left at the top and bottom margins be controlled?
- Printer Selection—Will the program work with many different types of printers, or is it limited to only one or two?
- Underline—Can text be underlined?
- Boldface—Can text be boldfaced?
- Large Characters—Will it produce expanded or larger-than-normal characters on printers that support that option?
- Italics—Will it print italics?
- Justification—Will it print text with straight right and left hand margins?
- Sub/Superscripts—Does it print *subscripts* and *superscripts*?
- Headers and Footers—Will the program let you



specify a message that will appear at the top or bottom of each page?

- Page Numbering—Will the program automatically number pages for you?

- See/Get—Will the program show you on the screen what you will get when the document is printed?

- Wraparound—Will the program automatically move to the next line when you run out of room on the current line? Does it take the word you are typing and move it down to the next line, or does it break the word and leave parts of it on different lines? Breaking words up is a poor substitute for true wraparound, which automatically moves the last word typed on a line, the one that is too long to fit, to the beginning of the next line.

As noted earlier this list of features is not exhaustive. Some of the word processors for the VIC have most of these and many more. We feel the list does give you a starting point from which to evaluate programs. You may also want to consider two other types of programs. There are programs that look at each word in a document and check spelling. These programs won't tell you if you used *effective* when you really needed *affective*. Both *effective* and *affective* are correctly spelled words and are accepted by a spelling checker. Words like *affected* or *therr* will be caught, however, by the checker. There are also programs that check for common errors in grammar and make suggestions for improving your writing. We were not able to find a grammar checker program for the VIC, but several spelling checkers are available.

## WORD PROCESSORS FOR THE VIC

*Un-Word Processor* (Midwest Micro Associates, cassette—\$13). This program is not a true word processing

program, but it does let you try out the concept without spending a great deal of money. It is a bit awkward to work with, however, and performs only the most basic of word processing tasks. You must take several steps to do things that can be done in fewer steps with other programs. However, the instructions it uses are relatively easy to learn.

*RapidWriter* (H. D. Manufacturing, tape or diskette—\$40). This program is a bit more sophisticated than the Un-Word Processor. It is available for the VIC and the Commodore 64 computers. It is easy to learn to use, has features normally found only in more expensive programs, and can be used with several different types of printers.

*RapidWriter* is written in BASIC and thus does not operate as rapidly as word processing programs written in machine language. All in all, however, it does most of the things you would expect from an inexpensive word processing program.

*Home Office* (Creative Software, cassette—\$29; diskette—\$35). This program is a basic, no-frills word processor that takes advantage of the color capability of the VIC. It will perform simple word processing tasks. You can type in material, edit and correct it, and print it out. The program is easy to learn to use and displays prompts, hints, and word processing instruction codes in bright colors: green, yellow, and red. The program, like the Quick Brown Fox described below, has one mode to create material for the first time and another to edit or correct the material. That makes the program a bit clumsy to use, but it is an adequate home word processing program that is reasonably priced.

The Home Office package also includes a data base management program. The data base lets you keep track of all sorts of information, like mailing lists, telephone numbers, Christmas card lists, indexes of tape or record

collections. With this program you can quickly search or sort through the information and get a printed copy of it. For example, if you would like a list of all business associates (or relatives) on your Christmas card list, this program will search through its data and list them for you. Again, this is a basic, no-frills program that's a good value for the price.

*Quick Brown Fox* (Quick Brown Fox, cartridge—\$65). This widely advertised program is probably the best known of the VIC word processors. It is written in machine language and compares favorably with word processing programs for computers like the Atari and Apple II. Quick Brown Fox (QBF) is a cartridge-based program that is available in versions for the VIC, Commodore 64, and IBM PC. It is easily the most professional word processor for the VIC. The manual is comprehensive, well-illustrated, understandable, and written with a bit of humor. It is clearly written for the novice user who has no word processing experience. When you use QBF, it asks you what size screen you have. It will work with standard VICs (twenty-three characters per line) and with most of the forty- and eighty-column video enhancements for the VIC. That is a desirable feature because it lets you try out word processing on a standard VIC and add a video expansion board later, without changing word processing programs.

We should probably mention a few complaints about QBF first. It displays white letters on a black background when it's used with an ordinary color television, a format some people may find aesthetically displeasing and difficult to read. A more serious limitation is the way it operates. On sophisticated word processing systems, you type in material, view it on the screen, and make changes as you write. The process takes place with the screen full of material and with the program in a standard *create and edit* mode. QBF has a *create* mode that lets you type

in material for the first time. In this create mode, the screen is not full of material, however. You must press several keys and go to the *view* mode to see a full screen. To edit that material, you press more keys and go to the *edit* mode. More expensive word processors permit you to create, edit, and view material simultaneously. That is, you don't have to move from one mode to another.

Many VIC word processors lack features you would normally expect on a *standard* program for small computers. That is not the case with QBF. It is somewhat awkward to use, but it has the features of programs that cost hundreds of dollars. For example, you can tell it to center a heading, underline or boldface selected words, and delete words. It has provisions for global replace and several other editing features missing from other VIC word processors.

Today QBF would be our choice for a serious VIC word processor. Better programs will probably replace it in the near future, but we were not able to find any that were better when this chapter was written. The company that created QBF plans to offer a spelling checker program soon, and a QBF-compatible mailing list program that will let you create and maintain lists of names and addresses.

We were not able to review two other VIC word processors that have been announced but were not on the market when this book was written. *HESWriter* is a \$40 cartridge that was highly ranked in a list of VIC software published in *Creative Computing*. Another word processor is *Totl.Text* from Totl Software. This program comes on diskette or cassette and is available in two versions, one for \$25 and a more powerful version for \$35. We reviewed a version for the Model 64 Commodore computer. The manual is poorly written and likely to be very confusing to novices. In fact, it will be confusing to experts. However, the program itself is powerful. If you're

a beginner, you'll find most of the features you need in this program. It is relatively easy to use once you figure out what the manual is trying to say, and it works with many different types of printers. However, it is written primarily in BASIC and is thus much slower than Quick Brown Fox. Totl.Text has a simpler and more straightforward method of editing material than QBF, so some VIC owners will prefer it.

While your VIC may not be the best computer for word processing, we hope we've given you an idea of what word processing is about.

# Business and Professional Applications

The VIC is not a business computer. A good business computer has fast, high-capacity disk storage, a well-designed keyboard with function keys, plenty of memory, and a video display that lets you put lots of text on the screen. The VIC has a decent keyboard, but it strikes out on all the other criteria for a good business machine. We do not recommend you buy a VIC for business applications. There are many different models in the \$1200 to \$2000 range that are much better business computers (for instance, the Eagle II and the Pied Piper).

What if you already have a VIC and you want to use it as a business computer? An unadorned VIC will perform some business functions adequately, and an expanded VIC (with disk drive, printer, and a circuit card that lets you expand the display to twenty-four lines of forty characters or twenty-four lines of eighty) can do some jobs for very small businesses.

Several companies offer accounting software that runs on the VIC. However, most software requires installation of at least 8K, and often 16K, of additional memory. PowerByte Software has a complete line of business and home software. Programs from this company include accounts receivable/payable, business inventory, order tracker, profit margin, business calendar, billing solver,

cash flow model, linear regression, stock ticker tape, home budget, medical records, and mother's recipes.

There are also several electronic spreadsheets for the VIC. You can use these programs to automate tasks that require calculations in which the formulas and formats remain the same but the actual numbers change. Examples of such tasks are job cost estimates, expense reports, loan and mortgage amortization tables, salary grids, breakeven analyses, inventory management, routine accounting tasks, and statistical analyses.

Several years ago some young fellows wrote and marketed a spreadsheet program called *VisiCalc* that ran on the Apple II and several other personal computers. Computer owners have now spent over forty million dollars on that one program. There are now at least fifty other programs like it for virtually every personal computer on the market.

When we received the VIC spreadsheet program called *PractiCalc* (distributed by Micro Software International), our expectations were low. We have used both *VisiCalc* and *SuperCalc*, two powerful spreadsheet programs. They cost as much as \$300 and run on computers costing as much as \$5000. Could a \$40 program, running on a \$500 computer (the VIC requires extra memory and a disk drive) compare favorably?

Because of the limitations of the VIC screen, *PractiCalc* does not display as much information on the screen at one time as does *VisiCalc*. Nor does it have some of the fancy features of the more expensive programs. However, it is a thoroughly professional product that functions acceptably in a business environment. The manual is one of the better ones we reviewed. It is easy to follow, yet provides useful information for advanced computer users.

The program itself has all the basic features of more expensive spreadsheet software. It even has some features

we preferred over the expensive programs. For example, odd numbered columns are displayed in a different color than even numbered columns, and the *active* cell is blue. (Cell refers to the space where columns and rows meet. The active cell is the cell you are currently working on.) Its use of color makes it easy to set up and use your own forms.

PractiCalc is an excellent buy for the money. The company that distributes this program plans to market several other programs for the VIC. If PractiCalc is an example of the quality we can expect from Micro Software International, they should be a good source of software.

Totl Software has two business programs for the VIC. One of them is called *TOTL TIME*. It costs \$30. If your company does work that needs precise scheduling of sequenced activities, this program may be a great help. It can plan and schedule the work of teams or individuals who are working on one or more projects. Different types of work are recorded separately. Reports or charts are generated in many different formats: by project, by individual, or by activity. The program can produce several types of summary charts, which appear in color on the display. The charts can also be printed.

This is not a simple program. You are not likely to use it for relatively straightforward scheduling. However, if your work involves something like building houses, where teams of workers with different skills (electricians, carpenters, carpet layers) must be scheduled for work, then *TOTL TIME* may be very useful.

The other program from Totl Software is *RESEARCH ASSISTANT*, a \$30 data base management program. If you keep card or folder files of information, you must decide how those files should be arranged. For example, if you keep track of college students and the courses they



are taking, you could create files on the basis of student name, course(s), or major. But what happens when you need to get a list of all the students enrolled in a particular course, and the files are arranged by student name?

To use this program, you type in information in much the same way you write information on three-by-five index cards. The information is stored on disk or cassette. With RESEARCH ASSISTANT, you load the files into the VIC and search through your *electronic* cards by giving the computer a *keyword* or words that guide the search. This means the same file can be organized by student name, by major, *and* by the courses the students are taking now. You could, for example, get a list of all the history majors taking the introductory sociology course.

We thought RESEARCH ASSISTANT was complicated to use, but it is one of only a few data base management programs available for the VIC. A program that appears to be similar is *Data Manager* from MicroSpec.

The final program we'll review in this section is *Stock Helper*, a program "written by a weekend investor for other weekend investors" according to (M)agreeable Software, which distributes this \$31 program. The program helps you keep track of the performance of individual stocks, as well as twenty market indicators. The data you type in is stored on a diskette. Stock Helper lets you enter fifty-two weeks of data on as many as 100 stocks. It will also display or print out several different types of data that are thought to be helpful in predicting how the stock market will perform. We don't dabble in the stock market and thus cannot evaluate the professional quality of this program, but it appears to do a number of the things more expensive programs for more expensive computers do.

**This is a brief chapter, because there are few business and professional programs for the VIC, with its inherent limitations as a business computer. Nevertheless, your VIC can help you with some small business tasks.**

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## CHAPTER NINE

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# The VIC's Programming Languages

The Commodore VIC in your home or business understands several computer languages. No, it doesn't converse fluently in French or Spanish, but it does understand a language called BASIC, as well as PILOT, Logo, FORTH, and COMAL. The concept of a *computer language* is a difficult one for new computer owners. What is a computer language and what role does it play in the computer?

The first thing you should know is that computer languages serve much the same purpose as human language. They are a means of communication. As an example, consider the way two human beings communicate. Let's assume that you are a cooking instructor. Today you are going to give someone directions on how to cook a soufflé. Because you and the student both understand English, you could communicate instructions in English. That means English is your language, or medium of communication. What you communicate is a set of instructions for how to accomplish the goal of cooking a good soufflé. The information you communicate to your student in English is a specific, step-by-step set of detailed instructions. *Recipe* is the special term used to describe such a set of directions when you are cooking.

If your student speaks French and you speak only

English, you may have a very strange looking soufflé. To get just what you want, there must be some communication between the two of you. The same thing can happen with a computer. Computers like the VIC understand their own set of languages. Computers cannot learn to understand English, so you will need to learn one of the languages the computer can understand. When you learn to understand a computer language like BASIC, you can communicate with the computer much as a master chef communicates with the student. Instead of communicating recipes, however, you will give the computer *programs*. A computer program is an organized set of instructions that tells the computer how to accomplish a particular goal. All the software reviewed in the previous eight chapters are really programs someone has written to tell the computer how to do a job. Programs, like recipes, are created by humans.

Before proceeding, we would like to make the point again that learning to program a computer is not something everyone should do. Learning how to use the computer to do a job or play a game is just as honorable a goal as becoming an experienced computer programmer. Learn to program the computer only if you find programming interesting to you.

## LEVELS OF COMPUTER LANGUAGE

Suppose you are thinking of learning a second human language. If your first language is English, there are some languages, like French and Spanish, that are similar to your native language. Others, like Greek or Latin, are not as similar, but will still contain some elements that are familiar to a person who understands English. Still

other languages, like Japanese and Chinese, are so different that few elements will be familiar to you. To learn Chinese, you need to learn a completely new alphabet that bears no resemblance to the one you learned as a child, and the way information is organized will be quite different.

If you decide to learn a computer language, you will find this analogy relates to computer languages. Some, like BASIC, are not exactly English, but there are enough similarities so that you don't feel completely abandoned by your native tongue. Others, like assembly languages, are not so much like English, but they still contain some familiar phrases or terms. Still others, like 6502 machine language bear little resemblance, if any, to English. We would advise you to learn one of the more English-like languages before tackling an assembly or machine language.

Computer languages have two basic parts: the vocabulary and the rules for using the vocabulary. These rules are usually referred to as the grammar. The word PRINT, for example, is a part of the vocabulary used in the VIC's BASIC. When the computer finds this word in a program, it looks for material to display on the screen. There is a rather extensive set of rules about how to organize and punctuate the material after PRINT. These instructions tell the computer exactly how you want it displayed on the screen. It is relatively easy, however, to remember that PRINT is one of the words in the vocabulary of BASIC and to remember what PRINT tells the computer to do. Things are not so easy with some languages.

## High-Level Languages

BASIC is only one of several languages that make up the category of *high-level languages*. High-level com-

puter languages like BASIC use English-like words and generally work with decimal numbers, the type we learned to add, subtract, multiply, and divide in grade school. Whereas the other two families of languages, machine and assembly languages, are written specifically for a particular computer, higher level languages are often developed for a particular purpose. One of the older computer languages, FORTRAN (FORmula TRANslator), for example, is the language most used by universities and scientists. COBOL (COMmon Business Oriented Language) is a popular business language, and BASIC (Beginners All Purpose Symbolic Instruction Code) is the best known of the easy-to-learn general-purpose computer languages. Every popular personal computer sold today understands at least one, if not several, versions of BASIC.

## **The BASIC in the VIC**

The VIC comes with an excellent version of BASIC in its ROM. The BASIC for the VIC was developed by Microsoft, the company that created the versions of BASIC in other computers such as the Apple and Radio Shack systems. Since it comes with the computer, is easy to learn, and is very powerful, most people select BASIC as their first computing language. The great majority of programs for the VIC that are published in magazines are written in BASIC. That is another reason to learn this language first.

There are many critics of BASIC today who feel some other language should be the first one most people learn. The criticisms of BASIC center on the fact that the language allows people to write rather disorganized, sloppy programs and still get them to work. Some people prefer languages that force programmers to be more structured, more systematic in the way they write programs. We like

BASIC. Our desk is a mess most of the time, and our programs tend to develop and grow more like weeds than carefully planted rows of corn. Perhaps BASIC fits the less formal, less systematic way we do things.

There must be a lot of us sloppy programmers out there, though, because BASIC is as close as we have come to a universal programming language for personal computers. Computers from Atari, Apple, Commodore, IBM, Mattel, and many other manufacturers all understand BASIC.

There is one fly in the BASIC ointment, however, which often creates a problem for beginners. Although some of the older languages like FORTRAN are now reasonably standardized thanks to the work of ANSI (American National Standards Institute), there is no such standardization for BASIC. The ANSI standard for BASIC is relatively new and has, in many cases, been ignored by manufacturers. That means a program written for the BASIC that is used on the Radio Shack Color Computer may not run on the VIC because the two computers understand different dialects of BASIC. Fortunately, Commodore has seen fit to keep the BASIC in all their computers relatively standard. From the VIC to the expensive business computers, the BASIC is about the same. The size of the screen display and the commands for color graphics and sound differ, however, because those features vary from computer to computer. The limited video display of the VIC prevents it from running many PET programs correctly, but if you learn the BASIC spoken by your VIC, you know most of the BASIC vocabulary on the other, more expensive Commodore computers as well.

A BASIC program consists of several elements. Consider the simple BASIC program below:

```
10 PRINT "HI, WHAT IS YOUR NAME?"  
20 INPUT N$  
30 PRINT "WELL" N$  
40 PRINT "MY NAME IS VIC AND I"  
50 PRINT "WANT TO BE YOUR FRIEND"
```

The words BASIC understands are called *keywords*. These keywords are used to make statements that get the computer to do something. Statements correspond to sentences in English. In the program above, each line is a statement. The statements have a BASIC keyword the computer understands (for instance, PRINT, INPUT), as well as other information you provide. Each line in the program begins with a *line number*, which is used to determine what to do next. When this program is typed in, you can tell the computer to follow the instructions by typing RUN and pressing the RETURN key. The computer then looks for the line with the smallest line number. It follows the instructions in that line and then looks for the line with the next lowest line number. It goes through all the lines of instruction until there are no more lines to execute. When you learn BASIC, you learn the rules for giving the computer instructions and the keywords in the version of BASIC you are using. Most of the keywords in VIC BASIC give at least some hint of what they do. Words like RUN, LOAD, SAVE, LIST, AND, OR, VERIFY, CLOSE, GET, NEXT, INPUT, LET, WAIT, READ, and STOP are all familiar. These keywords have very definite, specialized meanings in BASIC. You have to learn exactly what the specialized meanings are to be able to write programs in BASIC.

## PILOT on the VIC

PILOT was developed by John Starkweather because he felt that while BASIC let you manipulate numbers, it



was weak in keywords that let you manipulate words and symbols. PILOT, which is short for Programmed Inquiry Learning or Teaching, was intended to be a specialized language that educators use to create teaching programs. Over the years, however, PILOT has gradually increased in popularity and is now probably the second or third most popular computer language. PILOT is easy to learn, even easier than BASIC, and it is relatively powerful.

A version of PILOT called *Vanilla PILOT* is available for the VIC from Tamarack Software. There are some very poor versions of PILOT around, but this one is very good. We feel Vanilla PILOT is poorly named because it implies the program is a version that has only the standard or *Common PILOT* keywords. This is not a *vanilla* PILOT. It is an enhanced, superior version of PILOT that takes full advantage of the VIC. It even has keywords that let you use the color graphics and sound features of the VIC, something sadly lacking in the BASIC you get with the VIC. Vanilla PILOT handles Turtle Graphics, a form of graphics used in the Logo programming language. The manual for this version of PILOT is well written and informative, and the program is one of the best uses of PILOT we have seen.

Vanilla PILOT programs look like BASIC programs. There are line numbers at the beginning of each line. PILOT also uses a set of keywords. Here is the BASIC program shown above translated into PILOT:

```
10 T:HI, WHAT IS YOUR NAME?  
20 A:?  
30 T:WELL, $?  
40 T:MY NAME IS VIC AND I  
50 T:WANT TO BE YOUR FRIEND
```

PILOT programs use one- and two-letter abbreviations for their keywords (T and A in the program above), which come at the beginning of the line and are separated from the rest of the line by a colon. If you want to learn a programming language but are a bit concerned about BASIC and its mathematical orientation, consider Vanilla PILOT. It is easy to learn and has many commands for manipulating words.

## Logo on the VIC

There was no version of Logo for the VIC when this chapter was written, but we decided to include a description of it anyway for two reasons. First, it is very popular and somewhat controversial. Second, we think someone will probably produce a version for the VIC soon because the computer has all the features needed to support an excellent Logo.

Logo was developed at the Massachusetts Institute of Technology under the leadership of Seymour Papert. It is a language that turns the computer into an easy-to-manipulate, interesting learning environment. The original versions of Logo were written for large computers. These versions contain a set of instructions children can use to guide the movement of a small mechanical *turtle*. The turtle is a motorized device with a pen that can be told to move in different directions. As it moves, the pen on the turtle draws a line. Several of the words in Logo's vocabulary let children control the mechanical turtle's movement and the designs it draws as it moves. Children found the mechanical turtle a fascinating device, and they eagerly learned how to *tell* the turtle to do interesting things like drawing circles, squares, and other geometric designs. In the process of learning the computer language, they also learned a lot about mathematics, spatial

relationships, and the general process of solving problems.

Today most applications of Logo use a microcomputer version of the language. A company appropriately named Terrapin, Incorporated, markets a version of Logo for small computers such as the Apple II. The ATARI, TRS-80 Color Computer, and the Texas Instruments-99/4A all have Logo as an optional language.

Instead of a mechanical turtle that moves around on the floor, the personal computer versions of Logo use a video turtle that allows students to draw figures on a color monitor or television. The turtle becomes a small triangle that appears on the video display. There is a whole set of instructions that let children control the movement of the video turtle. Here is a program that would let you draw a square in Logo:

```
TELL TURTLE  
FORWARD 10  
RIGHT 90  
FORWARD 10  
RIGHT 90  
FORWARD 10  
RIGHT 10  
FORWARD 10
```

The turtle can be told to change two aspects of its position on the screen: location and heading. The word FORWARD tells the turtle to move in the direction the tip of the triangle is pointing. The number that follows FORWARD tells it how far to move. The word RIGHT tells the turtle to shift the direction of the turtle so it will be pointing in a different direction. The number that follows RIGHT specifies how many degrees to shift. Other keywords include PENUP and PENDOWN, which let you

move the turtle around on the screen with or without the turtle drawing a line as it moves. We have seen children work for hours with Logo, creating complicated shapes and pictures on their video screen. Several second graders, for example, created a detailed steam locomotive and then set it in motion across the screen. It chugged along with white puffs of smoke coming out of its smokestack.

However, turtle graphics is only one aspect of Logo. The language, like several we'll mention, is also expandable. You can teach Logo new words! For example, if we had typed TO SQUARE before giving the computer the set of directions to draw a square, the computer would have learned that those directions are what you do when you draw a square. Later you could tell it to SQUARE, and a square would appear on the screen at the point where the turtle was located. If you told the computer to CIRCLE before telling it how, the computer might say TELL ME HOW TO CIRCLE. Logo's ability to be taught reverses the traditional way computers are used in educational settings. Instead of the computer teaching the children, the children teach the computer. Proponents of Logo feel this approach produces a better quality of learning and may well help children learn important problem-solving skills.

If you have young children or if you are an educator interested in Logo, you might be interested in two organizations that support Logo. One is the Young People's Logo Association and the other is FOLLK (Friends of LISP, Logo and Kids). Logo is probably the best language for teaching young children about computer programming, and it is one to consider seriously as a first language for both elementary school and junior high school students. Some colleges even use Logo in their math classes.

As we mentioned earlier, Vanilla PILOT includes Tur-

tle Graphics in its VIC version. HES also has a program of turtle graphics for the VIC. Appropriately titled *Turtle Graphics* it was written by a well-known proponent of Logo and Turtle Graphics, David Malmberg. The HES version has many more turtle graphic keywords than does Vanilla PILOT, but it does not have as many commands for other types of computing tasks.

## **Pascal and FORTH on the VIC**

Support for these languages generally comes from experienced programmers who look for features that make it easier to write high-quality, well-organized programs. Both are powerful languages. However, they are not languages we would recommend for first-time programmers. They are more suitable for the person who has decided to get serious about programming and wants a language that, even though difficult to learn, offers some benefits for the experienced programmer.

The popularity of both Pascal and FORTH is increasing. You can find out who is selling the latest versions of both languages by looking through the ads in a current issue of a *Compute!*, *Micro*, or *Commodore Gazette* magazine. A version called VIC FORTH is available from HES. It is a \$70 cartridge. UMI also has a FORTH for the VIC called FORTH-20.

## **Machine and Assembly Languages**

In actual fact, computers understand only one language: machine. Machine language is not a single language, however. Each computer chip has its own set of instructions that are built in by the designers. Instructions given the computer in any language other than its own

machine language must be translated into the machine language used by the microprocessor chip or CPU before it can understand and process them. The VIC can understand BASIC only because Commodore put a BASIC translator (called an interpreter in computer jargon) in the computer's permanent memory (ROM).

Although much of the software in a computer's ROM was written in machine language, most beginners will want to leave that language to the experienced programmer. It is hard to use, very tedious, and time-consuming for the programmer. Using it requires some dedicated study of 6502 machine language and a clear understanding of just how the VIC is put together. The machine language for the VIC also uses unfamiliar number systems (hexadecimal and binary) instead of decimal. Here is an excerpt from a machine language program:

7F06	A5	12		LDA
7F08	F0	03		MOV C,A
7F0A	4C	00	BF	JMP

All the numbers above (they really are numbers even though they contain letters) are written in hexadecimal, a base-16 number system. It takes tens of thousands of machine language instructions to perform even a simple job like keeping track of a list of names that will be printed on mailing labels. Again we would suggest that you put off becoming a machine language programmer until you have experience with an easier language like BASIC.

In between BASIC and machine language is something called *assembly language*, which helps reduce some of the frustrations of programming in machine language. One of the most trying things about machine language programming is the fact that the symbols used for the

instructions are numbers, and not even decimal numbers at that. They give the human no indication of their meaning. Unless you memorize the numbers and their meaning, programming in machine language can be a boring, slow-paced procedure that is punctuated by searches through the table of instruction codes. There is, fortunately, an alternative. Remember LDA and MOV C,A? Assembly language uses the same grammar as machine language, and the vocabulary is equivalent. Instead of a number, however, each instruction has a short *mnemonic* that provides a clue as to its function. That means you work with instructions like JMP (short for jump), LDA, and MOV C,A instead of A5, F0, 12, and BF. You can thus write your program in assembly language, and a program called an *assembler* then converts it into machine language instructions the computer can digest. Since it is much easier to remember what MOV C,A means than it is to remember the meaning of numbers like AF D3, assembly language work is a lot easier than machine language. You still need to know the intimate details of how the VIC is organized internally to write assembly language programs. We recommend you put off learning this language until you are comfortable with one or two higher level languages.

There are advantages to programs written in machine or assembly language. They operate much faster than programs in BASIC, and once they are written, the actual program does not require as much memory as an equivalent BASIC program. Speed of operation is sometimes a necessity in a program (for instance, in a video game that uses animated color graphics), and that means the program will probably be written in something other than a high-level language. If you find your program needs call for speed or economic use of available memory, machine and assembly language may be your cup of tea.

You don't need to learn to program the computer at all to use its power. But programming is a pastime many people find both fascinating and fulfilling. The VIC offers owners a wide range of programming languages from which to choose. There may be several that appeal to you.



# Selecting and Buying VIC Accessories

The VIC computer is one of the least expensive ways to get into computing today, if you want a full-size keyboard with a relatively standard layout. That low entry cost is one of the major reasons why more than a million VICs are in the hands of owners today. The low price, however, is for a machine with few frills. Most people who use their VIC regularly end up spending more money on accessories for the VIC than they spent on the computer itself.

This pattern of expenditures, spending more on accessories than on the basic machine, is difficult for many people to accept. We are accustomed to buying cars that cost thousands of dollars and selecting accessories for it that cost hundreds of dollars. A Ford Mustang may cost \$8000, and a cassette/radio unit for it may be \$350. The VIC computer, on the other hand, costs less than \$100 while the 1541 disk drive for it is around \$300. If we applied that ratio of base price to accessory cost to the Mustang and its radio, the radio would cost \$24,000! The point is, the money you spend on the basic computer is often only a small percentage of the total cost of a computer system that can do the jobs you want it to do. The price of two video game cartridges can be more than the cost of the VIC.

Some companies have taken advantage of the public's inexperience with buying computers and accessories. They have lowered the price of their basic computers to the

point that they are unlikely to make any profit at all on each unit they sell. Once you buy their computer, however, you are locked into that company for accessories, which are priced so high the company makes a windfall profit on each item. One large manufacturer has even gone so far as to try to design their computer so that no other company can write video game software for it. They hope to recover money lost on selling their computer for less than it cost to build it, by charging what we consider excessively high prices for accessories and by forcing customers to buy all their game software from them. We consider that a business strategy that ill serves the people who buy that computer.

To their credit, Commodore has designed the VIC in such a way that hundreds of companies have been able to create and sell accessories and computer programs for it. You thus have a competitive environment in which to shop for VIC accessories. Few items are so unique that there is only one supplier for them. In addition, Commodore appears to have chosen to compete in the marketplace by offering excellent prices on both the basic computer and the accessories that go with it. The prices Commodore charges for printers, disk drives, and video monitors are very competitive.

This is not an advertisement for Commodore. Many companies manufacture products for the VIC at competitive prices, often lower than the price of similar products from Commodore. We'll discuss the types of accessories that are available for the VIC and review some of the products. In addition, at the end of the chapter we have included a description of some of the magazines that regularly publish material on the VIC. With new software and accessories coming to market almost daily, a subscription to one or two magazines is a very good way to keep up with what's new for the VIC.

## WHERE TO BUY ACCESSORIES?

Where should a new VIC owner buy his or her VIC accessories? If you subscribe to magazines like *Commodore Gazette* or *Micro*, you will see ads for hundreds of mail-order companies with toll-free numbers. Call them up, give your VISA or MASTERCARD number, and they ship products to you by return mail. Prices for products through the mail are often ten to thirty-five percent lower than the price of comparable products in local stores. Should you buy locally or through the mail?

We buy about half our computer accessories and software through the mail and half from local stores. In our opinion, beginners should seriously consider buying even more from local stores. There are several reasons. First, a good store will have someone who can give you advice, suggestions, and hints, not just take your money. A good store, however, can sometimes be hard to find. In some stores the only thing the salesperson can do is point you in the direction of the rack with VIC accessories and ask if that will be cash or credit card. Even with that type of store, it is usually easier to get an adjustment when a problem occurs. If the product doesn't work or the software doesn't load, the store will usually exchange it or refund the purchase price. A mail-order company will usually do the same thing, but you must return the product first. It can take several weeks to straighten out a problem, even if the mail-order supplier is cooperative.

However, there is one area where mail-order suppliers generally have an advantage. Few local stores carry the variety of products that are available by mail. Several mail-order companies sell over five hundred different products for the VIC; few retail stores carry that many.

Sometimes the only source for a product you want will be a mail-order supplier.

Whether you buy from local stores or from mail-order companies, there are some hazards you should be aware of. Local stores often have salespeople who have little or no understanding of your computer. Instead of telling you they do not know the answer to a question, many of them will give you the answer they think is most likely to make the sale. If we go into a store where we are not sure of the salespeople, one handy technique is to ask a few questions we do know the answer to. If the salesperson answers them accurately and honestly, even if the answer may reduce the likelihood of a sale, we can put more confidence in the answers that person gives to other questions. This technique has produced some astounding answers.

The people who answer the phone at a mail-order supplier can also provide inaccurate information. Perhaps the best advice is to be very careful about making buying decisions on the basis of what a salesperson, especially one working on commission, tells you. We know this is a sweeping generalization that does a disservice to many fine salespeople who do an excellent job. They are, however, a decided minority in this field. We feel a store that has such a staff is worth an extra ten to fifteen percent, since their knowledge and advice can save you much more than that.

A common problem with mail-order companies is the delays in shipping products. Think twice about ordering something that is not in stock. Many companies will tell you they are expecting a big shipment *on Friday* and will be glad to ship yours that afternoon. Big shipments in this industry are often late because companies cannot produce enough to meet demands. That Friday shipment may not get there for five or six Fridays. In addition,

even if the shipment does arrive, there may be so many back orders that your order cannot be filled from that order. It is not uncommon for mail-order suppliers to charge the cost of a product to your credit card the day you place the order and then take weeks, even months, to send that product to you. Again, we are painting a bleak picture with a wide brush. There are honest, responsive mail-order suppliers who do everything they can to provide the customer with quick service. As with local suppliers we feel that type of company is worth a little extra cost because it saves you lots of frustration.

## EXTRA MEMORY

The VIC is not well endowed when it comes to "random access memory" (RAM). Unless you use the computer exclusively to play video games that come on "read only memory" (ROM) cartridges, the message OUT OF MEMORY is likely to become a familiar sight to you. Most of the home record keeping and family finance programs need extra memory to function. Almost all the business programs need extra memory.

Some companies will say their program works with the standard VIC but uses as much extra memory as you can add. Generally that means the program is going to be very difficult or inconvenient to use unless you add extra memory. Other programs need a certain amount of extra memory. That means the program will not even load and run on a VIC without more memory.

The VIC can handle a total of 32K of RAM memory, counting the 5K that is built into the basic machine. Additional memory is added to the VIC by plugging cartridges into the slot on the back. Commodore manufactures 3K (\$40), 8K (\$60), and 16K (\$110) cartridges.

In addition Commodore's *SuperExpander* cartridge (\$70) includes 3K of RAM. At least twenty other companies also sell memory cartridges that plug into the VIC; prices are generally lower than the price from Commodore.

Memory is a relatively generic product which we feel is safe to purchase from a non-Commodore supplier with a good reputation. There is nothing complicated about the design and manufacture of VIC memory cartridges. Good design and care in manufacture are, however, required if the product is to operate reliably. Non-Commodore memory products generally come in cartridges that look like the ones from Commodore. You can also buy VIC memory that comes on a circuit board that attaches to the computer through a flat cable. This can make it easier to attach memory because you don't have a protrusion from the back of the VIC, but one such memory board, from Cardco, is considered *noisy* by some users. That is, the signals that travel back and forth between the memory and the VIC were sometimes garbled, because the cable did not isolate each line as well as it should. This is a little like making a long distance phone call and being able to hear someone else's call in the background. This *crosstalk*, when it occurs in a computer, will usually cause so many problems the system becomes unreliable. We expect Cardco, a major supplier of VIC accessories, to correct this problem in the future. Their other memory products and their expansion cards for the VIC appear to work well.

When you're shopping for memory for the VIC, you may also be interested in another feature: piggybacking. Since the VIC has only one slot for plugging in cartridges, you cannot normally plug more than one cartridge in at a time. Some memory cartridges get around this by placing a cartridge slot on the back of the memory cartridge. That means you can plug the memory into the VIC and then plug another cartridge into the memory cartridge.

Some of the more expensive memory cartridges even allow you to plug in several different cartridges.

## EXPANSION BOARDS

As we mentioned, you can plug only one cartridge into the VIC at a time. However, some VIC owners accumulate five, ten, even twenty different cartridges. Many will want to have three or four of them plugged in at one time. To deal with this problem, some memory boards have extra slots to plug in one or two cartridges.

Another way to get room for additional cartridges is to buy an expansion board. These boards plug into the cartridge slot at the back of the VIC and allow you to plug in from two to six different cartridges at once. Some have a way to select which cartridges are *active*, and some even include fuse protection and additional switches to control the operation of the computer. You could, for example, put six different video game cartridges in some expansion boards and then flip a switch to determine which game will be *on line* at a given moment.

## PRINTERS AND PRINTER INTERFACES

The printer Commodore sells for the VIC is an inexpensive (\$400) model called the VIC 1525 Graphic Printer. It is a Japanese import that has been modified to operate correctly with the VIC. It has three positive points and a few negative points. On the positive side, the printer is relatively inexpensive. In addition, it is capable of

printing all the VIC's graphic characters, as well as its letters, numbers, and symbols. Finally, the 1525 printer can be plugged into the VIC without special cables or interfaces. Plug it in, turn it on, and it works.

All is not rosy in VIC printerland, however. The 1525 is a relatively slow printer; and the quality of the print it produces is mediocre at best. And, although we have no concrete data, the robustness of this printer might be questioned. It does print, it is easy to use with the VIC, and it is cheap. We feel many people will be dissatisfied with the rather fuzzy quality of the print it produces, however.

There are at least 200 different models of printers on the market today that, with effort, can be used with the VIC. The price of these printers ranges from under \$100 to several thousand. Quality, as you might expect, varies as well. Some printers produce barely legible print, while the output of others looks as if it came from a high quality office typewriter. Several of the magazines mentioned at the end of this chapter regularly publish articles on selecting printers for your computer. The book *Computers For Everybody* also has a section on printer selection. You may want to consult these sources if you are shopping for a printer. We will concentrate here on the issue of compatibility with the VIC.

Before you can successfully connect a printer to your VIC, you must overcome three major obstacles:

- The printer must accept data in the form the VIC transmits it, OR an interface must be placed between the VIC and the printer to translate the signals from VICese to Printerese.
- The cable between the computer and printer must have the proper connectors on each end and must be correctly wired.



- The code used by the VIC must be the same one used by the printer, OR a program must translate the codes for the printer.

Let's deal with the interface issue first. Printers generally come in two different flavors: serial and parallel. Serial printers accept data a bit at a time, and each character code is made up of seven or eight bits. Parallel printers accept data eight bits at a time over eight separate data lines. The VIC contains a serial interface port (the round plug with six holes on the back of the VIC). In the best of all possible worlds, this serial interface would be where you could connect a serial printer. As you might expect, the world could stand a little improving. Every single computer we are aware of uses an industry standard voltage level when sending data to a serial printer. It is called the RS-232C standard, and it uses  $-12$  and  $+12$  volts. The VIC and the 1525 printer uses  $0$  and  $+5$  volts instead. That means this interface is not compatible with ninety-nine percent of the serial printers out there. If you intend to use a serial printer, you will have to buy an RS-232C interface cartridge. The version from Commodore sells for around \$50 and plugs into the user port on the back of the VIC. This particular serial interface is wired to operate with a modem rather than a printer. That means you will probably have to have a cable specially wired to use a printer, since printers and modems put some of their signals on different pins.

Parallel printers are also a problem because the VIC does not have a standard parallel interface connector. That leads us to the second issue: connectors. Serial printers generally use a special connector called a 25 pin D connector. Most computer stores carry cables with this type of connector on each end. The Commodore RS-232C interface has a plug that fits this type of connector.

Parallel printers use one of two types of connectors.

One is called a *Centronics compatible* connector because it was pioneered by Centronics, a printer manufacturer. A few parallel printers expect you to provide a cable with an *edge card* connector on it. These are often hard to find. In many cases you will have to build or buy a cable that correctly plugs into your VIC on one end and fits your printer on the other. Finding a cable that works is sometimes the most difficult aspect of getting your printer up and running.

The third issue to be considered is that of code compatibility. The VIC assigns an eight bit code to each of the characters it can display. Unfortunately, the code used by the VIC is not exactly the same as the industry standard code ASCII (short for American Standard Code for Information Interchange). The VIC code for letters and numbers is the same, but there is no ASCII equivalent for VIC graphics codes (most print as letters or symbols). A few of the VIC codes tell the printer to do things you would rather not have it do (such as stop printing and go into a resting state). The VIC 1525 printer is set up to accept the same codes as the VIC; almost all other printers you might want to use accept the ASCII code.

## Some Solutions

While we were working on this book we had the opportunity to use a program called *Smart ASCII* from Midwest Micro Associates. *Smart ASCII* is \$60. The price includes a program on cassette (it can be transferred to disk) and a cable. The cable plugs into the VIC user port. The other end is a Centronics compatible connector that will plug into many of the popular parallel printers. We used this program with an Epson MX-80 printer, but there are at least seventy other models it will work with. The quality of print from the Epson was far superior to that

available on the Commodore 1525. (In defense of the 1525, we would point out that the Epson cost several hundred dollars more than the Commodore printer. Commodore has several other printers that cost more than the 1525 and provide excellent print quality.)

Smart ASCII solves all three of the printer interface problems we've noted. A parallel port is provided, the cable works with many standard printers, and the program has three different types of *translation* from which to select. The VIC code that tells the computer to clear the screen of all printed material, for example, causes Smart ASCII to print CLR. The code for switching to reverse characters prints as RVS, and the code to set characters to red predictably prints as RED. The instruction manual that comes with Smart ASCII is clearly written and informative. The program is compatible with several of the more popular word processing programs for the VIC, a point that should not be overlooked, since some printer driver programs will operate only with programs written in BASIC. Machine language programs like word processors cannot be used with BASIC-only printer programs.

Smart ASCII lets you buy one of the printers that work with other personal computers and use it with your VIC. It is a good program. However, there is one aspect of its operation that could be done differently. Remember that the code for telling the computer to print letters in reverse video is translated as RVS? On the VIC printer from Commodore, this code is printed as a graphic symbol. That means what you see on the printout of a program is the same thing you see on the video screen. Printers like the 1541 can reproduce all the letters, numbers, and symbols that can be displayed on the video screen. They can also print a reasonable facsimile of all the graphics characters the VIC can display. One company, MicroWare Distributing, sells the \$119 Tymac Parallel Printer In-

terface, which, like Smart ASCII, has a cable with a Centronics connector on the printer end. This interface has several more features not provided by Smart ASCII. Perhaps most importantly, it can print the VIC graphics characters when it's used with some of the more popular printers like the Epson MX-80 and FX-80. That means you get a single graphic character printed in place of the RVS provided by Smart ASCII. Depending on your application, this feature may be important to you. The Ty-mac interface also has a 2K *buffer*, which means the computer can send 2000 characters to the interface and then begin another task while the buffer takes over the job of sending character codes to the printer.

Several other companies manufacture parallel printer interfaces. Prices range from around \$30 to well over a hundred. Do not shop for interfaces simply on the basis of price, since minimal systems may not work correctly or do everything you want. Decide what type of printer you want to use, what software you plan to use it with (for instance, only BASIC programs that you write, or accounting software, or a word processing program), determine if the interface is compatible with that software, and decide what you want the interface to do (whether it's to translate VIC code to ASCII or to print VIC graphics). Then select the interface that does the job.

## VIDEO ENHANCEMENT HARDWARE

Inexpensive computers aimed at the home and school market generally achieve their low prices in one of three ways: they use an inexpensive keyboard, they make many items *options* that really aren't (you must buy them to have a usable computer), or they skimp on the video display. The VIC's user memory (RAM) is on the short

side (the *option* approach), but memory is not that expensive. However, the video display leaves something to be desired. Yes, it does have color and graphics, but that does not compensate for the measly twenty-three-character by twenty-two-line display. The twenty-three-by-twenty-two format is the feature most often criticized on the VIC. When writing a BASIC program, you can type in a line of instructions that is as long as eighty-eight characters, but the VIC will need three or four screen lines to display that program line. It makes for a messy and confusing display. A better format is twenty-four lines of forty characters (as on the ATARI, Apple, and Commodore 64 computers). Even better is a twenty-four or twenty-five-line by eighty-character format (as found on the Radio Shack Model 4 and on many of the computers aimed at the professional and small business market).

Several companies recognized the need for a higher capacity video display on the VIC and designed products that let you use either a twenty-four-by-forty or a twenty-four-by-eighty format. The *VideoPak* from Data20 costs \$300 with 16K of extra RAM (\$400 with 64K RAM). It gives you a choice of either a twenty-four-by-forty or twenty-four-by-eighty. The *VideoPak* plugs into the cartridge slot on the VIC. It lets you use all the graphics characters on the VIC keyboard, and it includes software for using the VIC as a terminal (for telecomputing). The quality of the display is quite good when it's used with a video monitor. Normal color televisions, however, are not designed to display twenty-four-by-eighty-character displays. The characters are so fuzzy that you cannot read some of them and you are likely to tire your eyes. Plan on using only the twenty-four-by-forty format if you use the *VideoPak* with a standard television.

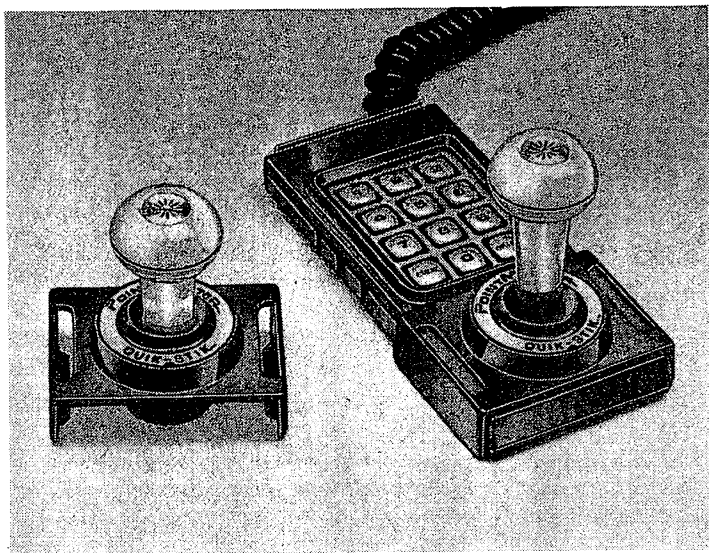
Several products similar to *VideoPak* are currently on the market, and many more are likely to become available

as VIC owners look for ways to get even more use from their computers. However, the availability of such products brings up an important point. The VIC was never intended to be a business or professional computer. It is possible, if you spend enough money, to give it many of the features of a \$2000 computer. You would spend quite a bit of money to accomplish that feat. Today there are professional computers in the \$1200 (the Pied Piper) to \$2000 (the Eagle II) price range that are very good business and professional computers. Why not let the VIC do what it does best and spend the money on another computer that was designed for the business and professional uses?

## VIDEO GAME CONTROLLERS

When you use the VIC for education and recreation, you often need a means of input other than the keyboard. Many arcade games, for example, do not work well if you must press keys to control movement. Commodore originally sold a video game joystick for the VIC that looked suspiciously like the one Atari makes. Apparently Atari thought it was a little too much like theirs, because they threatened to sue Commodore over the issue. Commodore now sells a different joystick that, in our opinion, is simply not as good as the Atari version. Our young video game evaluators used terms like *I hate it*, *It stinks*, and *Terrible* to describe the Commodore joystick. Many felt the three-sided post on the joystick was uncomfortable to use. Some complained about the stiff movement and about the awkward placement of the fire button. The Commodore joystick is cheap, but it is not good.

The same evaluators were not that impressed with the ATARI joystick, however. It is easier to hold, but some



**Fig. 10.1 Pointmaster joysticks made by Discwasher**

complained about the durability of the unit. We used a Pointmaster joystick from Discwasher. It is more expensive than the ATARI or the Commodore joystick but was rated better, though not arcade quality.

If you are shopping for joysticks, you may want to test drive several before buying. Joysticks vary considerably in their feel and fit, and a device that does not fit your playing style can cause fatigue and low scores. Some people feel the joystick made by Atari is difficult to use because you can't feel when you have moved the stick far enough to register. Others find its post too small and too short for their tastes.

Companies such as Discwasher, Spectravision, Suncom, and Wico manufacture higher priced but more adaptable models in a variety of formats and styles. Wico's Red Ball Joystick, for example, costs \$35, is sturdily

built, and has two strategically placed fire buttons. Wico, which also manufactures joysticks and trackballs for arcade games, has a large line of products, including the Power Grip Joystick (\$37), which has a large handle that fits your hand and a deluxe model (\$45) that comes with three different interchangeable handles.

There are more versions of the traditional joystick than any other type, but at least a few models of several other game controllers are also available for the Vic. Both Wico and TG Products market a *trackball* game controller that can be substituted for a joystick on the VIC. Trackballs let you roll a large round ball set in the top of the controller to direct the action of the game. This is more precise than many joysticks and can be done more quickly (for some games). Trackballs are generally much more expensive than joysticks, however. You can also buy radically different joysticks, like Zircon's Video Command, a cigar-shaped device with a triangular controller top that can be moved by your thumb, and Le Stick, another fat cigar-style joystick that you control by tilting your hand in the direction you want it to go.

For evaluations of new game controllers, you may want to read current issues of magazines like *Compute!*, *Video Games*, or *Video and Arcade Games*.

## MODEMS

You will need a modem if you plan to use your VIC for communicating with other computers and information utilities over the phone. A modem takes the signals from your computer and converts them into tones that can be reliably transmitted over phone lines. It also converts tones transmitted to your computer into signals the VIC can process.



There are at least fifty different models of modems on the market today with prices that range from \$75 to \$1000. However, VIC owners have a simple choice when it comes to modems. The VICmodem retails for just over \$100 and works fine. Because it was custom-designed for the VIC and Commodore 64 computers, and because it attaches directly to the phone line instead of using acoustic cups, we think this is the *best buy* for VIC owners and recommend it. See the chapter on telecommunications for more information on the use of a modem with the VIC.

## MASS STORAGE OPTIONS

We would like to emphasize again that this is not an advertisement for Commodore; we have criticized them when we felt they deserved it and thus feel it is more than appropriate to praise them when they deserve it. And they do, when you consider the two methods Commodore provides for permanently storing data and programs: the cassette recorder and the 1541 disk drive.

The 1541 disk drive is not fast, and it does not store huge amounts of data on each disk. Neither of those features is extremely important in the applications for which the VIC was designed. A VIC disk drive should be inexpensive and reliable. The 1541 is both. The low price of the Commodore drive has discouraged other manufacturers from designing their own drive systems for the VIC. There is not enough profit in the undertaking to attract many people. The 1541 can store a little over 160,000 characters of information on a disk, it works well, and it works reliably. If you really need faster, higher capacity drives, we discuss a method for attaching them to the VIC later in this chapter.

The Commodore tape recorder is expensive, as tape recorders go. Several products on the market let you use a standard tape recorder instead of the Commodore unit. Many home computer makers brag about their ability to use standard cassette recorders to store data. We don't think that is really something to crow about. We had never used a computer with a standard tape recorder that consistently loaded and saved tapes reliably. Ask Apple owners how they like the tape system that came on their Apple II. Both Commodore and Atari use specially designed recorder units that work only with their computers. We think that was a wise decision because Commodore and ATARI computers both have reliable tape systems. It is an unusual event when our VIC does not load a program properly. Unless you have good reason to use some other tape system, we feel you should choose the Commodore recorder for the VIC.

## NETWORKS AND IEEE INTERFACE

The 1541 disk drives and the 1523 printer both connect to the VIC through a serial port. That method of connecting printers and disk drives differs from the approach used on other Commodore computers, such as the PET. On the PET, as well as on CBM models, peripherals are connected by an interfacing approach called IEEE-488. This approach is fast and reliable. It is also more expensive, which explains why it is not used on the VIC. However, at least three companies offer an interface cartridge that lets the VIC operate disk drives and printers designed for the IEEE-488 interface. That means you can use high-capacity disk drives like the 4040 and 8050 on your VIC, as well as high-quality printers like the Commodore 8023. The IEEE-488 interfaces for the VIC gen-

erally consist of a piece of hardware that plugs into the VIC expansion port. Then you can run a cable from the interface to printers and disk drives. Prices for IEEE-488 interfaces are in the \$100 range. Southwest Micro Systems is one company that sells these interface boards.

A different type of interface is sold by Small Systems Engineering. Called Interpod, this \$180 device connects to the VIC's serial port by a cable. Interpod connects Commodore disk drives and printers that use the IEEE-488 protocol to the VIC; it can also connect standard serial printers and speech synthesizers. There are even switches to let you select the correct serial speed (called Baud rate or bps—bits per second) from the interface.

Richvale Engineering is another established manufacturer of hardware and software for the Commodore computer line. They created the Script-64 word processing program, for example. Richvale also manufactures a product called the RTC V-Link, which functions in much the same way as the Interpod. Both have an IEEE-488 interface for the VIC, and both have standard RS-232C serial interfaces. V-Link also has a parallel interface and additional software that lets you use the same disk drive commands that are used on the PET computers with 4.0 BASIC. The disk drive commands in 4.0 BASIC are much easier and more convenient to use than the ones available in Commodore 2.0 BASIC, the version used in the VIC and Commodore 64 computers. V-Link also has a program that makes it much easier to write and revise machine language programs. At \$185 (Canadian), V-Link is a lot for the price.

In addition to products that let you hook up other equipment to the VIC, there are devices that let you *network* several VIC computers. The concept of networking may not be familiar to many readers, but it is an important one if you plan to use several computers in one location. Under normal circumstances, if you planned

to use eight VIC computers in a classroom where computer literacy courses were taught, you would need to provide at least one disk drive or one cassette unit for each VIC. Peripherals like disk drives and printers are expensive; they generally cost much more than the computer. One way of saving on the cost of peripherals is to use a *resource sharing* network system. That means you can connect several VICs to one or more disk drives and a printer. Since the disk drive is actually used less than five percent of the time, and printer usage generally averages less than ten percent of a typical computing session, it makes sense to let the computers share these resources rather than providing a disk drive and printer for each keyboard. The VIC is a rather forgiving computer; you can unplug the disk drive and/or printer after use and plug it into another computer that needs access. We do not recommend this because of the wear and tear on the connectors. However, there are networking accessories that let you interface many VIC computers with one or more disk drives and printers. One of the least expensive systems is the VIC/64 Switch, which is distributed by Computer Marketing Services. It sells for \$150 and allows you to connect up to eight VIC and/or Commodore 64 computers to the VIC/64 Switch. You then connect the 1541 disk drive and a compatible Commodore printer to the VIC/64 Switch and start computing. Whenever one of the eight computers needs access to the printer or disk drive, the interface connects the computer to the peripheral, and operation proceeds as if the disk or printer was connected directly to the computer. If another computer asks for access at the same time, the interface puts that computer in a *wait* state until the first computer finishes using it. This is an inexpensive way to share resources through networking. The only expense is for the VIC/64 Switch and cables from the computer to the interface (\$10 to \$20 each).

There are hundreds of other products that will make using your VIC more productive or more pleasureable. One of the easiest and most effective ways of keeping up with new accessories is to subscribe to one or more of the magazines that cater to owners of Commodore computers.

## MAGAZINES FOR VIC OWNERS

*Compute!* We feel this is an excellent magazine for VIC owners. It is published monthly and carries articles on Commodore computers, as well as on the ATARI, Apple, Radio Shack Color Computer, and the Timex Sinclair. It is well edited, nicely illustrated, and filled with programs you can type in and run on your computer. Most issues contain at least two or three programs that will run on the VIC. In addition, there are all sorts of articles on how to use the VIC. Most of the articles are for intermediate or beginning users, but a few are quite advanced. This magazine also has several regular columns on topics like educational computing. The editorial balance is excellent. A typical issue will have articles on programming, reviews of commercial software and hardware, general articles on topics such as word processing, video games, and the social implications of computers. In addition, the magazine carries hundreds of ads for products you may want to buy. At \$20 a year, this is a magazine we strongly recommend.

*Compute!'s Gazette.* This magazine is for the VIC and Commodore 64 and is published by the same group that publishes *Compute!*. The first issue came out in the summer of 1983, so it is still too early to tell exactly where the focus of the magazine will be as it matures. At present

it carries the same variety of articles found in *Compute!*, with some preference for articles for beginning computer users. There are hardware and software reviews, programs that run on the VIC and 64, tutorial articles on topics such as programming in BASIC, and columns by well-known computer writers. Fred D'Ignazio, for example, writes on computing for kids. This magazine is published twelve times a year. Subscriptions are \$15.

*PowerPlay*. This magazine is published four times a year by Commodore. It deals with the VIC and Commodore 64 computers. Subscriptions are \$10 a year. It is not as good as the two magazines above, but it is one of the best company-sponsored magazines published. It is well illustrated, publishes articles for beginning and intermediate users, and accepts ads from companies other than Commodore (something some company magazines do not permit). The focus of this magazine is on home and recreational computing. Each issue generally has one or two programs as well as articles on a variety of topics. Most issues also carry a list of active users groups for Commodore computers.

*Commodore*. This magazine is also published by Commodore. It concentrates on professional and business applications of the entire line of Commodore computers. There are some articles on the VIC and 64. It is \$15 a year for six issues.

*Micro*. This magazine publishes articles relevant to owners of computers that use microprocessor chips in the 6502 and 6809 families. All the Commodore computers are thus covered. This magazine used to publish articles for intermediate and advanced computer owners who were interested in programming their machines or in building or interfacing equipment. The magazine changed ownership recently and now has many more beginning level tutorial and general interest articles, as well as programs

that will run on the VIC. We recommend it to new owners of the VIC. Well written and edited, it is published twelve times a year; subscriptions are \$24.

*The Transactor.* This magazine is aimed at the more advanced user. Although not as large as the other magazines we've mentioned, all the articles are relevant to Commodore computers. While it publishes reviews of commercial software and hardware products, the focus is on technical articles that deal with programming and/or the hardware design of particular models. Many articles are about the VIC and Commodore 64. It is published six times a year by Canadian Micro Distributors. Annual subscriptions are \$15.

*Strictly Commodore.* This bi-monthly magazine is not as flashy as some, but it carries lots of information for owners of Commodore computers. It is \$18 a year for six issues.

*Commander.* This is a relatively new magazine aimed at owners of Commodore computers. It includes a range of articles from tutorials to good product reviews. Subscriptions are \$22 a year from Micro Systems Specialties.

*Commodore Computing.* This excellent British publication covers the entire line of Commodore products and has articles for beginning through advanced users. It is 12.5 British pounds a year if you live in England, 15 pounds if you live overseas.

*VIC Computing.* This is another British magazine. All the articles in it are on the VIC. Subscriptions are 6 pounds in England, 9 in Europe, and 16 overseas.

*FOX 20.* This magazine is a little different. It is published monthly on cassette. You load the cassette into your computer and read informative articles on the VIC as they appear on your screen. In addition, each issue contains at least five programs for the VIC that you can load into your computer from cassette and run. Many are games, but there is quite a variety. It is well done, in-

teresting, and useful. Subscriptions are \$53 a year.

*20 Load*. This is another cassette magazine that is similar in intent to *FOX 20*. Subscriptions are \$50 a year.

In addition to these specialized magazines, there are several other computer magazines that regularly publish material on the VIC. Most of these are available on newsstands, where you can browse through them to determine if they fit your needs. *Creative Computing* is a fat, fact-filled monthly that covers the general field of personal computing. It regularly publishes articles on the Commodore computers, and Joel Swank writes a regular column for it titled *Commodore's Port*. The information in this one column is often worth the price of the magazine. Another magazine, *Computers and Electronics*, also publishes many articles that would be of interest to VIC owners, and *Easy Home Computer Magazine* is for the new owner and publishes VIC articles.

If you are interested in the recreational use of the VIC, magazines like *Video Games*, *Video and Arcade Games*, *Electronic Games*, and many more, often contain good reviews of VIC video games.

This concludes *Things to Do with Your Commodore® VIC-20™ Computer*. We hope that you have enjoyed it and have learned some useful things. If you haven't bought a computer yet, you might want to read some of the other books in this series. Buying a computer can be either an enjoyable or frustrating experience. How much you enjoy your computer may depend on how much you find out about it before you buy it.



# Glossary

**Alphanumeric:** Information presented in both alphabetic and numeric form, for instance, a mailing list. The numbers 0–9 and the letters A–Z or any combination.

**Applications software:** Programs designed to perform specific tasks. Applications software can be games, educational programs, or business programs.

**Arithmetic expression:** A group of letters, numbers and/or symbols that tell the computer to perform an arithmetic function. For example:

$2 + 2$

$2 * 2$

A22

$2/4$

$2/A$

$A*(2/B8)$

**Arithmetic operator:** A symbol that tells the computer to perform an arithmetic operation. The operators include + addition; – subtraction; \* multiplication; / division; and ^ raise to a power.

**ASCII:** A simple code system that converts symbols and numbers into numbers the computer can understand. For instance, when you type *a* on the keyboard of your computer, the binary number 01100001 is sent to computer's central processing unit (CPU). The CPU then displays the letter *a* on the screen.

**Assembly language:** A low-level programming language that is much faster than a high-level language such as BASIC. Assembly language programs are extremely difficult to write. Here are two lines from an assembly language program:

```
LDA
MOV C,A
```

**BASIC:** Beginner's All-purpose Symbolic Instruction Code. A high-level computer language designed for beginners. Commodore BASIC is a dialect of BASIC designed especially for the Commodore microcomputers. Here are three lines of program written in BASIC:

```
10 PRINT "HELLO HOW ARE YOU?"
20 INPUT A$
30 GOSUB 500
```

**Baud:** A unit of information transfer. In microcomputers, a baud is one bit per second.

**Baud rate:** The rate at which information is transferred. For instance, 300 baud is a transfer rate of 300 bits per second. The VIC 20 is an eight-bit computer. This means that each character, space or symbol requires eight bits. Therefore, a baud rate of 300 transfers only 37.5 characters per second. If you are sending a letter with each word approximately six characters long and you have one space between words, you can send about five words a second or 300 words a minute.

**Binary number:** A number system that uses only two digits, 0 and 1, to express all numeric values. See digital computer.

**Bit:** The basic unit of computer memory. It is short for

binary digit and can have a value of either 1 or 0.

**Black box:** A piece of equipment that is viewed only in terms of its input and output.

**Boot:** The process of loading part or all of the disk operating system into the computer. This lets you load information from the disk or save information to the disk.

**Break:** To interrupt execution of a program. The VIC 20 has key labeled RUN/STOP. When you press the RUN/STOP key the program stops running.

**Buffer:** A temporary storage place used to hold data for further processing.

**Bug:** A problem that causes the computer to perform incorrectly or not at all.

**Bus:** A set of connection lines between various components of the computer.

**Byte:** A group of eight bits usually treated as a unit. It takes one byte to store a unit of information. For instance the word *love* requires four bytes.

**CAI:** Computer-Aided Instruction.

**Canned software:** One or more programs that are ready to run as is.

**Cartridge:** A plastic box that contains ROM software such as games. Commodore also puts extra memory onto cartridges. These cartridges come in three sizes 3K, 6K, or 16K.

**Cassette:** A small plastic cartridge that has magnetic tape inside. It has two reels. The tape on one reel is wound onto the other reel. Computer programs can be stored on a standard audio cassette.

**Cassette drive:** A standard tape recorder used to save (record) or load (retrieve) computer information.

**Cathode Ray Tube (CRT):** The picture tube of a television set or monitor. It is used to display computer output.

**Central processing unit (CPU):** This is the heart of the

computer. It contains the circuits that control the execution of instructions.

*Chip*: A formed flake of silicon or other semiconductor material containing an integrated circuit.

*Circuit*: The complete path of an electric current. A computer circuit may have thousands of different elements, e.g., transistors, diodes, resistors, etc.

*Circuit board*: A plastic board that has hundreds or even thousands of different circuits.

*Clock*: An electronic circuit in a computer that is the source of timing and synchronizing signals.

*Code*: A system of symbols and rules for representing, transmitting and storing information.

*Coding*: The design of a computer program.

*Command*: An instruction that tells the computer to perform an operation immediately. The command *RUN*, for instance, tells the computer to begin executing a program immediately.

*Compiler*: A computer program that translates high-level language statements into machine language.

*Computer-Aided Instruction*: The process of teaching by computer. This is a system of individualized instruction that uses a computer program as the learning medium.

*Console*: The keyboard and other devices that make up the control unit of a computer.

*Control character*: A special character that is produced when the computer's control key and another key are pressed at the same time.

*Control key*: Pushing the computer's control key in conjunction with another key causes the computer to perform special functions.

*Controller*: A device that can be attached directly to the computer or to an external mechanical device so

that images on the screen can be moved around. A joystick is a controller.

**CPU:** Central Processing Unit.

**CRT:** Cathode Ray Tube

**Cursor:** The little flashing square on the CRT that indicates where the next character will be displayed. Normally the VIC 20 cursor is light blue displayed on a dark blue background. However, the color of the cursor can be changed. If you press the control key and a number key at the same time, the color of the cursor changes. For instance, control plus 8 is yellow.

**Daisy wheel printer:** A printing machine whose print head has a number (usually 96) of radial arms or petals. Each petal has a type character on the end. Daisy wheel type is equal to or better than most typewriter type.

**Data:** All items of information a computer can process or generate—numbers, letters, symbols, facts, statements, etc.

**Data base:** The entire collection of data in a computer system that can be accessed at one time.

**Data base management system:** A program that organizes data in a computer's data storage (disks, etc.) so that several, or all, programs can have access to virtually any item, and yet a particular item need be keyed into the computer system only once.

**Data processing:** The process of converting data into machine readable form so the computer can work on it.

**Data transmission rate:** Baud rate

**Datasette:** See cassette drive.

**Debug:** To eliminate errors in a computer program or a computer.

**Decimal number system:** This is the number system you are familiar with, i.e., 0–9

*Default:* See default value.

*Default value:* An assigned quantity for a device or program that is set by the manufacturer. For instance, a printer may have a default value that tells it to print everything in elite type. A default value in a program is usually the most common or safest answer. As another example, a word processing program may ask if you want to clear everything in memory. The safest answer is no, since it doesn't cause any harm if you hit the wrong key. In this example the program would have a default value of no.

*Desktop computer:* A complete computer system designed to fit on a desktop. The VIC 20 is a desktop computer.

*Device:* Any piece of computer equipment.

*Digital:* A system that uses the numbers 0 and 1 to represent variables involved in calculation. This means that information can be represented by a series of offs (0) or ons (1). See bit.

*Digital computer:* A computer that uses a series of electronic offs and ons to represent information. These offs and ons are converted to (or from) binary numbers. The VIC 20 is a digital computer.

*Directory:* A list of all the files on a diskette.

*Disc:* Disk

*Disk:* A piece of flat rotating circular mylar that is coated with magnetic material. It is used to store computer information. See also diskette.

*Diskette:* A flexible disk that is 5¼ inches in diameter (about the size of a 45 RPM record). It is the most common mass storage device. The VIC 20 uses diskettes as the primary means for mass storage.

*Disk drive:* An electromechanical device that stores on or recalls information from a disk. The VIC 20 has

a 5¼-inch disk drive called the Commodore VIC 1541.

*Disk file:* An organized collection of data stored on a disk.

*Disk operating system:* An operating system that lets the computer use one or more disk drives. See operating system.

*Documentation:* All of the available information about a particular computer, computer program or set of programs, e.g., how to turn on the computer, how to load programs, etc. For computer programs, the documentation should include such information as what type of computer the program runs on, how much memory is needed, and how to operate the program.

*DOS:* Disk Operating System

*Dot matrix printer:* A printer that forms characters as patterns of dots. The dots lie within a grid of definite dimensions, such as  $5 \times 7$  dots.

*Edit:* To make changes on the screen in data or a program.

*Electronic mail:* Personal or other messages generated on computer and transmitted to another computer at a different location. The computers are connected by phone lines.

*Execute:* To operate a computer program or part of a computer program. The process a computer goes through when it analyzes instructions and acts on them.

*Expression:* A combination of numbers, variables and operators that can be evaluated. The answer must be a single number or variable. For instance,  $2 + 3 = 5$ . It can't equal 7. Other expressions such as  $A + B$ ,  $A - 3$  or  $A/B * 38$  must also have only one answer.

*External memory:* Mass storage.

**Field:** A unit of information that is part of a file. For instance, in the following mailing list file, NAME, ADDRESS, CITY, STATE and ZIP are all fields:

SAMPLE MAILING LIST  
 NAME \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_  
 STATE \_\_\_\_\_  
 ZIP \_\_\_\_\_

In the example above, both the information and title are part of a field. For instance, the field for Joe Jones is this:

NAME Joe Jones

**File:** An organized collection of related records. A payroll file has a complete payroll record for each employee.

**Floppy disk:** Diskette

**Formatting:** The process of electronically organizing a diskette so that information can be stored on it and retrieved from it.

**FORTTRAN:** FORMula TRANslation. A high-level computer language used for mathematical or engineering applications. Here are three lines from a FORTRAN program:

```
40 FORMAT (E14.7)
X = A + B*C/D - E
WRITE (6, 50)X
```

**Function key:** A key that tells the computer to perform a special function. Function keys are programmable. Each key may represent something different in different programs.

**Graphics:** Pictures, line drawings, special characters, etc., that can be displayed on the screen. The VIC 20



has several graphics keys that produce special characters on the screen. See also special character.

*Hard copy:* A copy of the computer's output printed on paper.

*Hardware:* The various physical components of a computer system, i.e., the computer itself, the printer, keyboard and monitor.

*High-level language:* A computer language that uses simple English words to represent computer commands. For instance, the command PRINT "Hello" in BASIC tells the computer to print the word *Hello* on the screen.

*Initialize:* To set a program element or hardware device to an initial quantity (usually zero).

*Input:* To transfer data from the keyboard or a mass storage device into the computer's internal memory.

*Input device:* A device used to enter information into a computer. These are all input devices: keyboard, joystick, disk drive, cassette player.

*Input/Output:* The process of entering data into a computer or taking it out.

*Integrated circuit:* A group of components that form a complete miniaturized electronic circuit. The circuit has a number of transistors plus associated circuits. These components are fabricated together on a single piece of semiconductor material.

*Interactive:* A computer system that responds immediately to user input.

*Interface:* A device that allows other devices to communicate with each other. For instance, the Commodore printer interface connects the computer to your printer.

*Inverse video:* A process that shows dark text on a light background on your screen. Normally light text is shown on a dark background.

*I/O:* Input/Output

**Jack:** A plug socket on a computer.

**Joystick controller:** A two-inch by two-inch black box with a movable plastic stick on the top of it. It is used most often as an input device with computer games.

**K:** When used as a measure of computer memory, K is an abbreviation for kilobyte or kilobytes. It is also an abbreviation for kilo.

**Kilo:** A prefix meaning 1000. In computer jargon it is used as an abbreviation for 1024.

**Kilobyte:** 1024 bytes. Thus 4 kilobytes (abbreviated 4K) of memory is about 4000 bytes of memory. It is exactly 4096 bytes, but 4K is a convenient way to keep track of it. This means that if you have 4K of memory, you have space for 4096 characters, spaces, numbers and symbols in your computer.

**Language:** A means of communicating. The difference between computer language and human language is that a computer language allows humans to communicate with computers. The lowest level of language is machine language; the *pure* language of the computer. Machine language programs use 1's and 0's to represent the offs and ons in the computer. Machine language programs are the most difficult programs to write but they do not have the speed and action limitations of higher-level languages. Assembly language programs are also low-level languages, but they use simple mnemonic statements as commands. High-level languages, such as BASIC, FORTRAN and Logo, use English-like statements to tell the computer what to do. BASIC is the most common language because it is the simplest to use.

**Line number:** A number that defines each line of programming in a high-level language. Each line of the program begins with a line number. The com-

puter executes the program in line number order starting with the lowest number.

**Load:** The process of entering data or programs from an external device, such as a disk drive, into the computer. For instance, if you *load* a program into the computer, it is available for use.

**Logic:** A systematized interconnection of devices in a computer circuit that cause it to perform certain functions.

**Logical operator:** A symbol that tells the computer to make a comparison. These operators include  $>$  (greater than),  $<$  (less than), and  $=$  (equals).

**Logo:** A high-level computer language that is often used by children. An easy-to-learn language, Logo allows colorful, detailed graphics to be drawn on the screen. Sprite graphics and turtle graphics are terms associated with Logo.

**Loop:** A series of programming instructions that repeat. The last instruction in the loop tells the computer to return to the first instruction. Intentional loops have some means of escape built into them. Unintentional loops, caused by programmer error, can only be stopped by pressing the break key or turning the computer off.

**Low-level language:** A computer language at the machine level (a pattern of pure binary coding). It is neither simple nor obvious for a human being to read, understand or use.

**Machine language:** The lowest level language. It is a pattern of ones and zeros that the computer understands. Here are three lines of a machine language program:

```
000,000 333
000,001 000
000,002 346
```

*Mail merging:* A program usually used with word processing that allows you to insert names and addresses into a group of documents. All you have to do is load the names and a sample of the document; everything else is automatic. For instance, suppose you want to send the same letter to 2000 people. Once you have created the mail list and the letter, the computer adds the name and address of the first person to an original copy of the letter. It can also address the person by name at several different places in the letter. It does the same thing for the second person on the list, the third, etc.

*Mainframe computer:* A large, expensive computer generally used for data processing in large corporations, government installations, etc. Originally, the term referred to the extensive array of large rack and panel cabinets that held thousands of vacuum tubes in the early computers.

*Mass storage:* The files of computer data that are stored on media other than the computer's memory. For example, diskettes and cassettes are mass storage devices.

*Matrix printer:* Dot matrix printer

*Mega:* A prefix meaning one million.

*Memory:* The internal hardware in the computer that stores information for further use. The VIC 20 has 64K of memory.

*Menu:* A display shown on the screen that gives you a list of options. You select an option by typing a letter or number and pressing the RETURN key.

*Microcomputer:* A fully operational computer that uses a microprocessor as its CPU. Microcomputers are a new kind of computer. Whereas minicomputers are small-scale versions of large computers, microcomputers are an outgrowth of semiconductor technology. Consequently, some microcomputers have

features not found on either minicomputers or main-frame computers.

*Microprocessor:* A central processing unit contained on a single silicon chip.

*Minicomputer:* A small computer based on large computer technology.

*Minidisk:* Diskette

*Mnemonic:* A technique or symbol designed to aid the human memory. Its most common computer use is in assembly language programming. For instance, it is much easier to remember LDA (an assembly language term) than 004000 072.

*Mnemonic code:* A system of abbreviations designed to replace obscure, complex terms used in preparing assembly language programs.

*Modeling:* A partial simulation of real or possible situations.

*Modem:* A modulating and demodulating device that enables computers to communicate over telephone lines.

*Monitor:* A television or cathode ray tube used to display computer information. In common usage, a monitor usually refers to a special device used exclusively for computer output. It can display a line 80 characters long and has at least 24 lines of text.

*Mylar:* A type of plastic used in the manufacture of floppy disks.

*Nano:* One billionth

*Nanosecond:* One billionth of a second. Modern computers operate in nanoseconds.

*Newing:* This is a special Commodore term for formatting a diskette. See formatting.

*Numeric data:* Data that consists entirely of numbers.

*Operating system:* A set of computer programs devoted to the operation of the computer itself. The oper-

ating system must be present in the computer before applications programs can be loaded or run.

**OS:** Operating system.

**Output:** Information or data transferred from the internal memory of the computer to some external device.

**Output device:** A device used to take information out of a computer. CRTs, mass storage devices (such as disk drives), and printers are all output devices.

**Packaged software:** Canned software.

**Parallel:** The performance of two or more operations or functions simultaneously. For instance, a parallel port accepts all eight bits of a byte at one time. Some printers are connected to the computer via the parallel port.

**Pascal:** A powerful high-level computer language for business and general use. Named for French mathematician and philosopher Blaise Pascal (1623–1662). Here are three lines from a Pascal program:

```
BEGIN
READLN (I, HOURS)
IF I = 1 THEN WORK: = SUN
```

**PC:** Personal computer.

**Peripheral:** Any device that connects to a computer. Printers, joysticks and modems are peripherals.

**Personal computer:** Microcomputer.

**PILOT:** This is an easy-to-learn, high-level language designed for use by novice computer users. Primarily used for educational programs. Here are three lines from a PILOT program:

```
10 T:HI, WHAT IS YOUR NAME?
20 A:?
30 T:WELL,$?
```

**Pixel:** A picture element that is one point on a screen. The size of the pixel depends on the computer graphics mode being used and the resolution capabilities of the screen.

**Port:** The location where Input/Output devices are connected to the computer. For example, a printer may be connected to a computer with a cable at the parallel port. A modem may be connected at the serial port.

**Power supply:** A device, consisting of a transformer and other components, that converts household current (115 or 230 volt) to the voltage used by a computer.

**Powerful:** As used with computers, powerful means that a computer, a device, or a program has a lot of features. Powerful is so *overused* in the computer industry that it really has no meaning.

**PRINT:** A command to the computer that tells it to display something on the screen or print it out on a printer.

**Printer:** A device for producing paper copies (hard copy) of the data output of a computer.

**Program:** An organized group of instructions that tells the computer what to do. The program must be in a language the computer understands.

**Prompt:** A symbol, usually a question mark, appearing on the screen that asks you to enter information.

**QWERTY:** An abbreviation used to indicate a standard typewriter-style keyboard. The first six letters in the third row of a standard keyboard are QWERTY.

**RAM:** Random Access Memory.

**Random Access Memory:** This is the read-write memory available for use in the computer. Through random access the computer can retrieve or send information instantly at any memory address.

**Read:** The act of taking data from a storage device, such as a diskette, and putting it in the computer's memory.

**Read Only Memory:** A random access memory device that contains permanently stored information. The contents of this memory are set during manufacture.

A game cartridge is a Read Only Memory.

**Read/Write Memory:** Computer memory that you can put data into or take data out of at any time.

**Record:** An organized block of data. For instance, the payroll information on one person.

**Resolution:** The number of points (or pixels) you can put on a television screen (or monitor) both vertically and horizontally. High resolution indicates a large number of pixels and, therefore, a sharper display.

**ROM:** Read Only Memory.

**SAVE:** A command that tells the computer to store the contents of memory on some media, such as a diskette or cassette.

**Screen:** A CRT or television screen.

**Semiconductor:** A metal or other material (silicon, for example) with properties between those of conductors and insulators. Its electrical resistance can be changed by electricity, light, or heat.

**Serial:** A group of events that happen one at a time in sequence. For instance, a serial interface reads in a byte one bit at a time. Modems transmit data serially.

**Silicon:** A nonmetallic chemical element resembling carbon. It is used in the manufacture of transistors, solar cells, etc.

**Software:** The programs and data used to control a computer. Software is available in many forms. You can type the program in yourself, for instance, or you can have it transmitted to you over the telephone. You can also get it on cassette, diskette or cartridge.

**Special character:** A character displayed by the computer that is not a letter or a number; a heart, for instance.



The VIC 20 has 31 graphics keys that display special characters. To use the 31 characters shown on the right side of the key, press the proper key and shift at the same time. As an example, if you press the shift key and s key at the same time, a heart is displayed on the screen. To display the 31 special characters on the left side of the keys, press the Commodore key and the proper key at the same time.

*Sprite graphics:* Moving graphics that are produced by the language Logo.

*System:* All of the various hardware components that make the computer usable, e.g., the computer, printer, modem, keyboard, CRT and disk drive or cassette player.

*Text editor:* A computer program that allows you to change or modify the contents of memory. It can modify either data or programs.

*Turtle graphics:* A small, triangular shape that is displayed on the screen when the language Logo is used. The *turtle* shows the direction of lines for graphics. For example, if the instruction is to move north, then the turtle moves toward the top of the screen.

*User friendly:* A computer system or software package that is easy for novice users to use and understand.

*User's manual:* A book or notebook that describes how to use a particular piece of equipment or software. The VIC 20 user's manual shows you how to set up your computer, use the keyboard and hook up external devices.

*Value:* A quantity that can assume any of a given set of values. For instance, assume A is a variable whose value is 1. If you add 3 to it, its value is 4.

*Variable:* A quantity that can assume any of a given set of values. For instance, assume A is a variable whose

value is 1. If you add 3 to it, its value becomes 4.

**Video display:** The screen of your monitor or TV.

**Volatile memory:** As used with computers, volatile means that the memory loses its contents when the computer is turned off. That is, any information in volatile memory is lost when the computer is turned off.

**Word:** A minimum storage element in computer memory and the smallest data element worked on by the CPU. Word sizes vary with the design of the computer, varying from eight bits to 12, 16, 32 or 64 bits.

**Word processing:** A special feature of a computer that allows you to manipulate text. See also text editor.

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