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An astronomer's viewpoint

March/April 1985
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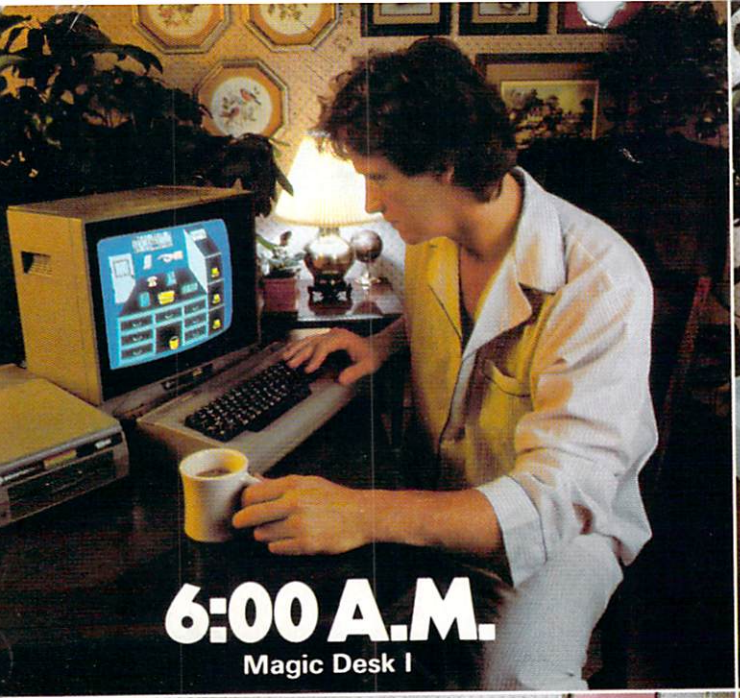

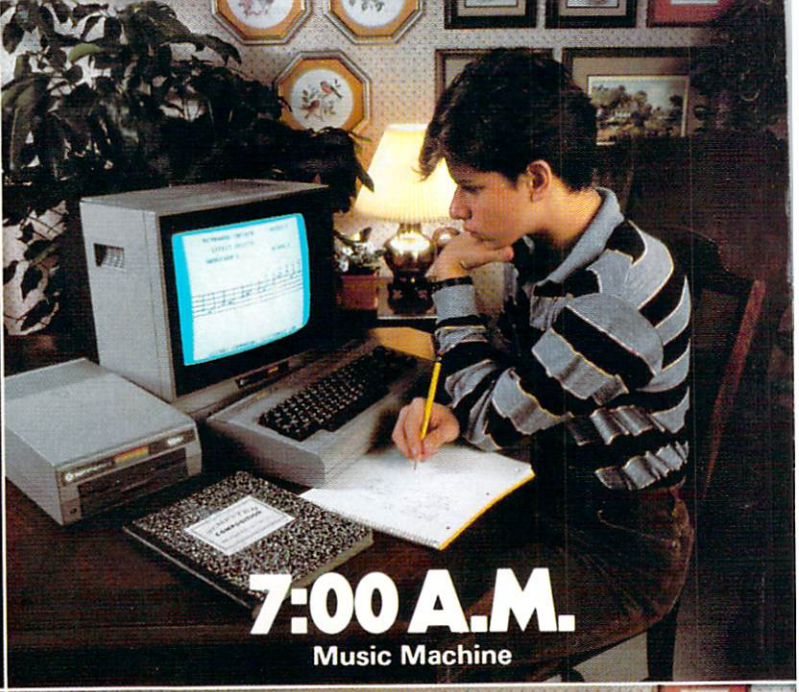

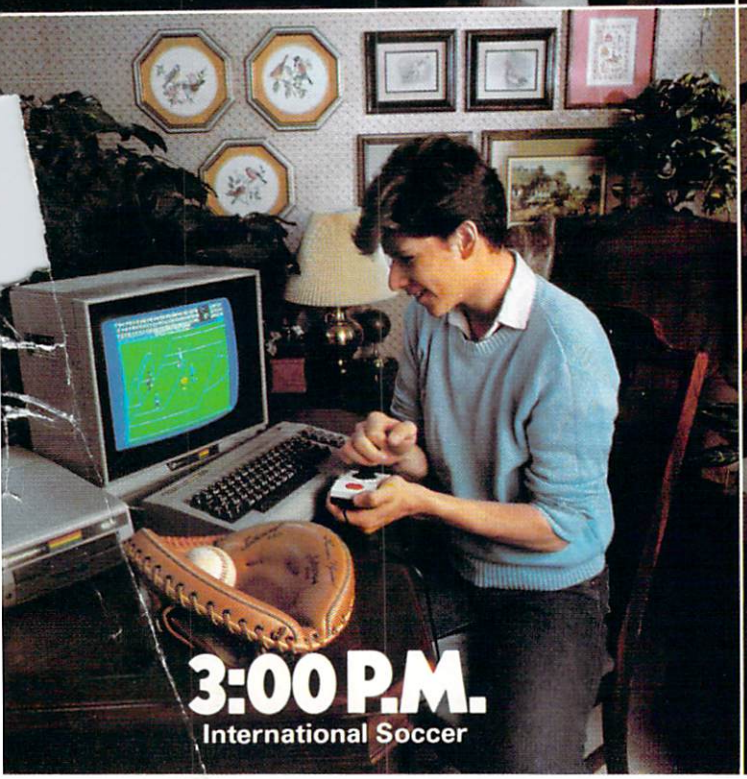

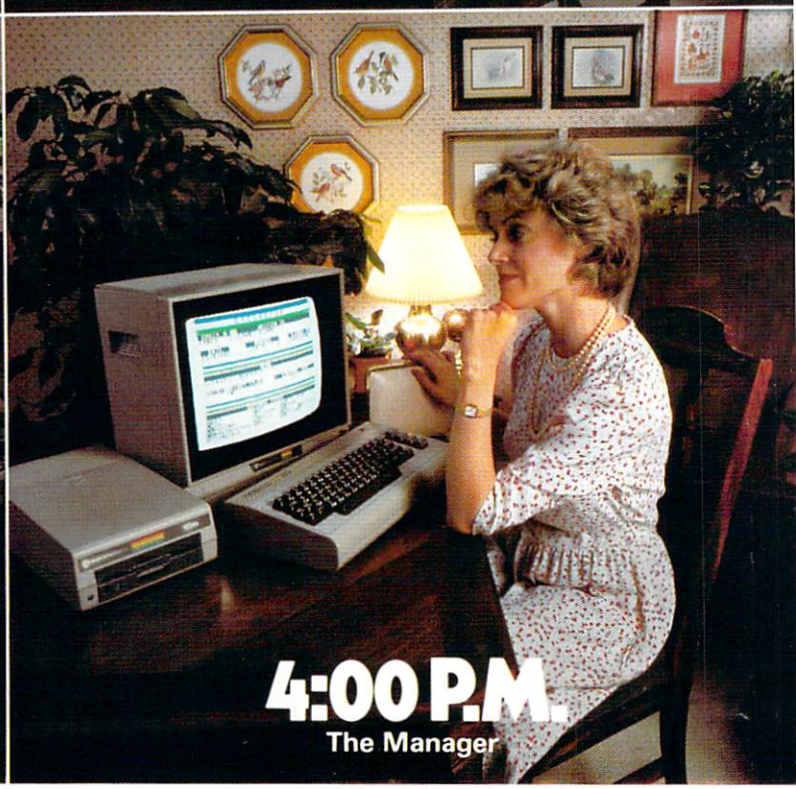

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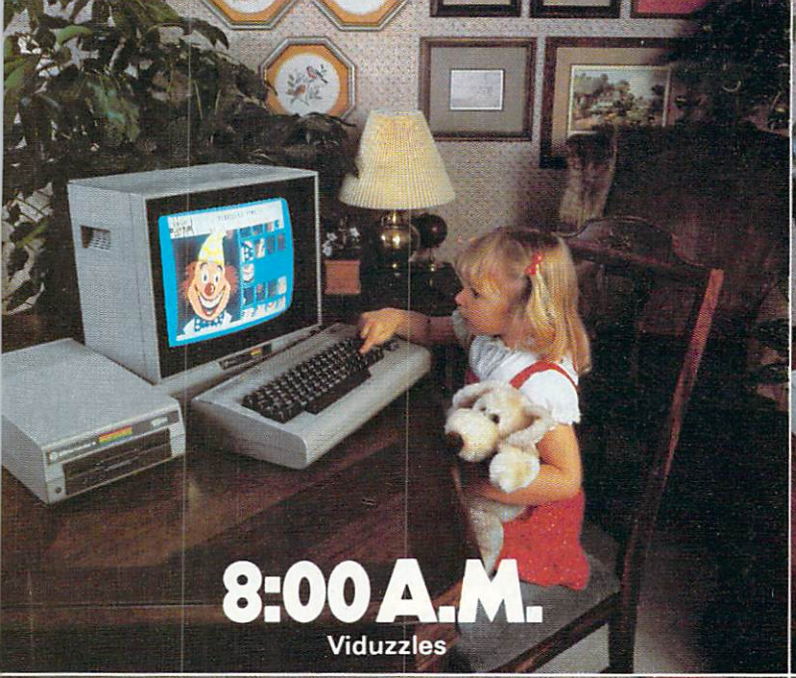

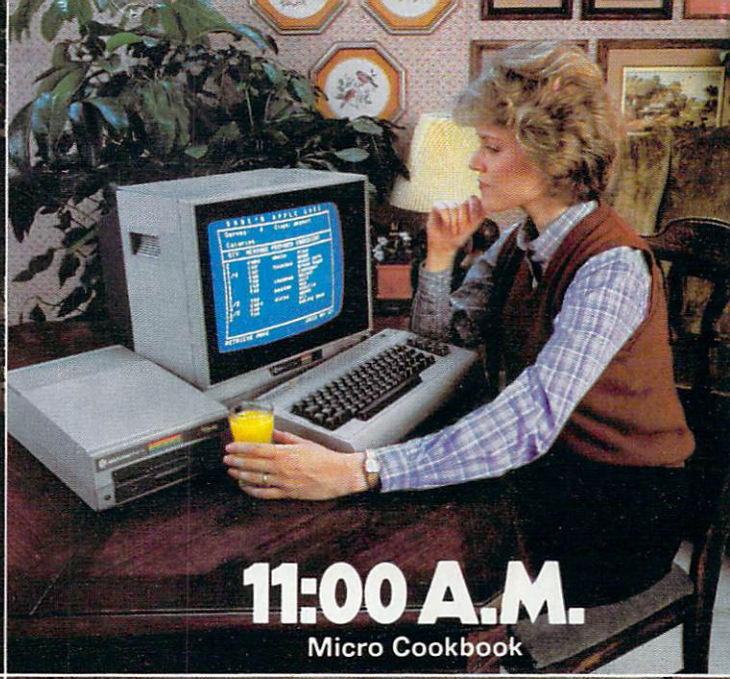

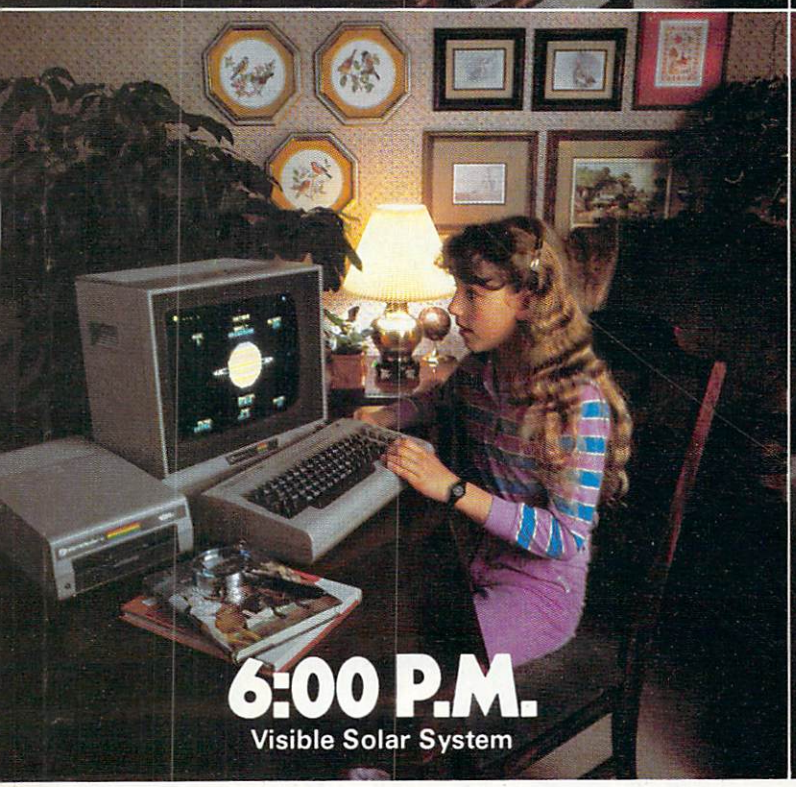

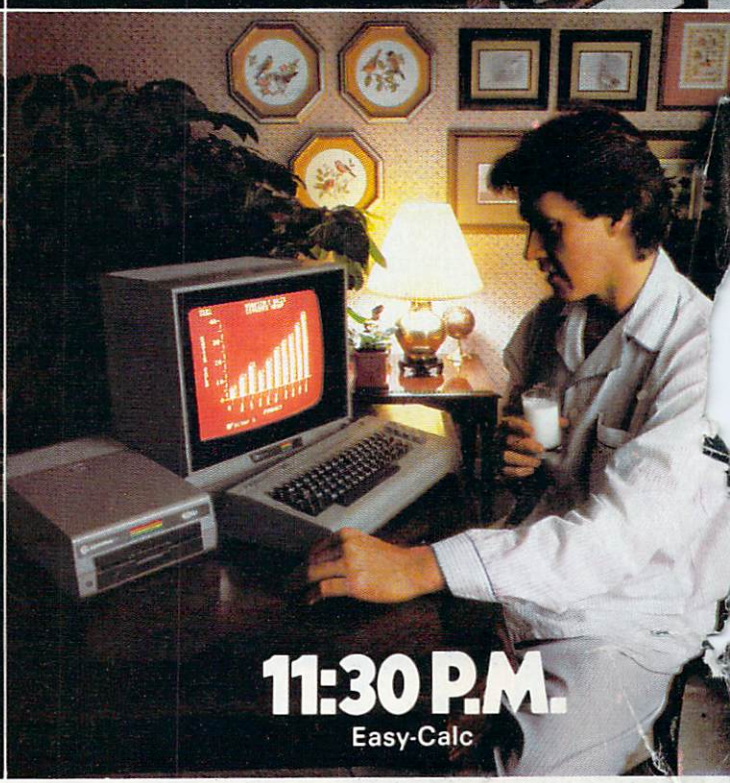

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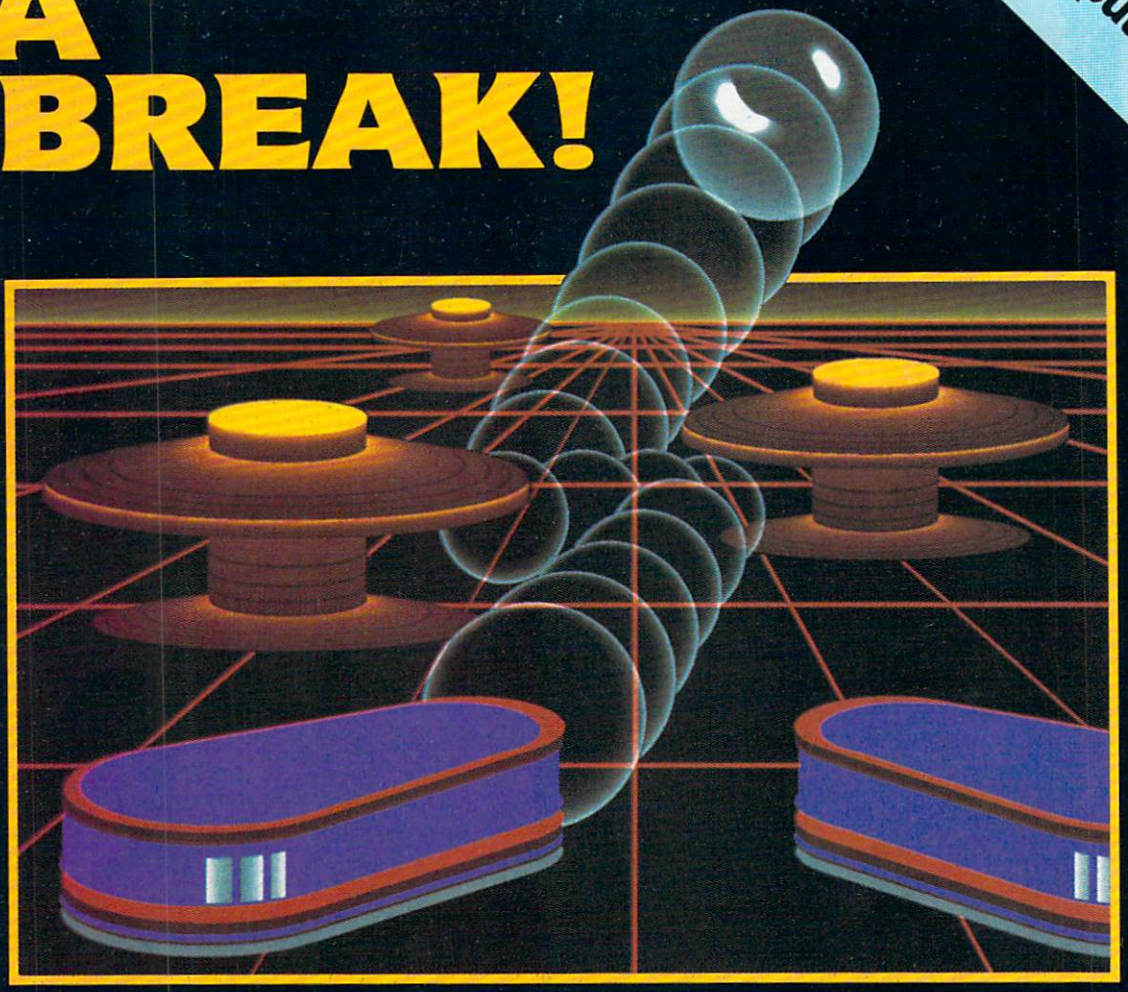

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commodore microcomputers

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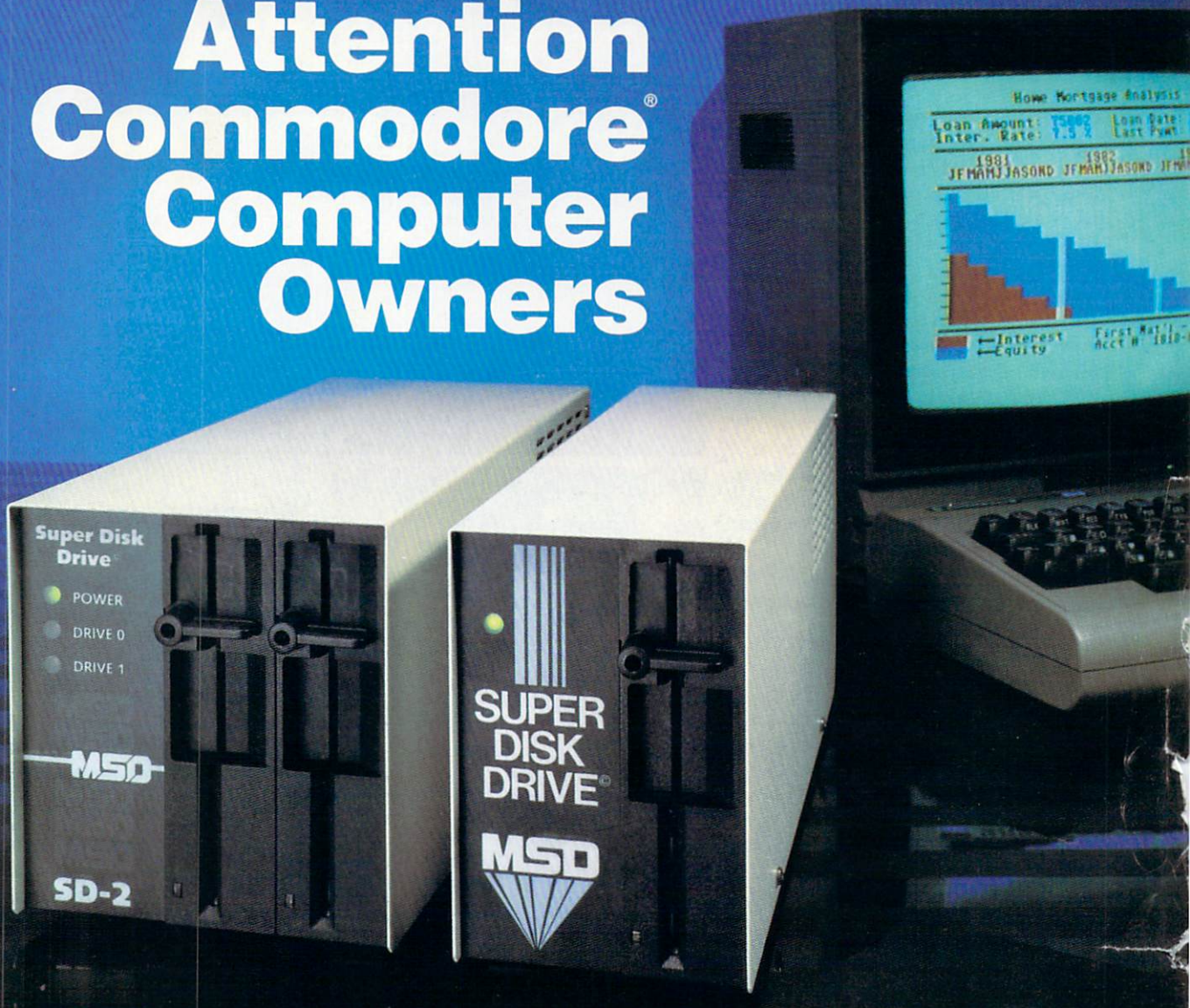

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Disk and DOS Wedge Commands

To the Editor:

I think the "Disk and DOS Wedge Commands" article (Nov/Dec *Commodore Microcomputers)* was long overdue. However, there are several errors in the commands.

First, the long form of the disk commands does NOT have to be used from within a program. To use the DOS wedge commands from within a BASIC program, just use the @ (or >) followed by the DOS wedge commands *within quotes!* For example, to initialize the drive and list the directory, use the following BASIC lines:

```
10 @"i0:":rem initialize the drive
20 @"$"  :rem read the directory
```

Also, the command to change the default drive number requires a # character between the wedge character and the number. So to change to drive nine, type @#9 (or >#9) instead of >9 as stated in the article.

James E. Borden
Carlisle, Pennsylvania

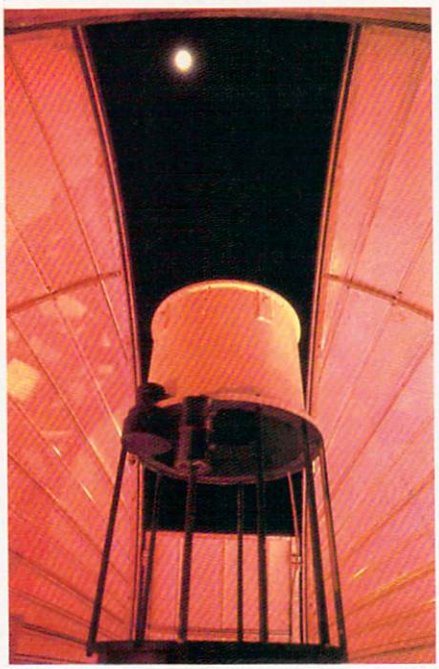
Commodore 64 Sky Watch

To the Editor:

I thought your readers might be interested in our application of Commodore computers. As the photographs show, we use two Commodore PET computers to control the telescope and instrumentation at our Dark Sky Observatory (DSO) in the Blue Ridge mountains of North Carolina.

A PET 4016 controls the motions of the 18-inch diameter telescope by sending pulses to stepper motors mounted on each axis. Thus, we are able to point the telescope and track celestial objects under computer control. A second Commodore, a PET 2001, is used to record data about the object under observation. At DSO, we mainly measure the brightness of variable stars. The brightness is converted to an electrical signal that is read by the PET. The measured star brightness, time and other data are both printed out and stored on disk for later analysis. Both computers share a common disk drive and printer.

It is remarkable that the computer system has worked very well through four winters of subfreezing temperatures (an observatory cannot be heated without degrading its view). This says a lot for the quality of Commodore products!



A second dome under construction will house a 16-inch telescope that will probably be controlled with a Commodore 64. Both telescopes will also be equipped with "smart" stepper motor controllers to remove some of the work now done by the computers. This will allow the computers to take on additional duties such as automatic dome rotation and instrument control. Our ultimate goal is to have the observatory operable via telecommunication—the "dial-up" observatory!

Daniel B. Caton
Assistant Professor
Appalachian State University
Boone, North Carolina

Programming Tip

To the Editor:

PET BASIC does not come with a fraction function. A convenient X-INT(X) does not give neat results either. For example, if X = 123.1111 and we apply X-INT(X) to this number, we shall be returned not with a value of .1111, but a value of .111100018. This disturbing quirk is a result of the way in which Microsoft BASIC handles floating point numbers. The subroutine in Listing 1 gives us a solution to this problem.

Line 30 is for testing purposes only. It simply provides us with a value to use. Your program will have its own way of getting a value to the subroutine. Line 40 converts the number into a string for processing. Lines 50 to 70 evaluate each digit in the number, searching for a decimal point. When one is found, a new string is created, consisting of the original sign of our number, the decimal point and all digits to the right of the decimal point. Line 80 converts this string back to a numeric variable.

If the sign of the number is not important to you, line 60 should be typed as:

```
60 IF MID$(X$,I,1) = "."THEN
    X$ = MID$(X$,I)
```

Listing 1.

```
30 INPUTX
40 X$ = STR$(X)
50 FORI = 1TOLEN(X$)
60 IFMID$(X$,I,1) = "."THENX$
```

Continued on page 8

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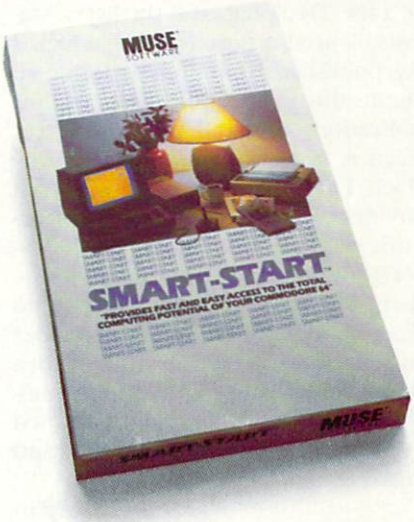

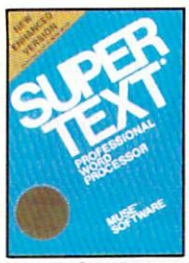

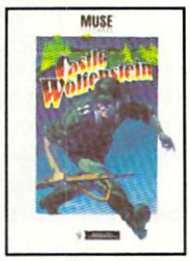

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```
    = MID$(X$,1,1) + MID$(X$,I)
70 NEXT
80 X = VAL(X$)
90 RETURN
```

Ronald Randolph
Philadelphia, Pennsylvania

Editor's Note: This routine requires that X has numbers to the right of the decimal point and that they are not all zeros.

Software Copyrights

To the Editor:

If your readers submitted programs which had been copied from a book or another magazine to you for publication, this would be a violation of copyright.

There are many programs published which contain sections which would be very useful if incorporated into programs which we write. In fact, that is the reason for publishing some programs.

With programs for our own use, I can see no problem with using these subroutines. However, suppose that we eventually decide that our program would be useful or interesting to someone else and would like to submit it for publication. For instance, I wrote a gradebook program which I use a lot. To alphabetize the list of students, I used a sort routine which I saw published. If I should decide to submit this gradebook program for publication, should I reinvent a sort which is as fast as the published one which I've been using? Or should I provide references, like they do in scientific publications? Do I need the author's permission? I happen to know where I saw this routine, but I would guess that many of us use routines without having the slightest idea where we originally saw them published. After all, many of us learned to program by reading books and magazines.

Jack Ryan
El Dorado, Arkansas

Since certain published programs may already be in the public domain—that is, they may not have a copyright—you should first check to see if this is the case. However, if a program you wish to use has an author's copyright notice affixed to it or appears in a copyrighted publication (a copyrighted book or magazine has a copyright notice somewhere near the front, usually in small type), then, yes, you will be violating copyright if you use that program verbatim in any program you intend to sell, trade or give away. However, you may, under the concept of "fair use," reproduce a copyrighted program for your own personal use.

Software copyright law is new, and different legal people draw the line in different places. We try to stay on top of copyright laws and will publish any new information as it comes in to us.

Traveling Abroad with Your Computer

To the Editor:

A few corrections to Matthew Kiell's article (Sept. 84). It reflects my experience of traveling with a Commodore 64, a 1541 disk drive, a 1702 monitor, an Epson FX80 printer and a Kaypro II computer to Israel through New York, Paris and Rome.

X-Ray Scanners and Customs

In the U.S. it is very easy to get a hand inspection at check points in airports. In Paris, however, all items have to be x-rayed for travelers who do not speak French. If you speak French, it is as easy to get a hand inspection as in the U.S.A. I even got two inspections when I went to the wrong corridor.

We found no problems carrying the computers on board the airplanes. Even a Kaypro computer in a padded envelope with the pocket full of manuals fits very well under the seat. What you do with your feet is another story.

In Paris, the customs are apparently very liberal. You may walk through the green "nothing to declare" door with your computer, as we did, and will not be bothered.

In Israel, if you can show that your computer is a company computer, and you intend to take it out of the country within a reasonable time, you must pay only 2% duty + 15% sales tax.

Electricity

In Israel, the current is 220 V 50 cycles, as it is in most parts of Paris. Unlike the description in Kiell's article, we experienced no flickering of the screen because of the difference in the cycles and saw no "migrating line" on the screen. The picture was as stable as in the U.S. However, the clock will not work correctly and if you have a watch program, it will be slow. The clock can be reset to work correctly if you write POKE 56334,129:POKE 56590,128 before the program. I have not found any program where the clock made a difference. In a music program, it does not.

Finally, it should be stressed very strongly that only an isolation transformer be used with "American" computers. I plugged my Epson printer by mistake into a Franzus voltage converter and the result was a burned power card. Luckily, I had the Epson technical manual, so a good electronic repairman could replace the burned components.

For those traveling abroad, it is advisable not only to take some plug converters, but also some American line and wall sockets. And if you intend to use your modem, do not leave home without a U.S. wall telephone socket.

Alexander Burcat
Haifa, Israel

In Defense of the Datassette

To the Editor:

Yes, compared to a disk drive, the datassette is slower in saving, loading and data processing. Also, disk allows random access files whereas only sequential files can be produced on tape. But, the datassette is still handy.

First, a cassette is not as fragile to handle as a disk and, thus, is easier to carry or mail. Unlike a disk, the plastic case housing the tape protects the contents better and will not bend.

Second, the datassette is always ready to use because it does not have to be switched on before executing a save. So, a person who starts experimenting around doing a little programming with no intention of saving it can change his mind without risking wiping out the program by turning on the disk drive.

Finally, programs for sale on cassettes are usually less expensive than on disk. (Of course, whether a cassette version will work on disk is a consideration.) In fact, some "obsolete" cassettes can be had at real bargains.

Therefore, having both a datassette and disk drive increases flexibility in acquiring programs, furnishes an always ready saving device, and provides safer program transportation. C

Rolf L. Miller
Ventura, California

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Vu-Tek eliminates up to 99% of VDT glare.

VDT Anti-Glare Filter

American Hoechst of Camarillo, California, has introduced Vu-Tek, a low-cost contrast enhancement filter that eliminates up to 99% of VDT glare. The need for such a filter is supported by numerous ergonomic studies including a 1981 survey by the National Institute for Occupational Safety and Health Study, which found that 91% of all employees who use VDT's regularly suffer from eyestrain.

The Vu-Tek contrast enhancement filter eliminates VDT glare by combining a circular polarizer with a special anti-reflective optical coating on its front glass panel. Very simply, it acts as a one-way light filter. Vu-Tek also increases character legibility by significantly improving the contrast ratio.

The Vu-Tek contrast enhancement filters are sold in sizes that fit more than 800 popular VDT types.

Commodore Sponsors Education Awards

Commodore recently demonstrated its support of excellence in education by sponsoring two national award programs for educators.

At the 1984 Presidential Awards for Excellence in Science and Mathematics Teaching, held in Washington, D.C., Commodore awarded Commodore 64 systems to 30 outstanding science and math teachers from across the U.S. These teachers were selected on the basis of their superior reputations for teaching excellence and for developing creative methods for improving students' understanding of mathematics or science.

These outstanding math and science teachers received Commodore 64 systems at the 1984 Presidential Awards for Excellence in Science and Mathematics Teaching held in Washington, D.C.

A total of 104 teachers—two from each state, Puerto Rico and the District of Columbia—were recognized at this award ceremony.

In another ceremony in Washington, Commodore sponsored awards for seventeen local school boards from across the nation for their exemplary efforts and leadership in upgrading education in their communities. The recipients of the U.S. Department of Education's Distinguished School Boards Awards were recognized for their work in raising high school graduation requirements, revising curricula to emphasize basic skills and motivating students toward higher academic achievement.

The Honorable Terence H. Bell, U.S. Secretary of Education, confers with Patricia Walkington, Commodore's Director of Education Marketing, at the Distinguished School Boards Awards ceremony sponsored by Commodore in Washington, D.C.

PASCAL

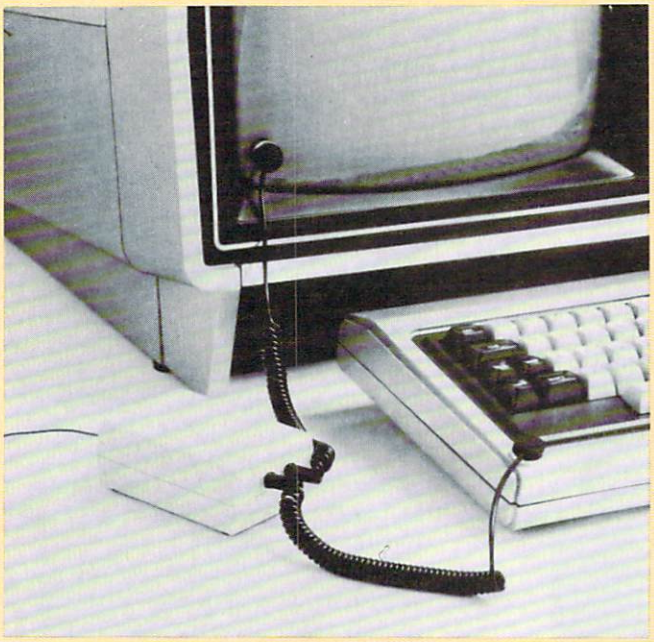
PASCAL-64, publishedf by Abacus Software of Grand Rapids, Michigan, is a full compiler which produces fast 6502 machine code. It supports multiple-dimension character arrays and offers easy string handling, procedures for sequential and relative data management, and the ability to write interrupt routines. Extensions are included for high resolution, sprite graphics and a link to Assem/Mon machine language. Retail price is $39.95.

New Book by Ashton-Tate

The Ashton-Tate Publishing Group of Inglewood, California, has released *Up and Running: Adventures of Software Entrepreneurs* by Charles Sherman, a book based on a series of in-depth and revealing interviews with 35 of the entrepreneurs who have built the microcomputer software industry.

These interviews tell the story of the birth and explosive growth of the industry—the $100 million firms built by visionaries still in their twenties, the mammoth promotional shows, and the success of marketing wizards who transformed a cottage industry into one of the most profitable and revolutionary industries in the country.

Appealing to aspiring software entrepreneurs, computer professionals, and anyone interested in the history of the software industry, this book has a suggested retail price of $15.95.



Static Buster eliminates computer problems caused by static electricity.

Static Buster

The Static Buster, a new anti-static equalizer measuring 2 1/2 by 3 1/2 by 1 1/2 inches and weighing only two ounces, is now available from Advanced Marketing Concepts of Tarzana, California. It eliminates most computer and peripheral problems caused by static electricity, eliminating such things as alteration of memory, head crashes, complete system failure from zapped components, eye strain caused by dust buildup on displays, loss of program or data, erroneous data input/output, and video scramble and wipeout.

The Static Buster installs in minutes and is designed to work with all microprocessors. Specially designed pickups attach to the computer's screen and keyboard or disk drive. A ground wire connects to an electrical outlet, water pipe or grounded building frame. It has no moving parts, no batteries to recharge and is warranteed. It meets all military standards for static decay and is capable of dissipating up to 20,000 volts in as little as two seconds. The Static Buster has a suggested retail price of $49.95.

New Telecommunications Network

Budget Time-Share of Marina del Rey, California, has introduced ECHO (Electronics Communications for the Home and Office), an electronic telecommunications network.

ECHO's electronic mail capacity allows microcomputer users to exchange messages, letters, reports, statistics and other information with anyone who has access to a personal computer (or terminal). ECHO is fully interactive, offering users a chance to talk to each other one-to-one or in conference, or through user group bulletin boards.

ECHO is also a research tool because it allows users to tap into the superior memory and calculating capacity of a mainframe computer. ECHO users can access many common data bases or create their own pool of information.

In the future, ECHO will have features such as an electronic employment listing service, classified advertising and electronic shopping. ECHO can be accessed immediately in over 500 cities on Budget's existing communications lines.

ECHO doesn't charge an initial registration fee and the user is not charged until he or she actually accesses the system. Also, there is no monthly minimum charge and the actual connect charges can be significantly lower than those of other electronic communications services.

INDUSTRY NEWS

Equipment Life Expander

Cool It, manufactured by Proto PC of St. Paul, Minnesota, consists of a low-noise fan, replaceable filter and an RVA mounting system, which works on any vented equipment. Cool It requires no tools or technical skills to install. It increases the life of electronic equipment, computers, disk drives, stereos and VCR's by lowering the internal temperature and keeping dust out. The Cool It fan retails for $39.95 and comes in black, beige, grey and white. A five-pack of filters retails for $4.99.

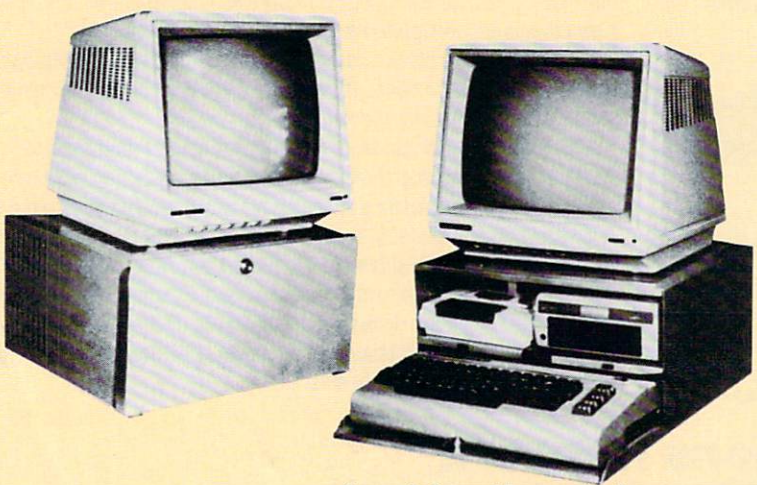
Cool It helps increase the life of electronic equipment.

Chess Software

Marshall Software of Marshalltown, Indiana, has released *Chess, Volume 1: American Triumph* for the Commodore 64. The game is targeted at both novice and experienced players. The player can learn to think like Bobby Fisher by using the first three modes, where points are awarded for correct move choices. The fourth mode, Electronic Chess Set, allows two players to play a game with or without a digital clock and to store the game on disk. This mode is also useful for tournament and postal chess players, who keep a record of each of their games. Stored games can, of course, be studied using the first three modes. Game notes included in the manual were compiled by a national chess master.

Marshall Software will also soon release *Best of Chess, Volume 2: Soviet Duel* for the 64, which will contain select games played by Soviet Grand Masters Karpov and Kasparov and will chronicle their battle for the World Championship currently underway (100 games in total).

Suggested retail price is $34.95.



Compu-Safe provides security for your computer system.

Computer Security

Omni Tech Corporation of Brookfield, Wisconsin, has released Compu-Safe, a security cabinet that will physically secure the component parts of your computer system from theft, tampering and unauthorized use.

Compu-Safe will house either the disk drive or tape cassette drive. The front opens downward and becomes a shelf for the keyboard when in use. When not in use, the 64 or VIC slides under the disk drive shelf. The monitor fastens to the top of the unit. Suggested retail price is $145.00.

Communications System for Traveler

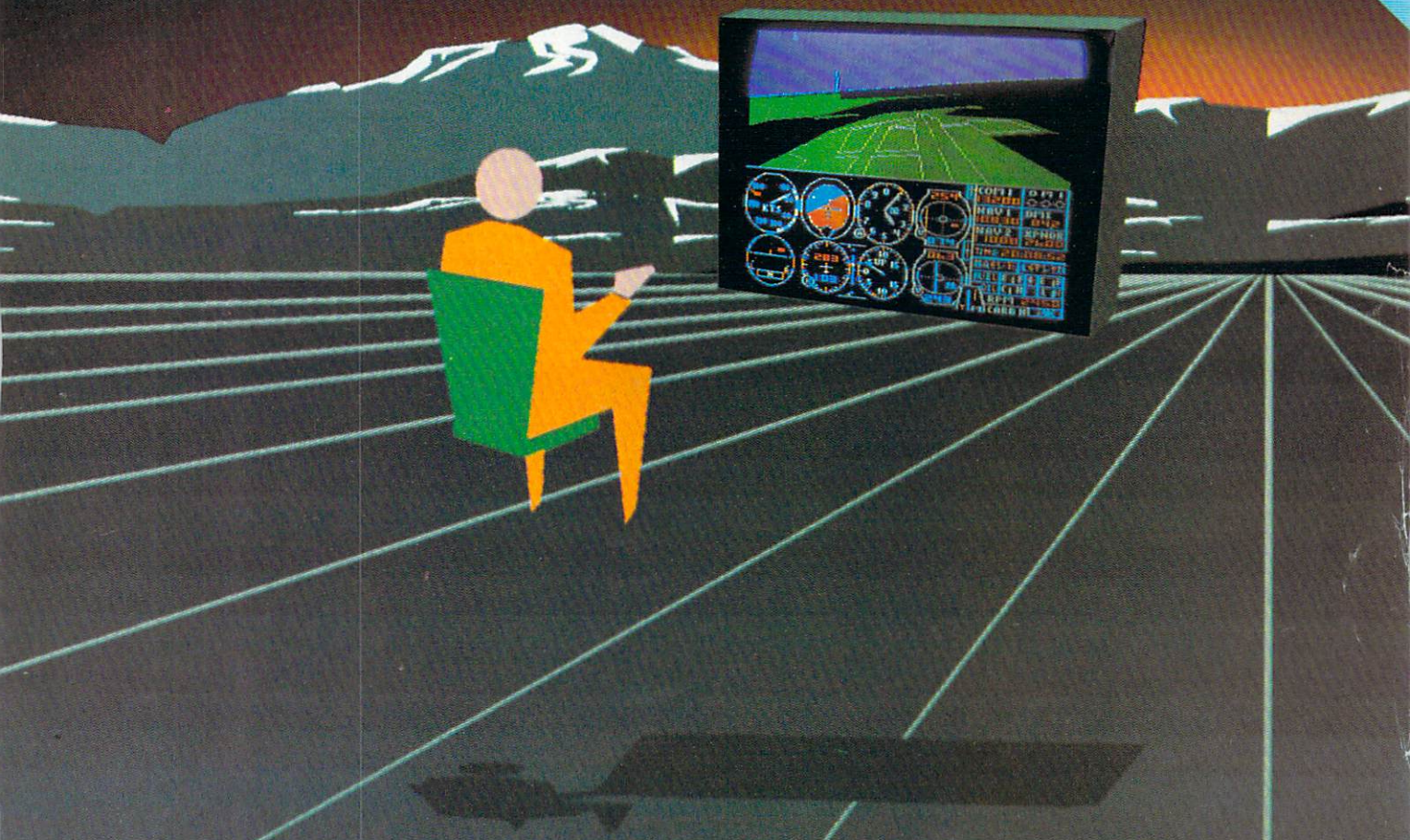
OEMI (Original Electronic Mailbox, Inc.) of Minneapolis, has announced a new communication system designed for the business traveler. The system, known as Pegasus, provides an instantaneous communications link to all major U.S. cities.

With an access card, similar to a credit card, the business traveler will have several communications services, including voice messaging, facsimile copying, teleprinting, two-hour and four-hour electronic courier-delivered mail and various other telecommunications services at his or her fingertips.

The Pegasus work station consists of three system components: a telephone, a facsimile machine and a teleprinter. Pegasus work stations will be found nationwide in hotels and motels, convention centers, airports and wherever there is a need for instantaneous business communication. The work stations are also available to hosts on a rental basis.

Flight Simulator II

For Commodore 64™ Computers



Put yourself in the pilot's seat of a Piper 181 Cherokee Archer for an awe-inspiring flight over realistic scenery from New York to Los Angeles. High speed color-filled 3D graphics will give you a beautiful panoramic view as you practice takeoffs, landings, and aerobatics. Complete documentation will get you airborne quickly even if you've never flown before. When you think you're ready, you can play the World War I Ace aerial battle game. Flight Simulator II features include ■ animated color 3D graphics ■ day, dusk, and night flying modes ■ over 80 airports in four scenery areas: New York, Chicago, Los Angeles, Seattle, with additional scenery areas available ■ user-variable weather, from clear blue skies to grey cloudy conditions ■ complete flight instrumentation ■ VOR, ILS, ADF, and DME radio equipped ■ navigation facilities and course plotting ■ World War I Ace aerial battle game ■ complete information manual and flight handbook.

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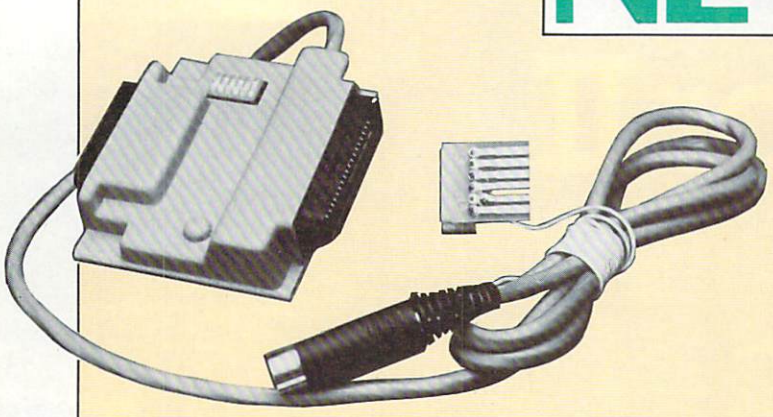
Circle Reader Service No. 36

INDUSTRY NEWS



Cardco's Card/?PS can be used with any standard parallel or serial printer.

Universal Parallel/Serial Printer Interface

The Card/?PS by Cardco of Wichita, Kansas, is a universal parallel/serial printer interface for the Commodore 64 and VIC 20 that may be used with any standard parallel or serial printer. This interface plugs into the serial bus port on the rear of your computer or disk drive, and won't tie up your modem or expansion port. The Card/?PS plugs into the same place as a Commodore printer would and you won't need any special "software driver programs" because this printer interface uses standard Commodore print format.

The Card/?PS is able to work with any standard serial input printer capable of accepting data at 300/1200 baud. There is also an optional conversion of non-standard CBM ASCII with optional automatic line feed function. Functions can be switch-selected or software-controlled and no modifications are necessary to your computer or to your printer.

Investment and Statistics

Programmed Press of Elmont, New York, has introduced its Investment and Statistical Software package for the Commodore 64. The package contains 50 programs for statistical forecasting, stocks, bonds, options, futures and foreign exchange. The 220-page *Computer-Assisted Investment Handbook* by Dr. Albert Bookbinder, lists, explains and gives sample illustrations of all 50 BASIC programs for profitable planning and forecasting. The software retails for $100.00 and the handbook, sold separately retails for $19.95.

New Trivia Game for the 64

Suncom of Wheeling, Illinois, has released *PQ—The Party Quiz Game* for the Commodore 64. The *Party Quiz Game* is the only computer trivia game that features hand-held controllers which allow players to bypass the computer keyboard and interact directly with the computer itself. This is significant not only because the controllers add suspense, but because they make the computer a truly social machine.

Exercise your intellect with Suncom's trivia.

Plea for Software Author

The Toronto PET User Group has come to the aid of a young software author whose program was pirated. The program, which backs up a full 1541 disk in three to four minutes, has been circulated under the names *Fast Copy, Fast Backup, S-Backup* and several others. According to Commodore expert Jim Butterfield, an adamant opponent of software piracy, the copyrighted program was, mistakenly or otherwise, released to the public domain worldwide. As a result, the West German author, Thomas Templemann, has been denied income on the program, which reportedly has been copied about 10,000 times.

In a recent article for TPUG magazine, the Toronto user group's monthly publication, the group's assistant business manager, Doris Bradley, issued a plea on behalf of Templemann to all users who have received the program through the public domain. Bradley requested that anyone who has a copy of the program send a $5.00 check payable to the Toronto PET User Group to acknowledge Templemann's contribution to Commodore programming. The group's address is 1912-A Avenue Road, Suite #1, Toronto, Ontario, Canada M5M 4A1. The group will convert the money into marks and forward it to Templemann in Germany, Bradley said. C

More news on page 124

To teach your child to spell, we had to design software that talks.

Cave of the Word Wizard.™ A unique way to develop spelling skills using human speech and arcade action.

Software that tries to teach spelling by jumbled letters isn't a very good teacher. The software has to talk. Now it does. Only on *Cave of the Word Wizard* from Timeworks.

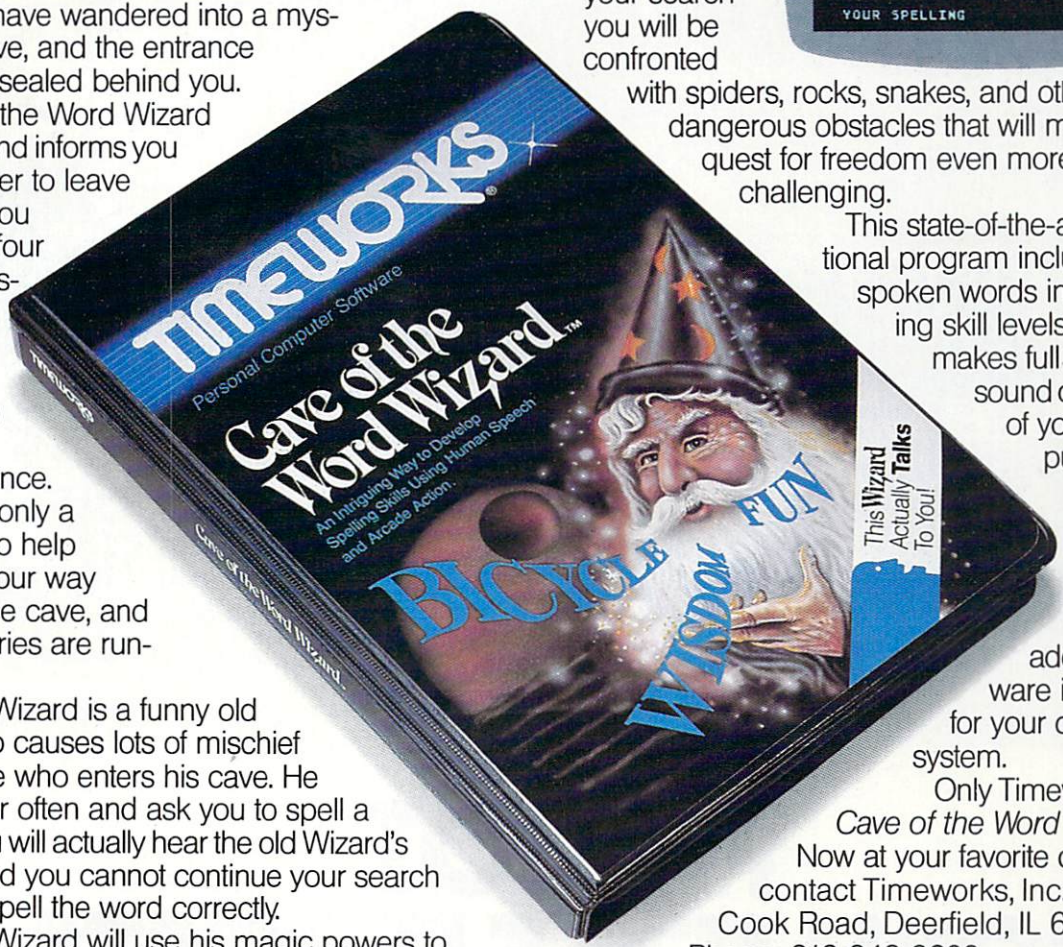
The Wizard talks like a human being, not like a robot. This fascinating character thrusts you into an intriguing adventure as he teaches spelling in the most effective way possible on a computer.

You have wandered into a mysterious cave, and the entrance has been sealed behind you. Suddenly the Word Wizard appears and informs you that in order to leave his cave you must find four magic crystals which have the power needed to open the cave entrance. You have only a flashlight to help you find your way through the cave, and your batteries are running low.

The Wizard is a funny old fellow who causes lots of mischief for anyone who enters his cave. He will appear often and ask you to spell a word—you will actually hear the old Wizard's voice!—and you cannot continue your search until you spell the word correctly.

The Wizard will use his magic powers to replenish the energy in your flashlight if you spell the word correctly, but each time you are wrong he will draw energy from your light. When your flashlight runs out of energy you will be doomed to roam through the cave in darkness forever.

During your search you will be confronted with spiders, rocks, snakes, and other dangerous obstacles that will make your quest for freedom even more challenging.



This state-of-the-art educational program includes 500 spoken words in 10 spelling skill levels and makes full use of the sound capabilities of your computer. The Wizard will talk to you in clear human speech. No additional hardware is needed for your computer system.

Only Timeworks offers *Cave of the Word Wizard.* Now at your favorite dealer. Or contact Timeworks, Inc., 444 Lake Cook Road, Deerfield, IL 60015. Phone: 312-948-9200.

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COMMODORE 64

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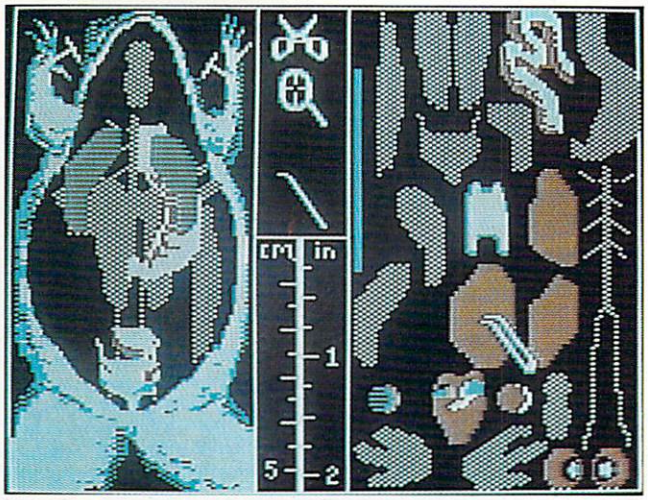
REVIEWED BY DAN GUTMAN

Operation Frog

Computer: Commodore 64
Publisher: Scholastic Software
730 Broadway
New York, NY 10003
Medium: Disk



OpFrog *won't let you just hack your frog to pieces and stand back to admire your handiwork. You've got to follow the rules of traditional dissection.*

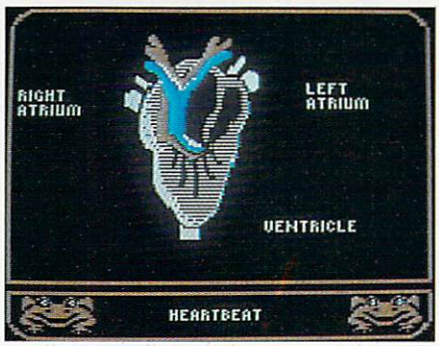
Remember when you got grossed-out dissecting that frog in biology class? Remember when somebody in your class then took the remains of the frog and put them in your sandwich? Well, those good old days are gone, now that Scholastic Software has released what may be the most outrageous educational program of the year—*Operation Frog.*

OpFrog as they call it at Scholastic, is an on-screen simulation of the dissection of *Rana catesbiana*—an American bullfrog. Though *OpFrog* isn't as gory as a *real* dissection, the programmers worked closely with biologists to simulate an actual dissection and make it into a computerized learning experience for children nine years of age and older.

OpFrog won't let you just hack your frog to pieces and stand back to admire your handiwork. You've got to follow the rules of traditional dissection. Four tools are provided—surgical scissors, a probe, forceps and a magnifying glass. To remove and examine any organ, you must first probe it, snip it with the scissors, drag it over the examination tray, and hold the magnifying glass over it. As with a real frog, the organs are arranged in three levels. The heart, liver, spleen and 22 other organs can be removed only in a certain order.

The screen is set up much like *Pinball Construction Set.* The sliced-open frog and the examination tray each take up half the screen. A small hand is manipulated with the joystick or keyboard to pick up tools and drag organs from one side to the other.

As wacky as it sounds, *OpFrog* is undeniably educational. After you place an organ on the tray, a flip of the disk and a tap on RETURN takes you to the "Frog File." A close-up of the organ appears, along with a screen or two of text explaining how it works.



In the case of the heart, you even get a simple animation showing how it beats. Fortunately, we're spared from seeing an animation of the digestive system, which would probably turn our stomachs as well as the frog's.

Actually, *OpFrog* may be *more* educational than a real dissection. This computerized operation gives a child the power to do something no scientist has ever done—bring the patient back to life. After you take out the frog's innards, you can put it back together again! Simply drag the body parts back to their correct places in the opposite order of how they were removed. Then comes the best part of the show—Froggy leaps off the table and does a little dance with a top hat and cane! You even receive points based on how skillfully you reconstructed him. You can recycle your frog and chop him up again another day. You can even stop your operation in the middle and save it on disk.

In all fairness, *OpFrog* doesn't make the dissections we know and love obsolete. You don't get to physically slice the frog open—the computer does that automatically. And there are just too many body parts to display on the screen. *OpFrog* shows the main organs, just one muscle, and no bones at all. But boneless frogs are better than none at all, right?

I have just a few quibbles with the Commodore 64 version of *OpFrog.* In a program like this, graphics are important. If an organ isn't clearly defined, you're not learning anything. It's very difficult to show roundness, shading, and detail of small objects on a computer screen. Some organs in this program, like the spleen and gall bladder, could just as easily pass for marbles. Also, *OpFrog* doesn't take advantage of the sound chip. There is no music at all in the program.

I felt Scholastic could have gone a little further with the organ descriptions. Instead of, "The eye is a special sense organ. Other sense organs include the ears and nasal sacs (nose)," I think the kids could have handled something more interesting. A simple explanation of how receptors in the frog's eye perceive a dark blur as a fly and how they send that information to the brain to activate the tongue would have been intriguing.

Despite these shortcomings, *Operation Frog* is a breakthrough program. It's cute, educational, fun, includes a help screen and excellent documentation. Most important, it takes advantage of the computer's ability to simulate a real life experience, and allows a child to do something that can't even be done in real life. That's what computers are for. C

PlayNET announces 19 exciting ways to bring people together.

Now there's a Home Computer Network that lets you communicate with all kinds of people—all over the country! Make new friends, play exciting games, barter—shop—trade, all from the comfort of your home.

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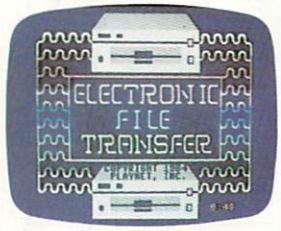

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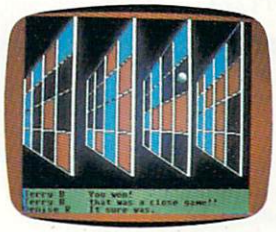

- Backgammon
- Boxes
- Capture the Flag
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REVIEWED BY CHERYL PETERSON

Cave of the Word Wizard

Computer: Commodore 64
Publisher: Timeworks
444 Lake Cook Road
Deerfield, IL 60015
Medium: Disk

Cave of the Word Wizard is a spelling tutorial game with a very distinctive feature: it talks without an interface or other hardware. The sound quality isn't perfect, but it is intelligible. Most of the words are understandable, but just in case, the program includes a repeat function so the player can listen to each word as many times as necessary.

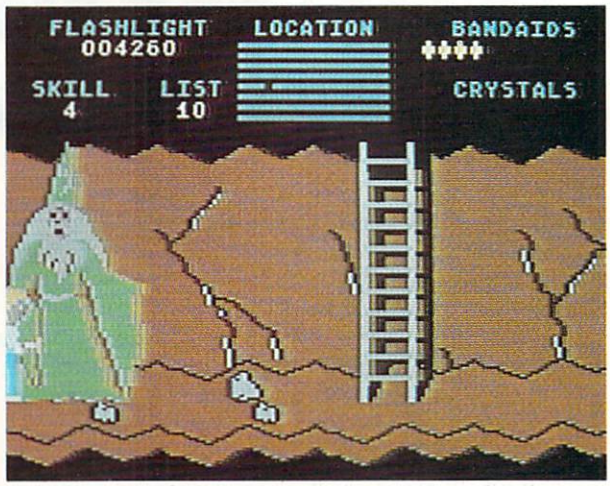
The program has four game skill levels and ten spelling skill levels varying in difficulty from beginner to advanced (ages six through adult). These have 46–50 words each and are provided in the manual so they can be studied before playing the game. A joystick is required to play.

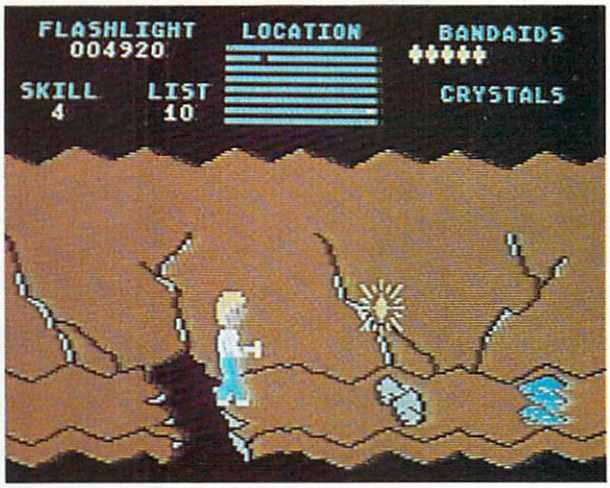
As the name implies, this program has a wizard who inhabits a cave. You, the intrepid explorer, must search the cave to find the four magic crystals hidden therein. A flashlight with rechargeable batteries is provided. Finding all the crystals and returning to the entrance wins the game. Although it sounds simple enough, there are complications along the way.

The scorpions, spiders and snakes that inhabit the cave are dangerous. Not so dangerous that a little Bandaid can't help it, but only five Bandaids are provided for the whole trip. The cave has pits, rocks and underground creeks as well. The latter two must be jumped to avoid injury. Descending to the lower of the cave's eight levels is accomplished by jumping into the pits. Ladders are provided to get back out, but they aren't always conveniently located.

The wizard himself is the biggest obstacle. Every time he pops in, he pronounces a word to be spelled. To continue exploring, the word's correct spelling must be entered on the keyboard. If the word is spelled right, the wizard says something encouraging and rewards the player with either a Bandaid or some energy for the flashlight. If it is spelled incorrectly, the wizard gives the correct spelling, steals some of the flashlight's energy and waits for the correct spelling to be entered.

The wizard himself is the biggest obstacle. Every time he pops in, he pronounces a word to be spelled. To continue exploring, the word's correct spelling must be entered on the keyboard.





When the player has exhausted the flashlight's energy, run out of Bandaids, or successfully reached the entrance with all four crystals, the game is over.

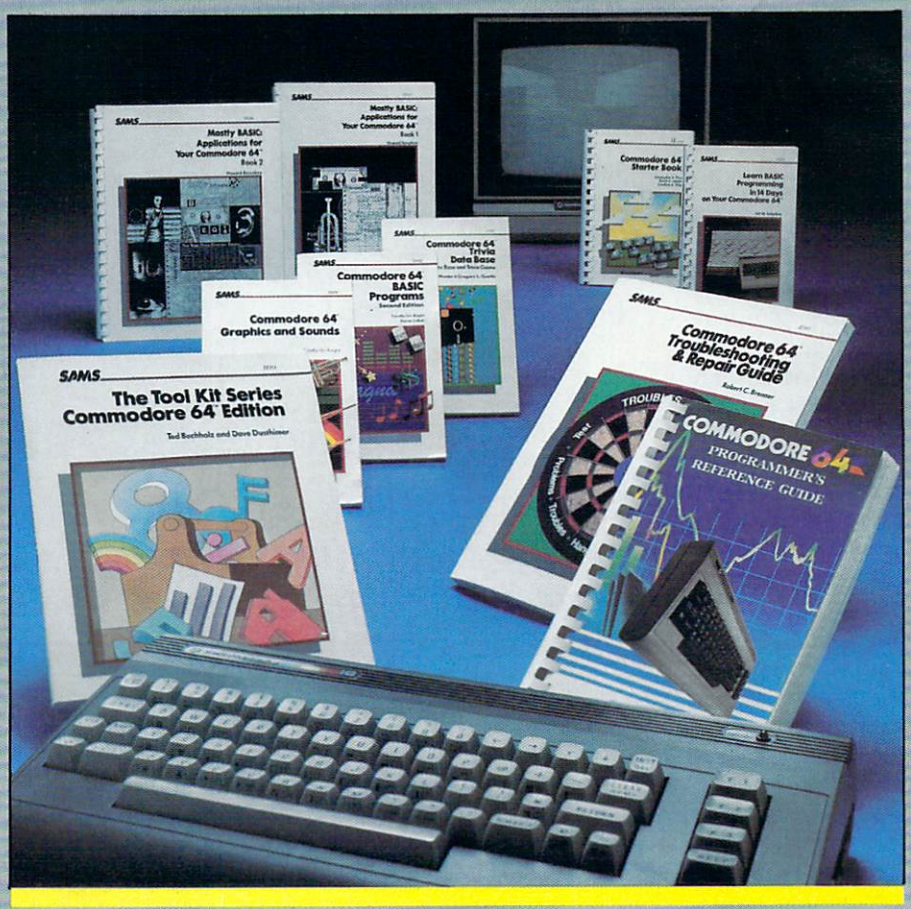
The program has an adequate manual with simple instructions. The diagram showing how to map the cave is a nice touch, as are the helpful hints on how to survive.

The graphics are nice and my only objection is that the screen doesn't actually scroll along with the explorer. Instead, when the edge of the screen is reached, the whole scenario is redrawn. This leaves the player in some doubt as to what will be encountered when he steps "over the edge." The sound effects are also well done. The player's movements, the wizard's appearance, and any creature's approach are all accompanied by sound cues.

All in all, I thought this was a good learning tool. It seemed to be a little more difficult than I would envision for youngsters, though. The combination of jumping over both moving and stationary obstacles, while trying to keep track of where you've searched and where you have left to go, before running out of energy for the flashlight, seemed a bit much. Compound that with spelling the words the wizard throws at you and it becomes almost impossible for younger children to keep up. Fortunately, most of them are good sports and don't expect to "win" anyway. The encouraging words from the wizard might keep them involved for awhile.

For a novelty, this program is a worthwhile purchase. The sound quality of the wizard's pronouncements is decent and the game's scenario is interesting. And youngsters might even improve their spelling! C

Ten Good Reasons To Buy Sams Two New Commodore Books.



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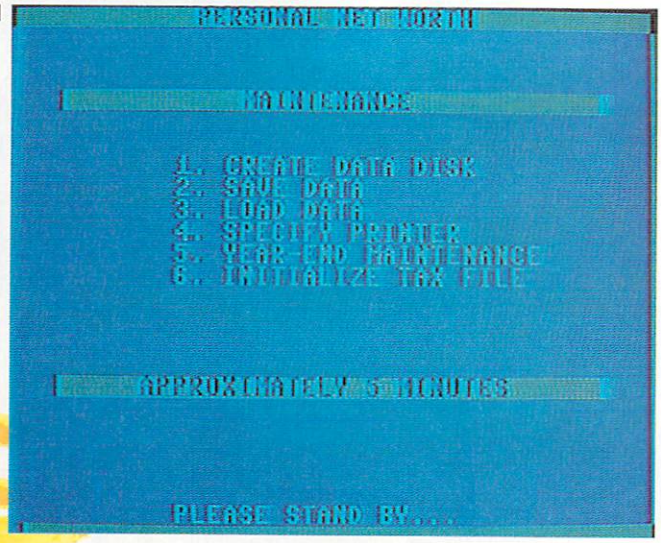
Circle Reader Service No. 12

REVIEWED BY TOM BENFORD

Your Personal Net Worth

Computer: Commodore 64
Publisher: Scarborough Systems
25 N. Broadway
Tarrytown, NY 10591
Medium: Disk



A "bonus" that's included in the package is a specially condensed edition of Sylvia Porter's Money Book for the 80's. *This bestseller is a veritable treasure-trove of information on managing your finances to best advantage.*

No bones about it, this program is about money—from the *genuine* Eisenhower silver dollar on the package to the inclusion of several "model" journals. But that's not all! The package is a functional plastic case that props open like an easel to hold your disks and manual. As if that isn't enough, also included is a condensed version of Sylvia Porter's smash best-seller, the *Money Book for the 80's*!

The manual, a spiral-bound 130-page work, is everything a good manual should be and more: it's clear, concise, logically organized, well laid out and, most important of all, it's *understandable*—it even includes a comprehensive glossary of financial jargon! Starting with necessary background information on money management, the book explains statements of net worth, budgeting, accounting terms, accounting methods, financial modules and guidelines for determining your own personal needs. The successive chapters cover such topics as establishing and modifying accounts, initial entries, charting accounts, general accounting, bank records, reports and different ways to treat transactions.

Users won't be lacking for information with additional chapters covering tax records, personal property, stock portfolios, maintenance and year-end procedures. Essentially, if it has to do with personal finance in any respect, *Your Personal Net Worth* covers it in both the program and the manual.

Right at the beginning of the manual you're advised that the cost of the program and of your equipment may be *tax deductible* in certain cases! (It's a good idea to check with your accountant to make sure that you're eligible to claim this deduction, though.) This is a good example of the kind of useful stuff the manual contains.

The entire program is menu-driven, and each of the money-management categories is replete with its own submenu to further define your application needs. The available main categories provided include making entries, posting entries, accounts, budgets, bank records, reports and account inquiries. The program itself is so easy to use that you probably won't need the manual at all after reading it once.

By using the program, the user can generate a balance sheet showing both assets and liabilities. The difference between the assets and liabilities is your personal net worth. I'd say that's pretty descriptive, wouldn't you?

Several journals are included which will provide you with an excellent set of models for creating your own personal financial picture. They're also invaluable for record-keeping, and the program should make income tax preparation a snap.

A "bonus" that's included in the package is a specially condensed edition of Sylvia Porter's *Money Book for the 80's.* This best-seller is a veritable treasure-trove of information on managing your finances to best advantage, and provides supplemental information to that provided in the manual.

OK, enough for the overview—now for the nitty-gritty of the software. I've been using it for a couple of months now (as of this writing), and it's an absolute dream to use. Two disks are supplied; one contains the actual program, while the other is for holding your data and journals. I am, by nature, a very disorganized person, and my "filing" system is not comprehensible to the average human (my accountant calls it an instant Excedrin headache). While I'll still have to retain my receipts for verification, at least the *data* will be in order for a change, instead of little shards of paper in a shoe box. I'm sure my accountant will be as enthusiastic about the program as I am.

I mentioned a silver dollar at the beginning of this review, so let me explain that now. The disks, manual and book all come attractively packaged inside a clear plastic case. Through the case, you can see the Eisenhower dollar, and as soon as you purchase and open the software, you can collect an instant *rebate*—see what I mean about the program being money-oriented?

By getting a clear picture of how you look in dollars and cents, you'll be able to manage your finances more effectively. I found *Your Personal Net Worth* to be an invaluable asset in charting financial strategies and managing my expenses and income. I recommend it without reservation as being one of the best personal finance packages I've seen to date! C

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COMMODORE

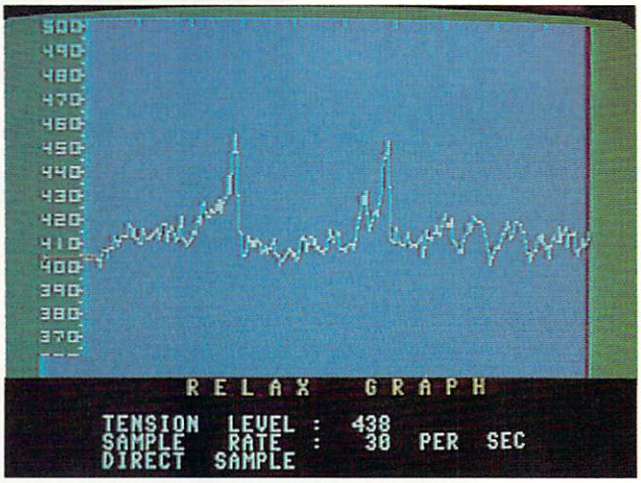
EDUCATIONAL SOFTWARE

REVIEWED BY TIM ONOSKO

Relax

Computer: Commodore 64
Publisher: Synapse Software
5221 Central Avenue
Richmond, CA 94804
Medium: Hardware, Disk

By using the EMG and the software that comes with it, you can learn to relax in the true sense of the word.

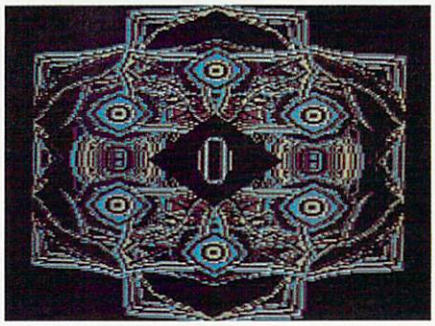


It could be the ultimate computer peripheral: a direct link between the human mind and the "soul" of a computer. Such a man-machine interface has long been a fantastic dream. *Relax* may be far from that dream. Yet, as the first biological interface for computers available to consumers, it will naturally stir speculation. After all, here you are, connected to your computer via a corduroy jogger's headband, and the machine is seemingly reading your mind.

Well, of course, it really isn't. The three metal sensor buttons in the band—which, in turn, are connected to some simple circuitry in a plastic box plugged into the computer's joystick port—are actually detecting minute changes in electrical impulses from facial muscles. This biofeedback technique, called EMG, or electromyograph, is one way to determine human stress. So the *Relax* hardware has less to do with the brain that it does the body's muscle system.

The purpose of the *Relax* package is to guide the user through a course of stress-reduction techniques. By using the EMG and the software that comes with it (in conjunction with a weighty manual), you can learn to relax in the true sense of the word.

At the core of the system is a three-part program. The most elementary portion of the program is a moving graph that resembles a polygraph, or lie detector. Using the graph, you can see levels of muscle tension rise or fall. The changes in these levels are relative, not absolute, and are measured against the rather arbitrary level of tension you bring to the system. This means that those who are fairly tranquil to begin with may have a difficult time making the graph fall very far to reflect their own relaxation. Though Synapse's manual said that first-timers will probably have a difficult time producing dramatic changes in this level, I found that many people I showed the system to could drop the measurement easily with little coaching.



Relax *will naturally stir speculation. After all, here you are connected to your computer via a corduroy jogger's headband and the machine is seemingly reading your mind.*

On the other hand, another portion of the program, which involves a kind of cosmic kaleidoscope that changes colors and shape with the rise and fall of stress levels, left me somewhat baffled. Is it science or art?

Finally, *Relax* includes a game that involves moving a balloon up and down as it drifts across the screen. The object is to avoid pins, which travel from left to right, while trying to pick up objects that move on various levels in the opposite direction. The lower the target object on the screen, the more you must relax, and, hence, the more points are scored. All of the people I showed *Relax* to liked this one best, probably because it was easiest to understand. It's quite eerie, watching a player who is not flipping the knob of a paddle or jiggling a joystick move an object on the screen.

The *Relax* device is actually seen by the computer just like a game controller, specifically a paddle. Only single axis values—between zero and 255 can be read. So don't think of adapting *Relax* to complicated arcade games that involve two-axis joystick control. It can't be done. In the above, for instance, the horizontal movement of the balloon is controlled by the computer.

Central to the *Relax* system is the book, authored by psychologist Martha Davis. A somewhat typical self-help book, it goes into stress evaluation tests, physiological breathing techniques, meditation, self-hypnosis, basic rules of health and nutrition, and even self-assertion. It is a tough 200 pages if you're more fascinated by the computer side of *Relax* or have only a casual interest.

What I didn't like about *Relax* in general, was its intense, trendy "feel." It could be too easily dismissed as a gimmick for the brie and hot tub set. I also didn't like the feeling of being wired directly to the computer.

In all, *Relax* is a good therapeutic tool, if you carefully follow the regimen outlined in Ms. Davis' book. It is a novel and intriguing device; one whose possibilities computer enthusiasts may like to further explore. C

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REVIEWED BY TOM BENFORD

Micro Illustrator

Computer: Commodore 64, Plus/4
Publisher: Commodore Business Machines, Inc.
1200 Wilson Drive
West Chester, PA 19380
Medium: Disk

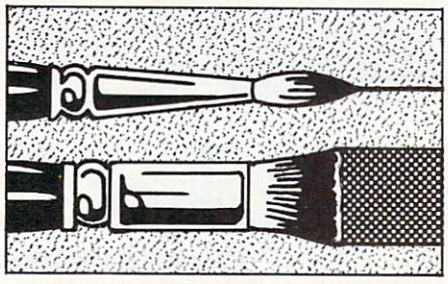
If you've been looking for a drawing/graphics program to let your creative juices flow, then you'll be interested in *Micro Illustrator.* This disk-based program contains versions for both the Commodore 64 and the Plus/4. When used with the 64, it will allow you to use a joystick *or* lightpen, whereas the Plus/4 version utilizes the joystick only. Both versions contain a multitude of useful features for creating beautiful *objets d'art* on your Commodore computer.

Ten different brush strokes are available and a palette containing 16 colors is provided. Additionally, you may choose solid, transparent or non-transparent effects from the palette. By mixing solids and non-transparent shadings, many impressive effects are possible. The transparent shading effects allow you to overlay one color on top of another (useful for creating more effects). Also included are several special effects, including draw, point, line, lines, rays, fill, frame, box, circle, disc, erase, storage, mirror, magnify and copy. Beautiful designs can be created by combining certain effects. For instance, the "rays" effect used with the "mirror" effect produces kaleidoscopic designs and if you vary the colors, absolutely breathtaking creations are possible. *Micro Illustrator* is a superlative graphics and drawing program.

I tested the program with both a joystick and a lightpen on the 64 and found it to perform flawlessly using either control device (my personal preference is the joystick, but I know many people who swear by lightpens).

A handy feature of *Micro Illustrator* is the provision to fine tune your lightpen to the program. This is done quite simply after selecting the lightpen option by placing the lightpen against the screen and pressing the action button, first on a vertical line, then on a horizontal line. Since different lightpens vary somewhat in their sensitivity, this feature allows the program to conform to the sensitivity parameters of your particular lightpen.

Ten different brush strokes are available and a palette containing 16 colors is provided. Additionally, you may choose solid, transparent or non-transparent effects from the palette.



Using *Micro Illustrator* is direct and simple. Upon loading, the program asks you to specify the control device (with a 64): J for joystick or L for lightpen. Once you've made your selection, the program continues to load and you're then presented with the title page. Pressing any key or the joystick action button calls forth the main menu, from which all selections are made. The spacebar acts as a toggle between your electronic canvas and the main menu screen.

Depending on which control device you're using, you position the selection cursor over any of the menu selections you desire, picking the brush stroke, color, pattern (solid, transparent or non-transparent), special effects and so forth. Once you've made these selections, tap the spacebar and—*voila*—you're ready to start creating. That's all there is to it.

The erase feature gives you two options: erase the entire picture or the last update. An update consists of the last additions to the creation up to and including the last press of the action button (joystick or lightpen), so caution should be exercised when using this option.

The documentation booklet supplied with the program is first-rate and I found it to be complete in all areas. Several helpful hints and suggestions are provided to aid you in the creation of your art, and the booklet is well written and easy to understand.

Micro Illustrator contains provisions for saving your work to disk as well. Also included in the program is a copy feature which allows you to make copies of your finished work. This is handy, since you can call up a previous work, copy it, alter it in any way you want, and still leave the original intact.

Three demonstration pictures are included on the disk: Faces, Mission and Design. Faces are multiple overlays of facial silhouettes, Mission is the cover of a mission briefing booklet, and Design is an abstract rendering of geometrical patterns. These three demos provide good examples of what you can do with *Micro Illustrator,* although they are only starting points. From there, your imagination is the only limiting factor on your creativity.

Unfortunately, there is no provision for printing out your completed work. This feature is sorely missed, since most people would like to have a hard copy of their artistic endeavors. This is the single drawback to an otherwise outstanding drawing and graphics program.

Micro Illustrator should prove to be the ideal program for most computerists who want to get involved in the fascinating world of electronic art. If you don't need the printing feature, then *Micro Illustrator* may just be the masterpiece you're looking for. C

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REVIEWED BY GAIL AUSTIN

Webster: The Word Game

Computer: Commodore 64
Publisher: CBS Software
1 Fawcett Place
Greenwich, CT 06836
Medium: Disk

Webster: The Word Game is a challenging word-recognition and spelling game for the entire family. There are seven levels of difficulty and the use of a joystick is optional. However, this educational game plays equally well using only three keys on the keyboard. The manual is short, easy to understand, and the game is extremely easy to learn.

Webster: The Word Game is a great replacement for hangman, because the loser does not get hanged. It gives you a number of blanks, each requiring a letter. The catch is that you have to select the letters before the word drops from the top of the screen to the bottom. As you correctly choose a letter, the entire word moves back up the screen one position, giving you more time to decipher the word. When incorrect letters are selected, they are highlighted at the bottom so that you do not use them again. As a pleasing visual effect, the letters also swoop up off the screen as the word continues its descent. If you do not figure out the word before it reaches the bottom, the word is displayed on the screen and you score no points.

This game is especially fun for those in the family who like word games and for those who need to improve their spelling. Because it is timed, younger children may want to play with a parent coaching them. The only minor problem with the program is in controlling the pointing finger. On some occasions, it is difficult to stop right on the letter you want. With practice, you will find this gets easier. (Adults seem to find this more difficult than the youngsters. Could it be that playing those video games does help in playing educational ones?)

Webster: The Word Game has some excellent features:

- A demonstration level is included to familiarize players with the hand movement.
- The entire alphabet is always displayed.
- Selected letters become big and colorful.
- Each player can select his/her own skill level.
- Changing from joystick to keyboard is allowed at the beginning of each turn.
- Hints can be given if needed.
- A pause is allowed at any time by simply pressing P.
- Demon words, always shown by red blanks, are given.
- At the highest level, the demon words are never revealed. They remain unknown until they are deciphered.

CBS Software really has a winner with this educational game. May the real Webster come alive as you play this game and learn. Have fun. You can't help it! C

This game is especially fun for those in the family who like word games and for those who need to improve their spelling.

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REVIEWED BY AL WILLEN

Scratchpad 64

Computer: Commodore 64
Publisher: Richvale Telecommunications
10610 Bayview Avenue, Unit 7
Richmond Hill, Ontario, Canada L4C 3N8
Medium: Disk

Richvale's *Scratchpad 64* is an extremely interesting and versatile business mailing list program. I've tested almost every version of this software, because the product has been around for almost a year, and all Commodore 64 upgrades are based upon David Foster's original PET version.

Although *Scratchpad 64* cannot, in the truest sense, be considered a database program, it is nevertheless, a very important addition to the 64's business software arsenal. In essence, *Scratchpad 64* is used primarily to store names and addresses for reference, print labels and interface with another Richvale product, *Script 64,* the full-feature word processing program also reviewed in this issue. When *Script 64* and *Scratchpad 64* are used together, personalized form letters are possible. In fact, the bond between these two products is so strong, that Richvale sells both programs as a "package deal."

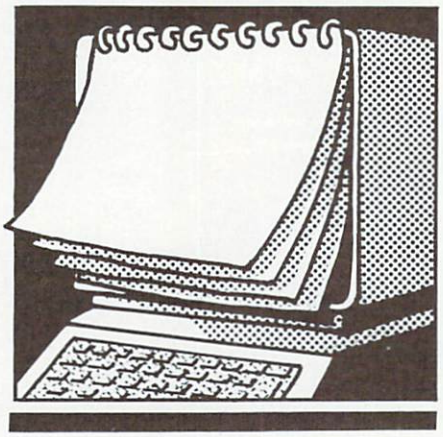
Scratchpad 64 loads quickly. After booting the source program, the user is asked a series of questions which "customizes" the program and data to the user's specific printer requirements. This custom file, called the configure file, can be saved for future setup of the program's parameters.

Also at this time the user is asked if the disk is new or old, the words "new" or "old" referring to whether the diskette is blank or contains data from previous uses. If the disk is "new", *Scratchpad 64* will automatically format the disk.

This formatting is more important than just recording a title (filename) heading. In fact, the entire *Scratchpad 64* file structure is set up at this time, creating an empty vessel which will later be filled with information.

Scratchpad formats the disk in a series of blank screens. There are 625 of these screens on one 1541/4040 diskette. Each screen (record) is subdivided into 20 lines, each of which can contain a specific facet of information or data field.

Scratchpad 64 *is used primarily to store names and addresses for reference, print labels and interface with another Richvale product,* Script 64



The user can enter up to 30 characters of information per field line. At this time, the user is asked to assign one of these lines the job of being the sort line. The sort line is used to arrange the hundreds of screens on a *Scratchpad 64* disk into some sort of logical order. For example, let's assume that line two contains the last names of people or firms contained in your file. If you make line two your sort line, the entire record file will be set up in alphabetical order according to the last name in each data record. Likewise, if you make line one (which may contain customer ID numbers) the sort line, then your entire disk file will be put into numerical order with the lowest ID numbers up first.

Assigning a sort line is very important to the subsequent usage of *Scratchpad 64* because once a sort line is assigned, it cannot be changed within the original diskette. (Of course different sort lines can be given to different files if each file is on its own respective diskette.)

Function Keys

There are a number of dedicated function keys to help the user get around the program. Keys F1 and F3 allow the user to sequentially move, one record at a time, forward or backward respectively throughout the entire file. Key F2 brings the data format screen on display. This specialized screen is constructed by the user to "label" each data field line within *Scratchpad 64,* in order to help the user remember the names of each individual line. Unlike the sort line, the data format screen can be easily changed inside the running program.

Key F4 activates the search format screen. This specialized screen can be set up by the user to selectively print records—in the print mode only—according to pre-set criteria. For example, let's say that field line ten contains zip codes. If we wish to print up mailing labels of customers living in the 11103 zip area only, we would access the search format screen by pressing F4. Next, we would use the cursor to move down to line ten, where we would type "11103."

When we begin printing our labels, the computer will automatically skip over any customer record that doesn't place the customer in geographic area "11103." Of course, the user can easily change the search format screen to work with the job at hand.

F5 displays the first record on file. In the print mode, this key is also used to confirm a designed print format. F6 can be used to restore text to an original condition before erroneous data was entered. F7 and F8 allow the user to input specialized French language graphic characters, an important feature in French-speaking localities.

Modes of Operation

Each *Scratchpad 64* screen has two display boxes. The top box, called the status display, shows the user information concerning the disk and screen on display, the available options (modes or status), and computer prompts (questions directed to the user by the program). The lower half of the display, called the data display, is divided vertically into two additional sections. The left section contains either the 20 field line numbers

REVIEWED BY WALTER SALM

Kwik-Load!

Computer: Commodore 64
Publisher: Datamost
20660 Nordhoff Street
Chatsworth, CA
91311-6152
Medium: Disk

Probably better known for its recreational software and library of hands-on computer books, Datamost has created an outstanding utility that's an absolute must for anyone who owns a Commodore 64 and disk drive.

Kwik-Load! is a useful, low-cost ($19.95 retail) utility that speeds up all unprotected software and program loading. Protected disks, such as games, alas, won't work with this utility.

To see how effective it is, I used an old-fashioned Heuer mechanical stopwatch and found that the advertised claims were too modest. Datamost says it will load 300 percent faster. A typical, rather long file that we used for the time trial loaded in 60 seconds normal mode. With *Kwik-Load!* in place, the same file loaded flawlessly in 13.5 seconds. Not quite believing my eyes, I timed the loading operation several more times. The time saving was more than 400 percent each time.

Kwik-Load! is totally transparent to the loading operation. Once the utility is in place in RAM, you load files just as if it weren't there. It's also very undemonstrative. There are no flashing lights or screen colors. You simply load it with LOAD"*",8,1 and in about five seconds, the screen will say "KWIK-LOAD READY!". Once it's in there, even the STOP/RESTORE function won't affect it. When you load a regular program file, the screen will go blank during the loading operation—something that I found a little disquieting, until the "READY" prompt came up on the screen.

Kwik-Load! *is a useful, low-cost utility that speeds up all unprotected software and program loading.*

The same disk that brings you *Kwik-Load!* also provides another utility program that is just a little more dazzling. Called "Kwik-Copy," this utility lets you do some neat things, like check the disk drive speed (my 1541 drive runs at 299.5 rpm), copy files, copy full disk, copy active sectors, call up the directory, perform DOS functions, turn on verify mode, edit a disk track by track and sector by sector, and even will display a hex and ASCII data readout of the data in a sector.

The documentation—a mercifully brief 16-page booklet—does give you this caution: "WARNING—You should not attempt to edit a diskette without advanced knowledge of Commodore DOS. A mistake in editing could result in loss of data. Always make a backup copy of the original, unaltered diskette before editing."

It sounds like good advice. Just seeing the display of the data in its raw hex and ASCII form is a little unnerving. I for one, didn't have the guts to try my hand at using this editing function. But one of these days, when I feel I'm expert enough in Commodore DOS . . .

All in all, I would recommend *Kwik-Load!* highly. C

(0–19), or an abbreviated data format screen. The right section contains the user "writing area"—a blank window where data can be entered according to user-selected fields.

Five modes of operation are shown in a status display line, which looks like this: "E:G:B:P:Q." The user is aware of the particular mode of operation because the status display line uses a highlighted (reversed) character to signify the program's status. Therefore, when the "E" in the status display line is highlighted, the edit mode is currently in operation.

The edit mode is the normal state of *Scratchpad 64*. It is used to enter new text, alter old text or to move around the data records and fields.

When a record is completed to the satisfaction of the user, the C= key is pressed. This initiates the "save" routine, via which the computer rearranges every record in the file according to the sort line, and then records the new/altered record in its own ordered file space RAM buffer. It takes a varying amount of time to organize a new record, depending on the current size of the file and the placement of the new record.

The "G" mode (global search mode) allows the user to *visually* search throughout the entire file and pick out records that meet one specific criterion. For example, if the user wants to find the record of a customer named "Willen," he would enter the "G" mode and type "Willen." The computer would then go through every record sequentially, until it hit the desired name. It would then display the "Willen" record.

Since *Scratchpad 64* can read roughly three fields per second, it can go through 625 records—by sort line search—in about 3.5 minutes. However, there is a secondary, more comprehensive way, to use the "G" mode. You can search through each and every field, in every record by typing in "* name." Thus, even though the name "Willen" may not have been originally entered in the sort line field, it can still be found.

Unfortunately, *Scratchpad 64*'s secondary global search is also painfully slow as far as computer global search modes go. Although the search speed has not increased (still three fields per second), the computer will have to plow through 12,500 fields (20 fields per record × 625 records) in a totally

Continued on page 127

REVIEWED BY JOHN DIPRETE

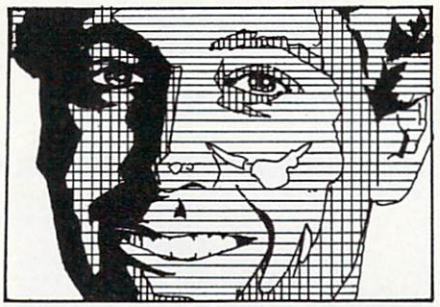
Facemaker

Computer: Commodore 64
Publisher: Spinnaker
215 First Street
Cambridge, MA 02142
Medium: Cartridge

Very early in life, children learn to appreciate faces as symbols of expression. The importance of these flesh-and-blood portraits probably accounts for the popularity of Spinnaker's *Facemaker,* an educational game designed for youngsters three to eight years old.

When the game starts, a blank, empty face lights up the screen. The outline is missing ears, eyes, mouth, nose and hair. The upper left of the screen lists the attachments and when the space bar is pressed, a cursor goes to each part. When a feature is singled out, another screen reveals an array of different styles to choose from. An article like hair, for example, is shown graphically in varying shapes and textures. When a choice is made, that is added to the original outline.

Facemaker offers children a fun way to get acquainted with their computer.



Soon the entire face is completed, revealing a colorful individual countenance. Making the face resembles the method used by police to piece together witnesses' descriptions of suspects. But the technique and variety of forms in *Facemaker,* of course, are much simpler.

After the child completes a face, the different parts can be made to perform. Pressing certain keys prompts gestures like winking, smiling, sticking the tongue out, wiggling the ears, and crying. The graphic effects delight young children and also show clearly how the face expresses emotion.

The program doesn't stop here, however. Youngsters can play a memory game with the face by observing a sequence of gestures, then correctly recording them in the proper order. Typing in letters, each one standing for a gesture, in the right sequence causes the face to wink and smile.

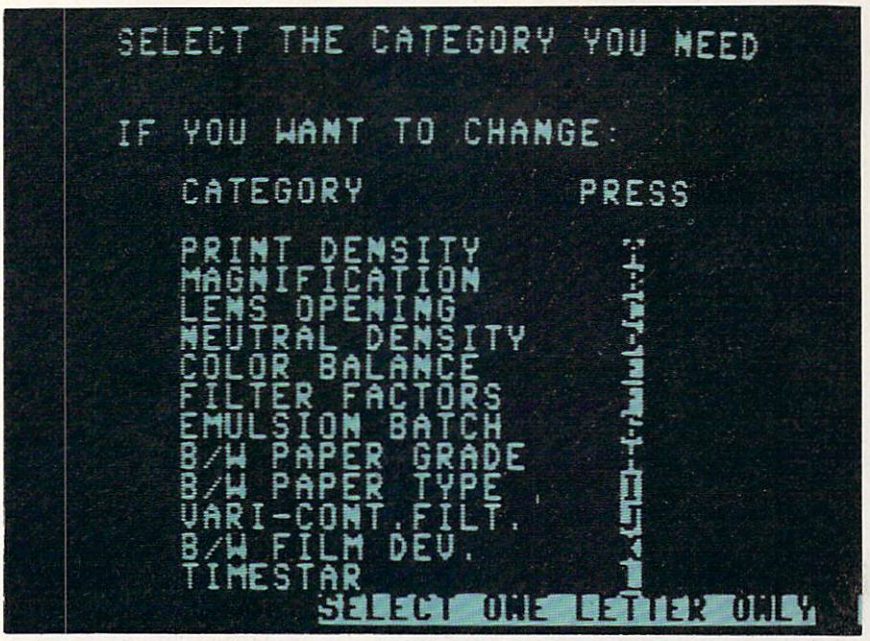
Players can also program the face to perform a list of gestures in succession, such as smiling, smiling, smiling, winking, sticking out the tongue, sticking out the tongue and crying.

Facemaker offers children a fun way to get acquainted with their computer. C

BY BOB NADLER

Darkstar Plus: A Darkroom on Diskette

Computer: Commodore 64
Publisher: F/22 Press
P.O. Box 141
Leonia, NJ 07605
Medium: Disk/Tape



Even if you don't know a film tank from an enlarger, Darkstar Plus *is really so simple to learn and use that with it your entry into photographic darkroom work can be made virtually painless.*

I'm a freelance photojournalist and a champion procrastinator. It's almost midnight and I haven't gotten my act together. I've still got to develop a half-dozen rolls of film and make the contact sheets I need for a morning meeting with a client. Oh well, I guess it's time to start. I hate to, though, because the heat is turned down in the darkroom and everything in it is cold—62 degrees Fahrenheit, to be exact.

What's the first thing I reach for? Wrong! It's not the thermostat, or even the film tank or the chemicals. It's the Commodore 64. The Commodore 64!? The Commodore 64 and *Darkstar Plus* software.

My trusty 1541 takes less than a minute to get my *Darkstar Plus* program up and running. It takes another few seconds to press the K key to pick the black-and-white film-processing section of the program and tell it my dilemma. In nothing flat, the 64 tells me that if I normally get the kind of negatives I want when I process Tri-X film in D-76 developer (1:1) for ten minutes at 68 degrees, when the room is 62 degrees, I will have to process the film for 13 minutes and six seconds. No fuss, no muss. I can use the chemicals, tank and reels at room temperature. I don't have to bother with temperature control at all.

But that's only one of *Darkstar Plus'* abilities. It also does lots of other things that need doing in the photographic darkroom. For example, let's suppose I just made a good work print at 6X magnification (that's about a 6x9" print from a 35mm negative) on one type of printing paper and now I want to make a 17X exhibition print on another type. I can tell all this to *Darkstar Plus,* and instantly be given a new exposure time to use when making the bigger print. The new exposure will even compensate for the emulsion characteristics (reciprocity-failure) of both printing materials.

By eliminating the expensive waste involved with the usual trial-and-error solutions to such problems, the *Darkstar Plus* program can save many times its cost over a relatively short period of time.

In case you're wondering how I can keep a computer monitor going in the darkroom without exposing the light-sensitive materials, the answer is simple—I don't. I turn off the monitor, but not the computer, whenever I need to.

When you are making color prints, *Darkstar Plus* is even more useful. If, for example, my work print had been just a little too green because I was printing my color negative through the wrong color-printing filter pack, I could tell my problem to *Darkstar Plus* with a couple of key strokes and it would instantly give me the new filter pack I'd need to correct the color imbalance. It would even automatically subtract any neutral density (gray) from the filter pack while it was making its choice and give me a new exposure time for the bigger print. It would also calculate that new exposure time by taking the color-printing paper's reciprocity-failure characteristics into account, as well as considering the number and type of filters I had in the both first and the final filter packs. So who needs brains or experience in the darkroom when you've got *Darkstar Plus*?

Darkstar Plus is a menu-driven program. That is, it provides you with a list of all the things it will do—some 12 major items in all—and invites you to press a single key on the 64's keyboard to select each specific portion of the program. The items on the menu are: print density; magnification, lens opening; neutral density; color balance; filter factors; emulsion batch; black-and-white paper grade, type, and variable-contrast filters; black-and-white development and *Timestar.*

If you decide you want to change any one of those common darkroom variables, you need only press the key indicated on the monitor screen, and then answer a few simple questions, again with usually only a single key

press, to tell the computer what you have already done and what you want to do. The 64 will then tell you exactly how to do it.

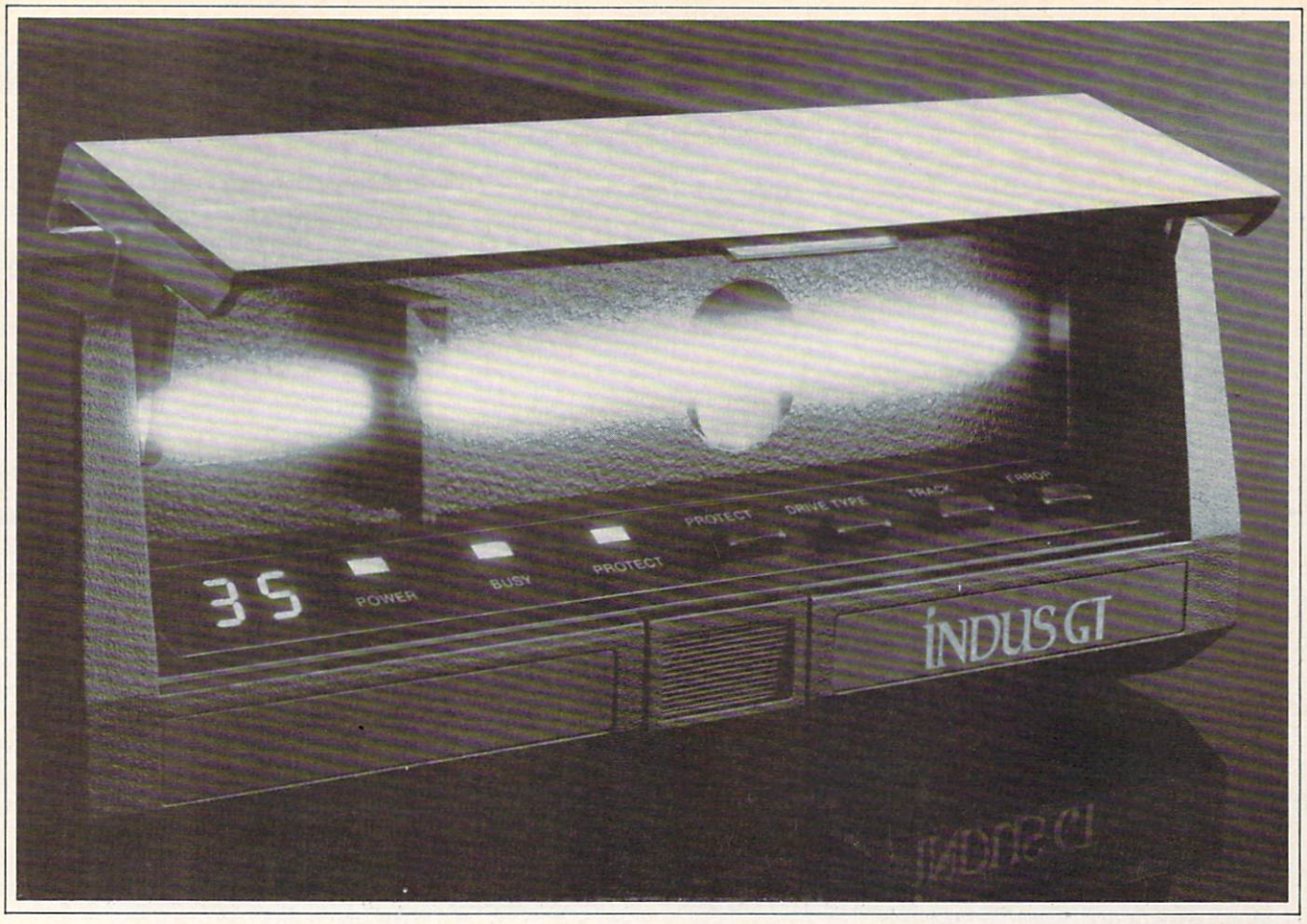
The last selection on the *Darkstar Plus* menu, *Timestar,* is actually a separate program in itself, which is the reason for the "Plus" in the program title. *Timestar* turns your Commodore 64 into a very powerful program timer. It allows you to program as many as 15 separate sequentially timed periods, name each of them, select whether the timing will be done automatically or manually, and select the amount of warning (five to 50 seconds) before each period ends (or no warning at all if you are so inclined).

At the exact amount of time you have selected for a warning, the monitor's loud speaker hoots at you twice. Then it hoots once again at the end of the period. If you have selected automatic operation, the next period begins immediately to be counted down and, of course, to be so indicated on the monitor screen. Manual operation requires that you push a key to begin the next period.

Timestar is most often used in the darkroom to time the many sequential steps involved with processing film or paper. It is also very useful to control a sequence of burns or dodges on the enlarger easel.

Darkstar Plus, as well as its two component programs *Darkstar* and *Timestar,* are available on both tape and disk for the Commodore 64. The programs are supplied with very complete documentation, which contains many simple, specific examples of every aspect of the program's use. *Darkstar Plus* is available directly from its publisher, F/22 Press, postpaid at $89.95 on disk and $74.95 on tape. *Darkstar* by itself is available at $64.95 on disk and $49.95 on tape. Both the tape and disk version of *Timestar* sell for the same $24.95 price.

Even if you don't know a film tank from an enlarger, *Darkstar Plus* is really so simple to learn and use that with it your entry into photographic darkroom work can be made virtually painless. Add this program to your collection and you may discover the little known photographic fact that pictures are taken with a camera, but great images are created in the darkroom. C



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REVIEWED BY TED SALAMONE

Speed Reader II

Computer: Commodore 64
Publisher: Davidson and Associates
6069 Groveoak Place
Rancho Palos Verdes, CA
90274
Medium: Disk

A highly effective program designed to improve reading skills through user interaction. Based on over 15 years of educational experience.

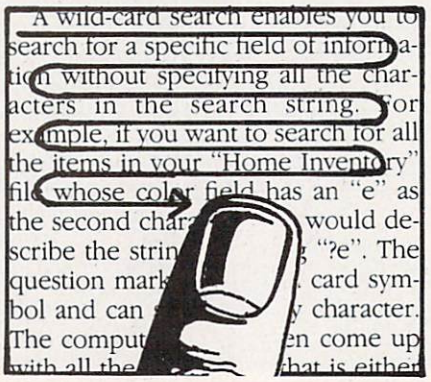
John F. Kennedy practiced it. Most successful businessmen and academicians still do. What are we talking about? Speed reading, of course! From high school courses to special training sessions offered by firms such as Evelyn Wood, enhanced reading skills and comprehension have become quite desirable.

Davidson and Associates, a relative newcomer to the software field, is one of the first firms to produce a highly effective program designed to improve reading skills through user interaction. Based on over 15 years of educational experience, *Speed Reader II* is a fine-tuned derivation of edition I, a software package originally coded to help students at the nonprofit educational center Dr. Davidson founded several years ago. Testimony to *Speed Reader II's* effectiveness can be found in the "teacher certified" seal of approval bestowed on it by the NEA, the nation's foremost association of educators. It is designed for high school and college students, as well as adults.

Bound in a sturdy (three-ring) vinyl binder, *Speed Reader II* comes complete with a program disk and a data disk, an easy-to-follow instruction manual and plenty of practice session charts for computerists to keep track of their progress. Personal Record Sheets provide each individual with a pre-organized format to record all relevant information so it will be readily accessible for future evaluation.

Wisely, Davidson has seen fit to offer additional data disks for about half the cost of the program itself. Some of these additional disks supplement the high school-to-adult categories. Additionally, others cover a broader market by providing elementary and junior high school levels.

In addition to the necessary disk drive, monitor and 64 itself, a printer is a handy option. Hard copies can make use of the program much easier. Though the program disk is copy-protected, the data disks aren't. A backup program disk is available for a nominal $10.00 fee after Davidson receives your registration/warranty card.



Using *Speed Reader II* is a simple matter; just choose from the on-screen menus. *Speed Reader II* warm-ups consist of two different, but related, routines. Designed to increase the scan area of your peripheral vision, these lessons put letters, and later, words on the video for you to read. Keying in the characters after they've disappeared tests your retention as well as your scanning abilities. Both of these exercises work similarly in that two-letter (or word) phrases are depicted for shorter periods of time until speed 15 is reached. From that point, users can switch into higher gear by contending with three- and four-letter (or word) phrases. It's tough, but worthwhile.

The eye movement lesson forces you to rapidly follow phrases from 20 different stories as they flash on opposite edges of the screen, all the while scrolling quickly downwards. Comprehension quizzes can be taken at the end of each paragraph, if desired. As with most of the other routines, a scorecard points out the progress in elapsed time, number of words read, speed attained, and percentage of correct answers.

Another way to boost the strength of your peripheral vision is to make the column reading lesson a steady diet. Here a column of words is depicted for you to comprehend with a single downward glance. This section uses the same skills as the eye movement segment and display speed is user adjustable.

Fifteen reading selections (different from those above) of approximately 400 words each are also stored on the disk. These, ranging from "The Egg" and "The Computer Age Orange," to "Christmas in July" and "Splitting the Brain," increase speed and test comprehension at each level. Users select the velocity and size of the window or number of lines allowed on-screen at any given time.

The timed reading test also makes use of the same passages, but in a slightly different manner. A full screen of information is provided for the reader. Advancing to the next screen by depressing the space bar tells the computer to divide the number of words by the length of time taken to read the entire passage. The optional quiz is strongly recommended.

Personalized responses and audio indicators provide positive reinforcement whenever correct answers are given. A clock displays the amount of time spent answering, a very useful reminder for timed test (SAT, GMAT) preparation.

The manual gives a brief outline covering the principles of speed reading and some of the benefits which accrue to those attaining better-than-average speed and comprehension.

Finally, a very useful feature is the built-in editor which allows creation of customized reading material. Within the guidelines, it is possible, for example, to insert business or school speeches for practice prior to presentation. This flexibility, coupled with the extra data disks, ensures *Speed Reader II* a long and useful life for many less-than-speedy readers. C

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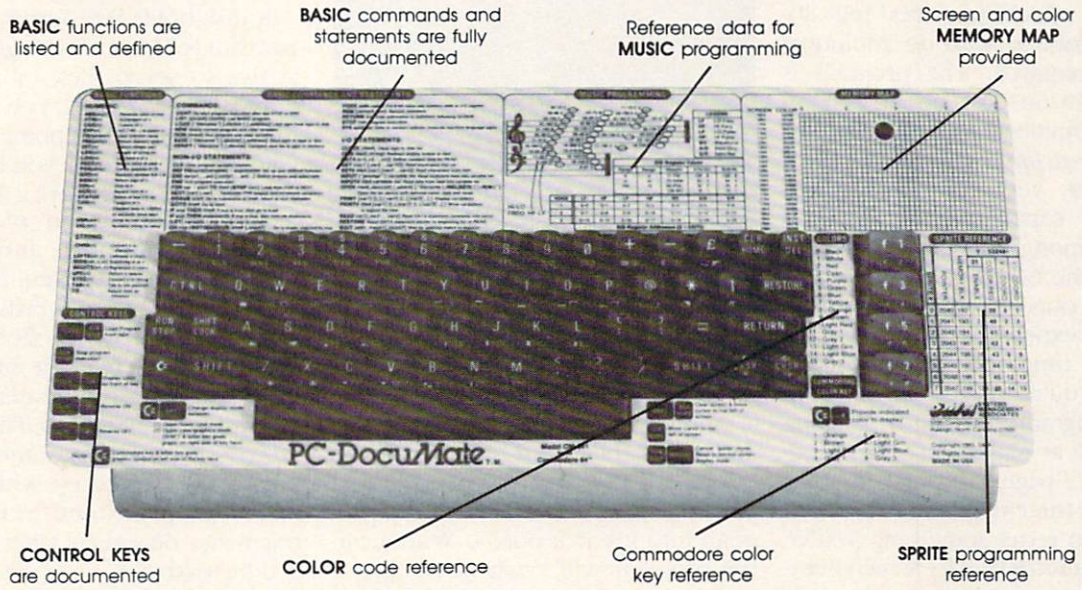

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REVIEWED BY DAN RUSTIN

Script 64

Computer: Commodore 64
Publisher: Richvale Telecommunications
10610 Bayview Avenue, Unit 7
Richmond Hill, Ontario, Canada L4C 3N8
Medium: Disk/Tape

There are several 80-column options available for the Commodore 64, but for most you pay a premium—either in additional hardware like an 80-column adapter, or in inconvenience, like having 80 columns for viewing only, but not for editing.

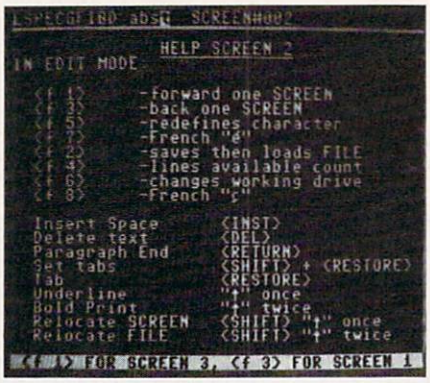
For the past two years, however, a Canadian company named Richvale Telecommunications has been quietly marketing a word processor called *Script 64*, which provides full 80-column capability with no additional hardware required. The program is sold for $79 on disk, about $50 on tape, and combined with a mailing list handler, *Scratchpad,* for $105.

Its power, versatility and built-in 80-column capability clearly rank *Script 64* among the best word processors for the 64. In fact, a program such as this puts the 64 in a class with much more expensive computers.

The first time you sit down with *Script 64,* you're aware that this is an unusual program. Instead of scrolling through text as with most word processors, you "page" through it. Each screen has a three-digit number. When you want to recall something you've written, you retrieve it by screen number. A screen represents roughly half to one-third of a typed page. You can store the equivalent of ten to 15 double-spaced pages in memory at any one time.

Script 64 is actually two word processors, one with 40-column display, the other with 80-column display. You can't toggle back and forth but, with limitations, you can use the best virtues of each on the same manuscript. For example, you can create text in the more readable 40-column format, then view and edit in 80-columns. Incidentally, you do get a legible output in 80-columns on a home television set or color monitor, though a monochrome monitor is far superior for serious 80-column work.

The dongle does have its virtues. It allows the program to be non-protected, so you can make as many backups as you want and the publisher needn't worry about rampant theft of his product.



Another difference between this and most other word processors is its "dongle." You insert this metal and plastic plug that comes with the program into joystick port 1. Without it, the program will crash faster than a wingless bat. But the dongle does have its virtues. It allows the program to be non-protected, so you can make as many backups as you want and the publisher needn't worry about rampant theft of his product.

After you load *Script 64/40* or *Script 64/80,* you're confronted with a menu of printer options. If your printer is not on the list, don't panic. You can select an ASCII option or devise your own printer-instruction file with individual codes for underline, bold, or italics, and choose the output port through which your printer is connected. The program is said to support virtually any printer.

Next, screen 001 pops up and you're in business. In 80-column mode, you can type 1,760 characters per screen; in 40 columns, 880 characters (since each screen accommodates 22 lines of type). You don't get twice as much text in an 80-column file, however. This is because a 40-column file contains 40 screens, twice as many as its wider counterpart.

If you're working in 40 columns, you cannot fill the memory before reaching the end of your file. In the 80-column format, however, you can run into trouble. At 350 lines (about screen 16, if you write to the foot of every screen) you'll get a "memory full" warning. You'd better pay attention, save your work and load another blank file, or you won't be able to edit what you've written.

A disk holds 999 *Script 64* screens, tape holds 150. A disk is generally full at five to seven files, or roughly 70 double-spaced pages. You get a "disk full" message at this point and, again, you'd better listen or you'll lose some data if you don't uncork a fresh disk.

Another distinction of *Script 64* is that it doesn't automatically wordwrap. It writes in "wordstream." In other words, it won't carry over full words from the right edge of the screen. It breaks them there and jumps to the next line with the rest of your word. This is not as worrisome as it sounds, though. Word breaks are cleaned up when you format your page. And reading word fragments on-screen takes very little getting used to.

As you use *Script 64,* you get the idea that almost every contingency has been carefully thought out. Typical is a feature called the "structured screen." This concept enables you to write your text on screen exactly as you want it printed by simply placing a return arrow in the home position of any screen. You hit [C=] and "a" and you get automatic word wrap. Hit [C=] "b" and you get a buzz when you type within five spaces of the right margin, like the bell on a typewriter.

In 80-column mode, this "struc-

Continued on page 40

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Commodore 64 Benchmark (Sieve of Eratosthenes)	PROMAL	BASIC	COMAL	FORTH	PASCAL	
Execution Time (secs.)	30	630	490	51	55	
Object Code Size (bytes)	128	255	329	181	415	
Program Load Time (secs.)	3.2	3.8	6.3	11.2	23.5	
Compile Time (secs.)	8.5	—	—	3.9	108	

As the benchmark results in the table show, PROMAL is much faster than any language tested. From 70% to 2000% faster! And it generates the most compact object code. The PROMAL compiler is so fast that it can compile a 100-line source program in 10 seconds or less. And, not only is it fast in compile and run time, it also reduces programming development time.

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tured" feature is extremely handy for setting up a business letter or a complicated table, the latter virtually impossible with many word processing programs. Tabs and centering are two-stroke commands.

On the down side, editing a structured screen is slower than a word-stream screen (you can't mix the two formats on one screen, but you can jump back and forth within a file), and you have to edit a structured screen line by line.

Another ingenious concept of this program is a "control map," which is a grid you use to format all printing variables, like margins, justification, headers and footers, line spacing and page length. You can use the default parameters, change any or all, or create a new default schedule if you like. With this map, all your format codes are "banked;" you see no formatting symbols on screen except the return arrow. You can also alter the format at any point in your working session.

Even more ingenious is the ability to change parameters on an individual screen. For example, if you want tighter margins for a quotation, or single spacing within a double-spaced paragraph, you access a "small control map" which sets the variables for that screen only. Conveniently, you can save both kinds of maps if you plan to reprint your text in the future.

Commodore's four function keys are put to good use. F1 pages forward and F3 backward through your file. F2 saves your file while loading another one. F4, on alternate strokes, reads unused lines in memory, current screen line and indicates which drive is being used. F5 allows you to redefine any key up to 15 characters. F6 switches working disk drives, while F7 and F8 access French characters (we did say the publisher is Canadian).

The [C=] and RUN/STOP keys control all other important functions. [C=] accesses the major commands like load, save and print. RUN/STOP calls up the heavyweight editing functions. You hit one of these keys, then you specify the desired command with a mnemonic: "l" for "load," "d" for "delete a line," for example. For simpler editing functions, like letter delete or insert a space, you use INST/DEL.

With many features of this unusual program, there is more than one way to get the desired result, depending on need and speed. In the editing mode, you can delete by letter, line or entire paragraph with, at most, three keystrokes. You can move copy around, even between files, very easily.

Drawbacks? A few, as with every word processor. In a highly structured manuscript—a thesis with footnotes, for example—you can't easily tell where pages break while you're in edit mode.

To recall accidentally scratched copy, hit SHIFT/back arrow. However, this feature will work only if you've already committed that copy to buffer memory by changing screens.

To print, you key [C=] and "p" and you're presented with a "screen sequence" box. You enter the numbers of the screens you want printed and in what order, type "000" and your printer is clicking. To view your work before going to paper, you insert "v" before "000." If you're in 40-column mode and you want to view 80 columns, you scroll left and right with the "6" and "4" keys.

The print mode also allows you to imbed screen numbers in your left margin for easy text locating, to print multiple copies, to combine with other files (including sequential ones), to print across files and to hyphenate.

For its cost, *Script 64* offers an inordinate number of features that don't normally come packaged in a $79 program. It does search and replace faster than you can blink. It allows you to call up as many as 20 different variables, each up to 30 characters, at one time. It does automatic enumeration, neatly indenting items on a list. It will also tabulate with aligned decimal points, while automatically totaling the columns. Tabs are a snap to set with SHIFT/RESTORE.

You have three spelling checker options: create your own dictionary, buy one (about $15) or merge these or another two. However, speed of word checking is lamentably slow. You can look up words in the dictionary faster. The program will also hyphenate, albeit crudely.

Documentation is clearly written in a 140-page manual which guides you effortlessly through the many features of this sophisticated program. And, like the program itself, the manual is exceptionally well thought-out. If you're anxious to get on with it, you can absorb the basics in a few minutes and start word processing instantly. If you're interested in exploring all the advanced features, you can read at leisure. Chapter endings summarize the main commands, and an index leads you flawlessly to any one of them. Unfortunately, there is no crib sheet.

Help screens are available, but to call them up you have to swap your data disk for the program disk, which can be inconvenient. However, the inconvenience is offset by the knowledge that no valuable memory space is being wasted on help screens that may be redundant with such a fine instruction manual at hand.

Drawbacks? A few, as with every word processor. In a highly structured manuscript—a thesis with footnotes, for example—you can't easily tell where pages break while you're in edit mode. You have to go to screen print, find your page breaks, then go back to edit mode to make adjustments. This, of course, may disturb the remainder of your pages.

Another feature that's missing is the ability to scroll backwards while previewing on-screen. Right justification, like hyphenation, is easy to do, but short of professional-looking in output. You can correct both manually, of course, but in a long manuscript that can be tedious.

All in all, *Script 64* is a completely professional word processor with an impressive inventory of features that far outweigh its relatively few drawbacks. Its flexibility, married to the legendary power of the Commodore 64, makes this combination one that compares favorably with systems costing two or three times as much. C

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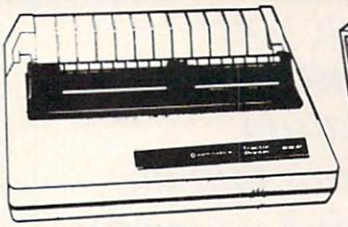

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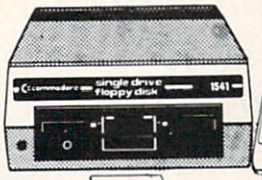

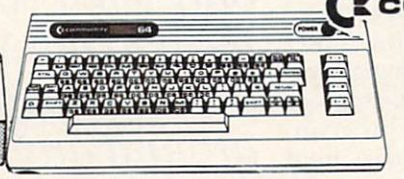

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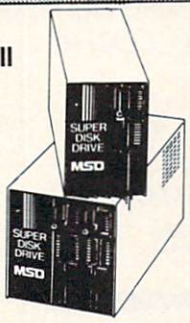

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COMPUTER CENTERS OF AMERICA

REVIEWED BY DONALD H. GRAHAM

The ELF System

Computer: Commodore 64
Publisher: Codewriter Corporation
7847 N. Caldwell Ave.
Niles, IL 60648
Medium: Disk

The ELF System *will allow you to create your own custom application programs that do only what you want them to do! You don't have to wait around any more for someone to come out with a commercial program that almost suits your needs.*

STEVE EARLY

Just what is the *ELF System* and what's it for? Well, the *ELF System* (Easy Language Format) is a code-generating program that will allow a user with limited or no programming experience to set up a complex series of operations/screens in a program. These screens can accept data from the user, display calculated results, write reports to a printer, and perform several other functions. It does all this without requiring the user to type in a single line of BASIC code!

You can create an application program that will accept and track your travel expenses. You can create a program that will make it easier to keep track of your income tax deductions and other data. You can create a program that will monitor your investments, or keep an eye on your IRA, your savings, or any other data manipulation/processing that needs to be done on a relatively small scale.

In short, the *ELF System* will allow you to create your own custom application programs that do only what you want them to do! You don't have to wait around any more for someone to come out with a commercial program that almost suits your needs, or does most of the things that you want it to do. Now you can easily create your own program that meets your standards not somebody else's.

Understand, this system is not a data base system! It is not intended for manipulating large amounts of data, or sorting or categorizing or finding a particular record within a file. It is intended for custom applications. You decide how it is to work, how it is to get data from the screen, how the screens will be formatted.

Just what will you get for your money? You'll get the software on disk, a function key overlay card, a book of instructions, and a very nice folder in which to keep all of this material. It doesn't look like a lot for your cash. But fear not! If you spend your money on this little system, you will reap the rewards as long as you use the software. There is simply no limit to the number of applications that this package can help you create. The more you use it, the more you'll save in software costs, as well as aggravation.

The manufacturer bills this as a free-form program generator. This can take the form of a spreadsheet, a letter or a series of user-input data fields, upon which the program (your program) will act to provide you with the output data that you require. There are provisions for saving your data as a file, although there is no ability to cross-reference your files. Remember, this is not a data base system.

How, then, does this *ELF* work? First, you must decide if you will be using the scroll mode (like a spreadsheet application or a letter) or the page mode, wherein you will define each page (or screen) separately. You will then arrange the page as you would like it to look, putting prompts where you want them, deciding what to do with the data that each screen collects from the user. You can define complex calculated fields, you can enter names, addresses, amounts, factors, or conversion parameters.

After you have developed all of your screens, you sequence them in the order that you would like them to appear when the final program is run. At this time you may set conditionals for each screen if you wish, allowing for alternate paths for the program flow. After that, you will be ready to set up the program (your program) and direct the *ELF* to actually create the final application program. The only real work you must do involves planning the program operations and making decisions as to what will happen and when. Once the *ELF* has done its work, all that is left for you to do is to LOAD and RUN your program. RUN it as often as you like.

You will spend a good deal of time getting familiar with the system and how it works. The instruction manual is very well organized and very well written. Throughout the manual you

are provided with detailed direction on how to create a screen, what to expect and what your options are at any given point in the process. The system is largely menu-driven, making it very user-friendly and almost foolproof. The tutorial in the manual is complete and provides examples of just about every avenue that you might want to use in your program development.

In addition, there is a margin on each page indicating what kind of operation you are expected to perform, using visual prompts for ease of recognition. For example, there is a little picture of a disk indicating that you are expected to change disks. There is a little picture of the keyboard, indicating that you are expected to type something. These aids go a long way to make the system user-friendly.

The end result will be a BASIC program that you can use whenever you need it, that does only what you want it to do. The detailed instructions provided in the tutorial leave nothing to the imagination, hence the resulting program works exactly as planned. There were a few instances of errors in the manual, but none of them was earth-shattering. Most of them were merely editing errors.

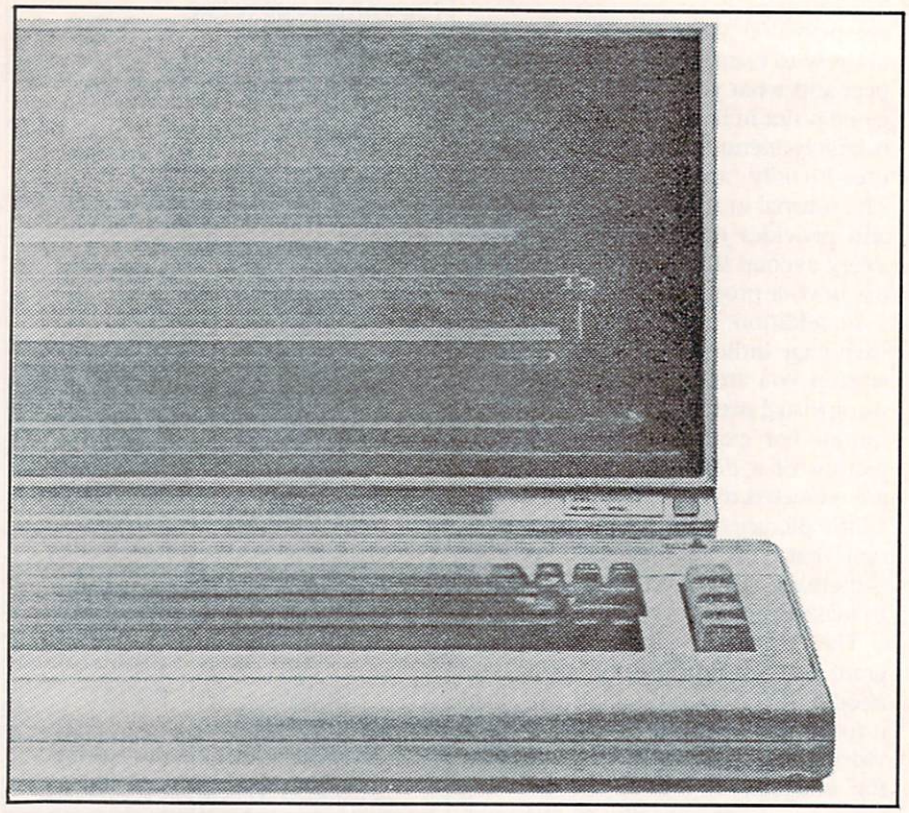
The *ELF* system works very well. It is complete, it provides a great deal of flexibility in screen design (and screen editing), and it is certainly one of the most user-friendly programs that I have seen. The only area of ambiguity that I could find occurred in the tutorial. The manual indicated that, when setting conditionals for program flow, an "open window to BASIC" was available to the more advanced programmer. Unfortunately there was no other mention or reference as to what this meant to how it could be implemented.

In conclusion, the *ELF System* is a complex program-generating program that offers flexibility and ease of operation to the non-programmer. The only skills required to use it are that you must know how to turn on the computer and you must know how to insert a disk into the disk drive. This is a very simple approach to complex problem solving. I recommend it to anyone who is interested in putting his/her computer to work on meaningful tasks, but is not interested in being put to work writing programs. C

REVIEWED BY DONALD GRAHAM

Speedwriter

Computer: Commodore 64
Publisher: Codewriter Corporation
7847 N. Caldwell Ave.
Niles, IL 60648
Medium: Disk



STEVE EARLY

What do you do with a BASIC program that you wrote (or bought or typed in) that is nice, does what you want it to do, but is just too slow to suit you? Maybe it's a game that uses screen pokes or sprites, but is too slow to be really challenging. Or maybe it's a nice data handling program that just takes too much time to manage the data involved or requires too much garbage collection.

Well, *Speedwriter* is just the prescription for those sluggish programs to get them back into the swing of things again. Now marketed by the Codewriter, this program will compile your BASIC program into faster, more efficient code, thereby speeding up program execution by as much as 55 times! *Speedwriter* eliminates the need for each command to be interpreted every time it is executed. (This is why BASIC is so slow. Every command must be interpreted every time it is encountered during program execution.) *Speedwriter* transforms the BASIC commands into what is known as Pseudo-code, a quicker form of code that does NOT have to be interpreted!

The package includes a disk which converts your BASIC program (the source program) into a new compiled program (the object program), along with a complete instruction manual. The only hardware requirements are the 64 and a standard 64 disk drive. It may work with other drives, but no compatibility is guaranteed by the manufacturer. A printer is optional for hard copy of the source program, error messages or program statistics.

Codewriter advertises that no previous knowledge of BASIC or machine language programming is required to operate the software. They certainly live up to this promise! After loading the main program you will be prompted for a few required parameters (like disk drive configuration, source program name, object program name, and printer specs), then *Speedwriter* takes complete control of your system and requires no further user interaction until the compilation process is completed. If there are no errors, the object program is automatically written to the disk in the drive and the user is offered the options to compile another program, load and run the most recently compiled program, or quit. If any errors are encountered during the compilation process, they are listed to the screen (or printer) and the process is aborted without creating the object program. That's all there is to it!

Speedwriter *is just the prescription for those sluggish programs to get them back into the swing of things again.*

There are some very nice features about this compiler package, the most impressive of which is the ease of operation and the thoroughness of the instruction manual. The compiler doesn't take away any of your BASIC program memory area—any program that will run in BASIC will run compiled. In most cases you needn't make any changes to your BASIC program before compiling it, as long as it is error free.

Speedwriter handles Commodore 2.0 BASIC (and even extensions to BASIC) without hassle. Compiled programs are usually smaller than the original BASIC program. Theoretically, you could compile a program that will fit into the CPU but won't run (due to variable memory needs), into one that will fit and run. The system also has its own garbage collection routine which runs in about one second!

The manual introduces the user to the world of compilers with a basic explanation of interpreted code (like BASIC) and non-interpreted code (like machine language), then directs the beginner and the experienced programmer to the main program loading instructions. The manual offers (but does not require reading of) more advanced information about how the compiler works and some details about the very few situations that are

known to cause problems in compiled programs. The manual also includes details on how to compile programs that use extensions, how to handle machine language routine calls from BASIC and other advanced techniques.

In addition, there are chapters on error handling, adding directives to the source program, integer/floating point conversions, program chaining, warning messages and other topics. On the whole, the manual is very complete and well written.

There is one notable shortcoming in this system. The compiled program requires that the run-time library (called RTL-64) be resident in the CPU or on the disk in the drive when you run your compiled program. Neither the manual nor the disk provides a means of copying this program (it's not a BASIC program) onto another disk. If you happen to have a program that will copy files, you're probably OK, but you cannot just load and save this program. You will also have trouble with the run-time library. While it will load into the VIC (if you provide RAM in Block 5), you will lose control of the compiled program when you run it.

This program will compile your BASIC program into faster, more efficient code, thereby speeding up program execution by as much as 55 times!

As with all copyrighted material, you may not reproduce and/or distribute the compiler for any reason other than for your own personal use. However, Codewriter allows you to market any program that you compile (along with their run-time library) for no fee or royalty. They only require that a notice of copyright (in accordance with their instructions) accompany the distribution medium. Furthermore, if you write and compile a BASIC program, Codewriter will consider marketing the compiled program for you!

At first I was somewhat disappointed with *Speedwriter* because I expected a compiler that produced native 6510 machine language and *Speedwriter* appears to generate pseudo-code instead. On the other hand, after using the compiler a few times I found it to be terribly complete, being able to compile just about any possible configuration and mix of BASIC and machine language. It is well documented, right up to a listing of some memory locations used by the compiler for housekeeping chores. It handles arrays, floating point and integer BASIC, passing variables between programs, extensions to BASIC, and compiles a series of programs without user intervention. It's a very nice addition to any software library and one that will not collect dust in my computer room! C

REVIEWED BY SHLOMO GINSBURG

VicTree

Computer: Commodore 64, VIC 20
Publisher: Skyles Electric Works
231 G S. Whisman Road
Mountain View, CA
94041
Medium: Cartridge

This cartridge module enhances the capabilities of the computer by providing the user with over 40 commands.

VicTree plugs into the cartridge slot and is activated or disabled by a single command. It does not require loading of programs from disk or tape: and enhances four groups of commands: editing, disk, debugging, and printing.

Editing Commands

AUTO generates line numbers automatically. This feature is important for programming, as the user does not have to type the current line number for every statement. It also avoids errors, such as specifying an existing line number. The command allows one to choose the starting line and the increment.

CHAIN loads a program and places it at the end of the one currently in memory. It is useful when the user creates distinct sections of a program, each of which is tested independently. A similar option is provided by the MERGE command, which does not allow changes in the program in memory whenever a line number appears in both programs.

CHANGE searches for a specified text (BASIC commands or literal text) within a given range of lines and replaces it by another. This is most useful when a repeated mistake appears in the program or when the user wishes to change variable names. Without this command, the programmer might need to spend a lot of time searching for the expressions to be replaced (on the screen or in the program listings) and replace them one at a time. Even then, he might skip some of the occurrences of these expressions.

DELETE deletes a specified range of lines. This avoids the need to type many line numbers followed by [RETURN].

FIND searches for text and prints the lines in which it appears. This is useful for debugging and correcting mistakes.

LCOPY copies a range of lines to a new location within the program. It allows the user to save the effort of retyping commands that are used more than once.

LMOVE moves a range of lines to a new location. The old lines are eliminated and all references to these lines are updated. This option is very useful when the programmer decides to move sections of the program, such as subroutines, to new locations, for reasons of the program's logic or for improved efficiency.

LITERAL enables the word processing editor. That is, upper and lower case characters can be entered and text can be printed.

PAGE lists groups of lines, so that no line will scroll off the top of the screen. This command will automatically display the word "PAGE" at the bottom of the screen for further use.

RENUMBER renumbers a specified range of lines at a given increment. This command lets you obtain a more efficient structure of the program, in addition to the convenience of inserting new lines, etc. All references to the old lines, such as GOTO and GOSUB are updated.

TYPE prints a document without line numbers. It is useful for text generated by the word processing mode.

Disk Commands

APPEND allows you to add data to a sequential file, avoiding the usual tedious effort associated with this process.

BACKUP duplicates a disk (requires a dual drive).

CATALOG displays the disk directory without LOADing it. It is very useful when the user wants to SAVE his program, making sure that the name he is using does not belong to another program, or that if it does, to recall the name of a program to be CHAINed, etc.

CHAIN# loads a program under program control. It allows you to sequentially execute programs. For example, when a program is too large for the memory, it may still be possible to break it into segments, and RUN them sequentially.

CONCAT reads a file and adds it to the end of another file.

COPY copies a file from one disk to another, or, with a dual drive, it copies all files from the first to the second disk without altering the existing files on the latter.

EXECUTE loads a program and RUNs it.

HEADER prepares (formats) a disk for use.

INITIALIZE initializes the disk drive. This is a most important command for avoiding problems whenever disks with identical ID's are used.

RENAME assigns a new name to a file on a disk.

@@ allow the user to execute user-defined BASIC commands which reside on a disk. This is equivalent to creating a library of BASIC commands.

Debugging Commands

DUMP displays all non-array variables which currently have a value. After RUNning a program, this command allows the programmer to verify the values of variables. For those variables which are assigned different values during execution, STOPping the program and using DUMP several times may be necessary.

HELP displays a line which contains an error, and highlights the approximate location of that error.

TRACE allows the user to see his program execute, one command at a time. The user may continue execution at a convenient pace or he may stop it.

VicTree is a sophisticated tool for the beginner, as well as the advanced programmer. It reduces the effort of writing programs, disk operations, and other system controls. It also provides several safety means to avoid sad accidents. This product is obviously a result of experience and thorough development. It is highly recommended for both serious programming and just for having fun. C

BY PAUL HIGGINBOTTOM

Life Beyond SID

A Review of Passport Designs' MIDI Hardware and Software

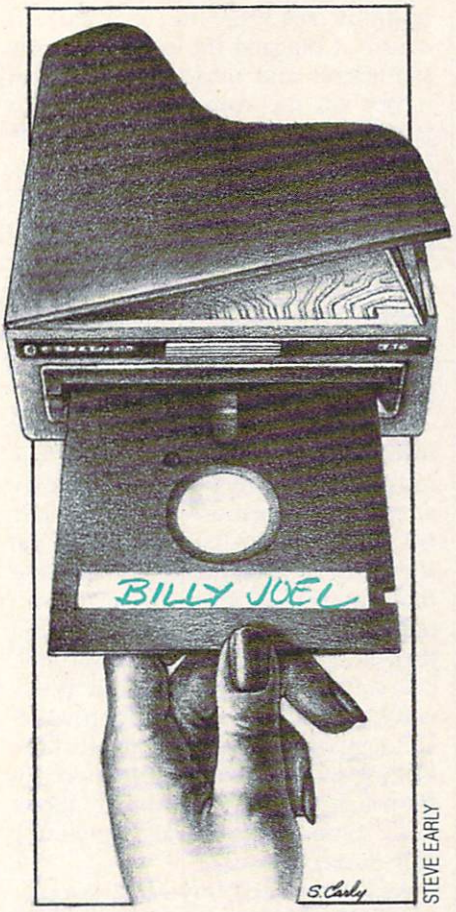
Computer: Commodore 64
Publisher: Passport Designs
625 Miramontes St.
Half Moon Bay,
California 94019
Medium: Disk

Somewhat of a revolution has been taking place in synthesizers over the last year or so. A standard interface has slowly been evolving for keyboards, which not only allows them to talk to each other and synchronize with drum synthesizers, but also to talk to computers! This interface is known as MIDI. MIDI stands for "musical instrument digital interface." The connectors and cables resemble the ones for the Commodore serial bus (the cable between a Commodore 64 and a disk drive, for example). Essentially, a MIDI is a serial bus, also.

A MIDI keyboard can transmit both keypress information as the keyboard is played (including velocity sensitivity, if the keyboard has it) and any parameters stored in the synthesizer. These parameters might be, for example, preset instrument information and wheel settings (most synthesizers have small wheels to the left hand side of the keyboard which allow the user to bend the pitch or change some other aspect of the sound while they are playing).

MIDI works both ways, though, and the same information can be sent *to* a MIDI keyboard, so the music can be played by another keyboard or a computer.

Several MIDI interfaces and software packages are available for the Commodore 64. Commodore 64's are used a lot with keyboards now, even non-MIDI ones, because they are inexpensive, and have lots of I/O—ways to "talk" to keyboards—including the parallel user port, the serial bus, the game ports, and the expansion cartridge port.



STEVE EARLY

I have three diskette "records" that include well known songs by popular artists such as Billy Joel, Olivia Newton-John, Wings, Hall & Oates and the Beatles.

A company that produces some very interesting MIDI products for the 64 is Passport Designs in Half Moon Bay, California. This small but expanding company created one of the early keyboard add-ons for the Apple, and some exciting multi-track recording, sheet music printing and editing software. They are now working mainly with MIDI keyboards and computers, and they market both software and a MIDI interface for the Commodore 64, allowing it to communicate with any MIDI-equipped synthesizer and drum unit.

Passport's MIDI interface looks like a game cartridge and, like one, plugs into the expansion port. The difference, however, between it and a usual cartridge is that it has three cables coming out of it, each of which ends in a connector that looks like the CBM serial port. These three connectors are labelled IN, OUT and DRUM. Most synthesizers equipped with MIDI interfaces, such as my Yamaha DX-7, have three MIDI connections on the back marked IN, OUT and THRU. IN implies information coming from some outside source which will be going INTO the synthesizer to program or play it. This must be connected to OUT on the Commodore 64 MIDI interface, where information from the computer will be coming OUT. Similarly, IN on the MIDI interface, must be connected to OUT on the synthesizer, since this is how information goes from the synthesizer into the computer. The THRU port on the synthesizer simply mirrors what is coming into IN so that the information coming into the synthesizer, can also be sent on to some other device as well, such as a drum synthesizer or another keyboard.

These connections allow the computer to record what a person plays on the synthesizer keyboard. They also let the computer itself play the synthesizer. In other words, the computer can either play back the same information it's recorded from the synthesizer or transmit to the synthesizer a tune composed on the computer.

Besides the hardware (the MIDI interface), Passport offers some excellent software, including three "records," which are diskettes with music on them, and multi-track recording software. For example, I have three diskette "records" that include well known songs by popular artists such as Billy Joel, Olivia Newton-John,

SOFTWARE REVIEWS

Wings, Hall & Oates and the Beatles, ten classical pieces and a single track polyphonic recording program.

When I received the Passport products, I eagerly plugged in the interface without reading the manual, of course. I plugged the cables into my synthesizer and turned it on. I then turned on the computer, and did a LOAD"*",8 with the Beatles diskette in my 1541. I waited a minute or so, and was prompted by a menu of songs of which I could select any number, and the software then played them in order. I was amazed! The software obviously could not know how many voices the attached synthesizer had, so it assumed a minimum of six. (Mine has 16, so it had "room to spare.")

Not only could I select the instrument on which I wished to hear the music played, but I was able to play along! This is because the synthesizer is merely receiving an additional source of keypress information from the computer. Needless to say, I had a ball listening to the Beatles tunes, and then all of the other two diskettes full. The software was consistent in its operation, which I definitely approve of, although one minor detail was that the loading message was a little more informative on some than others (obviously some of the software was newer than the rest).

As I mentioned, my MIDI sampler "record" also has a one-track polyphonic recorder. This is easy to use, and allows users to record what they play in the computer's memory and save it on disk. At a later time, this music can be loaded back in and played, using the MIDI sofware. The recording remembers changes of instruments and all control information used while playing (pedals for example) if the synthesizer sends this information out of the MIDI. Additionally, the software (as all should) provides a disk directory, format, and delete file functions from a menu.

In addition to the software above, I received MIDI/4, a multi-track recording and sequencing software package. A "sequencer" by the way, is a sequence of notes which repeat over and over. Bass lines often do this. MIDI/4 can record four tracks of playing, and the user can make any, and even all of the tracks a sequencer, or "loop" as it is referred to in the excellent manual that accompanies the software.

Additionally, MIDI/4 can merge two recorded tracks together, freeing up tracks for additional playing. The tempo can be changed before or after recording, so that, for example, someone can play something slowly and have it played back very fast. Also, there's an excellent "cheat" for those who only like to play in the key of C major, for example (all the white keys). The playback can be transposed into other keys from zero (unchanged) to 99 semitones. Therefore, if you want to hear something in the key of D, and you originally played it in C, you simply transpose it +2 semitones (the difference between C and D). Also, the software uses the Commodore 64's SID chip to provide a handy metronome, which helps the user keep a steady tempo.

Something that ought to be made clear here is that the tracks don't have to be recorded independently of each other. When one records, all previously recorded tracks are played back.

MIDI/4 can optionally record aftertouch information. What is "aftertouch" you say? Some synthesizers allow the user to play a note and then press the key harder to bring in an effect (vibrato for example). I use this for instruments like trumpets so I can hold a note, and then press harder to add vibrato at the end. MIDI/4 has the recording of this information only as an option, because it consumes a lot of memory. That's because it has to keep track of aftertouch information through the entire duration of the note.

In conclusion, Passport Designs is putting out some useful software and hardware for amateur and professional musicians. Those of you who were wondering where to go for the next step in electronic music may find that your 64 can play an important role in that music. The only thing a computer recording facility can't do is do multi-track recording in different instruments. This is because a synthesizer (most, anyway) can't play different instruments simultaneously. However, for composing and arranging, the 64 can be a handy and compact recording studio when used with software such as that offered by Passport Designs. C

REVIEWED BY LARRY GREENLEY

Commodore's New Modem/300

The Modem/300 telecommunications package includes terminal software called HiggyTerm all the wires and connectors you need for all the possible setups.

Commodore has just made telecomputing easier than ever with the new Modem/300 telecommunications package. The Modem/300 is a low-cost auto-answer, auto-dial, 300-baud modem designed for the Plus/4, Commodore 64, SX-64 and VIC 20 computers. Advanced features like Touch Tone or rotary dialing and a built-in speaker make the Modem/300 so easy to use, it does most of the work.

For those of you who are unfamiliar with the subject, telecommunications, sometimes referred to as telecomputing, uses standard telephone lines to allow computers to communicate with each other using a special interface called a modem. When a computer receives information, the modem translates (DEModulates) the electrical signals from the telephone into digital signals the computer can understand. As a computer sends information, the modem translates (MODulates) the signals back again so that they can be returned over the telephone lines.

The new Modem/300 technology is a quantum leap (far, to say the least) ahead of other low cost "modemware." The Modem/300 automatically dials the phone for you when you originate a call to another computer. And it automatically answers the phone for you when your computer receives a call.

The Modem/300 supports both rotary and Touch Tone dialing. It is compatible with most telephones, so you don't have to worry about additional connectors or interfaces. It has a built-in speaker so you can hear exactly what is happening when you originate a call to another computer. In short, the Modem/300 is probably the most sophisticated modem available in its price range.

The Modem/300 telecommunications package includes terminal software called *HiggyTerm* (don't ask why), all the wires and connectors you need for all the possible setups, and a free subscription to and one free hour on the CompuServe Information Service.

CompuServe houses the popular Commodore Information Network (CIN), which contains the Commodore electronic bulletin boards and the Commodore software data bases. An electronic bulletin board is a public storage area like a regular bulletin board, except the messages are stored in a computer rather than being tacked to a corkboard. The data bases hold hundreds of programs including graphics, educational programs games and handy utilities, that you can save to your own diskettes at no extra charge.

CompuServe also contains information on almost any subject you can think of, including up-to-the-minute world, national and financial news, stock quotes, an on-line encyclopedia, shop at home services, educational (trivia) games and much more.

The *HiggyTerm* software included with the package allows you to upload (send) and download (receive) both text and program files to and from other computers. This means you can send and receive text messages to and from the Commodore Information Network electronic bulletin boards. You can also save programs from the CIN data bases. Through uploading, you can send messages and program listings to your fellow computerists.

The Modem/300 also puts you in touch with on-line conferences, where users from all across the country can meet and converse. You can even get on-line with the computer at your school or office because the software can support most standard control (Control C, Control P, Control S, etc.) codes and protocols (baud rate, duplex, parity, etc.). All this is available for the cost of the telecommunications package, an hourly CompuServe fee* and the cost of a local telephone call (unless you live in the real boondocks) to one of the hundreds of CompuServe satellite computers across North America.

Once you connect your modem and the appropriate cables (following the precise documentation), your tele-

Continued on page 126

REVIEWED BY TOM BENFORD

Super Box 64

Computer: Commodore 64
Manufacturer: Handic Software
530 Fellowship Road, Suite B206
Mount Laurel, NJ 08054

Super Box 64 is a most accurate name for this product, since the features it contains are indeed super! Designed specifically for the Commodore 64, Handic's Super Box 64 is a three-slot expansion card *plus* a "warm start" reset switch *plus* an IEEE-488 parallel interface, all neatly packaged in one unit.

The Super Box 64 is well constructed of metal using premium-grade electronic components, and quality workmanship is evident throughout. Handic is a leading manufacturer of Commodore-compatible peripherals and software in Europe, and the first is now breaking into the American market. Judging by the quality and performance of the Super Box, they'll receive a warm reception from Commodore users here in the U.S.!

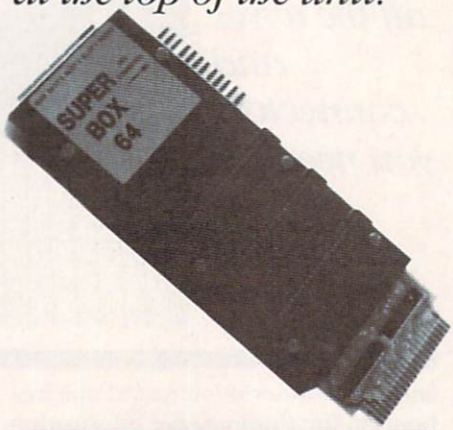
The Super Box plugs into the cartridge port of the 64 and provides the user with three expansion slots for game and/or applications cartridges. Each slot of the Super Box is selectable via a switch at the top of the unit.

A red switch is also included at the end of the row, and this one functions as a "warm start" (also known as a "warm boot") switch. This is, in itself, a very handy feature, since it allows resetting the computer without destroying the contents of certain memory locations in the machine.

For instance, if you're using *Easy Script,* using this reset switch after the program is loaded will allow you to clear the screen of text and reconfigure *Easy Script* without having to reload it. I've found this to be a real time saver, since I usually use a dot matrix printer for my manuscript rough drafts (printer type zero), then reconfigure for daisywheel (printer type three) to print out the final version. There are many, many other uses for a reset switch beside this.

Having three cartridges on board all at the same time is another convenience feature that you'll learn to love.

The Super Box plugs into the cartridge port of the 64 and provides the user with three expansion slots for game and/or applications cartridges. Each slot of the Super Box is selectable via a switch at the top of the unit.



For instance, with Super Box 64 you can have *Simons' BASIC, EasyCalc* and *Satan's Hollow* all "ready to roll" at the touch of a switch without the bother of shutting the computer off, removing one cartridge, inserting another and turning it back on again! It's really a boon if you use a lot of cartridge-based software.

I've saved the best for last—that's the IEEE-488 interface feature of Super Box 64. IEEE-488 is a form of parallel data transmission protocol used by Commodore PET computers and peripherals. "Yes, but I have a 64, not a PET," you're thinking to yourself, right? With Super Box 64, you can have the best of *both* worlds—read on!

The Commodore 2031 single disk drive and 4040 dual disk drives owned by many Commodore users' read and write data in essentially the same format as the trusty 1541. The principal difference is that both the 2031 and 4040 drives are *parallel* devices, while the 1541 is a *serial* drive.

The important thing to remember here is that parallel is a *faster* data transmission protocol. The 64 is a serial-protocol computer, but with the Super Box, it's able to address parallel devices, such as these two high-speed disk drives and other PET peripherals as well. I'll bet you're starting to see the advantages I'm driving at, right?

To give you an idea of how much of a speed difference there is, consider that in serial transmissions, data is sent *one bit* at a time, while in parallel transmissions, it's sent *one byte* (8 bits) at a time. Analagously speaking, a serial device receives or sends one *letter* at a time, while a parallel device handles one *word* at a time. (This is only meant as an example to illustrate the difference in speed—don't take me literally on this point!)

One of the nicest features about the Super Box is that it doesn't use up any precious RAM to operate. Handic cleverly engineered a way for the unit to pick up operating power by using a *jumper wire* that connects to a resistor inside the 64 case. Now, don't get frightened away because of this; it's really simple to install and it doesn't require any soldering or electronics knowledge. The documentation supplied with the unit clearly shows the correct resistor in a photograph, and it attaches easily with an alligator clip—the whole installation takes about five minutes to complete.

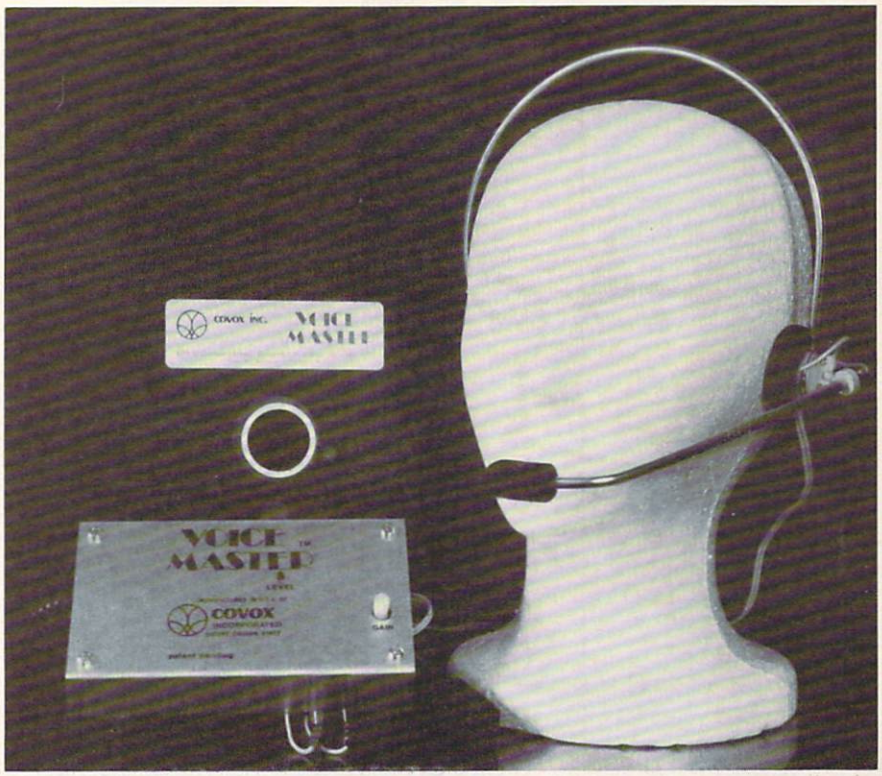
The other end of the jumper connects to the Super Box with a slide-on connector that can be undone quickly if you wish to remove the unit. The jumper-wire arrangement may seem awkward at first, but it really is the most efficient way of making the connection. Remember, also, that you only have to install the jumper once—then you can forget about it. When you weigh the advantages you'll gain against the slight effort it takes to install this jumper, you'll agree that it's not much of a bother at all.

I've been using my Super Box for a couple of months now, and I simply *love* it. Everything works fine, I haven't had any problems with it, and it's been a great asset in helping me to use my 64 more efficiently. I wonder how I ever got along without it! C

REVIEWED BY JAIME WILCUTTS

Voice Master

Computer: Commodore 64
Manufacturer: Covox
675D Conger Street
Eugene, OR 97402



Vocal computer programs are no longer an expensive hardware investment. However, many inexpensive systems have built-in vocabularies and phonics which can limit the potential for creative software development. Voice Master, a program development tool by Covox, allows you to create your own vocabulary files using the hardware and then reproduce that vocabulary *without* the hardware, so your vocabulary is virtually unlimited.

The Voice Master package consists of a hardware module which plugs into the joystick port, a head-set microphone for digitalizing your speech, and several programs to aid in developing your own software. Since the hardware is "pitch sensitive," you can even sing your vocabulary. The system can record whole phrases at once and the "pitch sensitivity" gives an accurate reproduction of the word inflections.

The new model Voice Master's head-set microphone is an important improvement over the former hand-held model. This frees both hands for keyboard work, but more importantly, it holds the microphone in the same position, making the recording quality more consistent.

The software included in the package contains several utility programs, the most important of which is "Voice Master." This program adds ten new commands to BASIC, allowing you to record and play back words and phrases as well as change the quality of speech recorded and reproduced.

Commands

The LEARN X command is used to digitally record a spoken word or phrase into memory. X is a number from zero to 63 and identifies the recorded word. You can record 64 words or phrases at a time and store that 64-word file on disk or cassette with the command PUT"filename",8 (drop the ,8 for cassette). The number of files is limited only by storage space.

The LEARN command variable X can be a calculation or can be read from a data line. The clearly written documentation provides several ideas for creating programs for recording vocabulary.

Because the microphone is "sound actuated," the LEARN command does not have an effect until input from the microphone is received. Normally, recording will stop when you stop speaking. However, if there is too much background noise, the LEARN function will continue until information has filled the buffer, approximately ten seconds.

The SPEAK X command takes vocabulary learned by the 64 and reproduces it through the TV monitor. Again, X may be a calculation or read from a data line.

Files which have been put in storage can be loaded into memory with the FIND"filename",8 command. This allows several vocabulary files to be used within a program. A file containing 55 phonics, words and phrases takes approximately 17 to 18 seconds to load into memory. This time factor is not a problem when wise vocabulary management is used.

The monitor screen will normally blank out during play back, but you can stop this distraction by using the SCREEN N command. The screen will remain on when the value of N is any positive number and will not cause a change in the quality of speech.

The RATE N and SPEED N commands change the rate of digitalization and the speed of speech respectively. Both commands have 11 different values for N (zero to ten).

Sentences can be created by combining individual words and phrases from the vocabulary file. They can then be given a less mechanical inflection by using the PAUSE N command between some of the words. N can have a value of one to 255; a value of one equals .25 seconds, two equals .50 seconds, four equals one second, etc. The VOLUME N command may be used with values of zero to 15. But at low settings, the quality of reproduction begins to deteriorate.

Finally, the CLEAR command will clear vocabulary currently in memory without disturbing the program. A FIND command will automatically enter all vocabulary. The "Voice Master" program will not be eliminated by a NEW command.

Your BASIC program can incorporate the Voice Master vocabulary if

Continued next page

VOICE MASTER

you add "VM2.0" to your program. The "Play/Find" program can be used in the same manner if you only need to load vocabulary into memory and reproduce it. It is usually wise to put the "VM2.0" or "Play/Find" program on the same disk as your vocabulary files. The Voice Master package includes software for making backups of your programs.

The software includes a program called "Bar," which displays the frequencies and volume levels the microphone picks up. This can be valuable in obtaining the optimum recording quality from the system. The "Demo" program gives you a look at and a listen to the programs in the Voice Master package. It includes instructions which are helpful in developing an understanding of Voice Master.

Pragmatic Approach

In order to discover the "in's and out's" of the Voice Master system, I put together a database program for a blind friend. I used *Programming Kit #3* from Timeworks as a basis and added the Voice Master system.

Special attention was given to two elements in this project. The recording quality had to be good. Although my friend knows my voice, too much noise can be distracting, even irritating. Experimentation is the only way to find the optimum recording level. Remember that the monitor which reproduces the sound will have an effect on the final quality.

The management of vocabulary files was extremely important. I used three files which loaded into memory at different times. They had to be loaded so that time was not wasted. After all, my friend can flip through her braille files with great agility.

One part of the files is a "talking keyboard" vocabulary. The calculations for the X variable in SPEAK X used the ASC command. Therefore, the order of the vocabulary was important, as it is in all calculations involving vocabulary. Vocabulary planning is most important.

The sound of the Voice Master is a bit noisy, but within acceptable limits. This tool for creating verbal software is worth the cost and the commercial applications would be worthwhile, with some creative development and programming. The system can add a vocal dimension to programs at a minimal cost. C

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BY JANE REH

So You're Using Simons' BASIC

From Simons' BASIC: A Hands-On Approach

Do you know how much *Simons' BASIC* can do for your programs? This Commodore-extended BASIC, available on cartridge from Commodore, has so many commands, with so many options and possible command combinations, that it takes a lot of programming to find all that it offers—and it offers a good deal more than you may have found. Indeed, as was true with BASIC itself, reading the manual shows you only the "tip of the iceberg"!

This article will concentrate on just a few of the programming aids offered by S.B. *(Simons' BASIC)* and show you a few uses that you may not have discovered on your own. While I'm sharing my discoveries, I'll also point out a few "bugs" that you can correct in your S.B. manual.

ON ERROR/NO ERROR

As you probably know, error trapping is provided by the ON ERROR command, which allows you to avoid a "program crash" by branching to another part of the program when an error is detected. If you've been using the ON ERROR command to check for one specific error as shown in your S.B. manual, do this no more! Let the ON ERROR and NO ERROR commands do *all* the work for you. After using NO ERROR, you can display both the error number (ERRN) and the line number in which the error occurred (ERRLN). Your manual lists all of the errors trapped by ON ERROR on page 10-2.

Command format for ON ERROR:

Line Number ON ERROR GOTO Line Number

This command may be used anywhere in the program—at the beginning of your program or before that portion of the program where error trapping is required.

Command format for NO ERROR:

Line Number NO ERROR:

This is the command that ON ERROR will branch to, and can be used either at the end of the program or following that portion of the program where error trapping is necessary. Follow the NO ERROR command with a PRINT statement to display the value of both ERRN and ERRLN. ERRN will contain the error number, and ERRLN will contain the line number in which the error occurred.

To demonstrate these commands, the following program will trap five errors one at a time, as they occur. The errors are: illegal quantity, syntax, out of data, NEXT without FOR, and RETURN without GOSUB. After each error is trapped and the error and line number displayed, the incorrect statement will be edited, and the program rerun to trap the next error. This process will be repeated until all five errors have been found and corrected. First plug in your *Simons' BASIC* cartridge and turn on your 64.

ENTER: AUTO 10,10

and the following program. (This command generates automatic line numbering, beginning with line number 10 and incremented by 10.) The command illustrated is shown to the left of the program listing, and the error numbers are shown in parentheses to the right of the statements containing an error.

Command *Illustrated*		*Error #*
ON ERROR	10 ON ERROR:GOTO 150	
	20 PRINT "[CLEAR"] TAB(520) "TITLE IS ERROR"	(14)
	30 GOSUB 120	
	40 FOR I=1 TO 5	
	50 READ D	(13)
	60 FOR J=1 TO 3	
	70 PRONT I,J,D	(11)
	80 NEXT I	
	90 GOSUB 120	
	100 NEXT J	(10)
	110 DATA 15,25,35,45	
	120 REM SPACING ROUTINE	
	130 PRINT:PRINT	
	140 RETURN	(12)
NO ERROR	150 NO ERROR:PRINT "ERROR #"; ERRN;	
ERRN		
ERRLN	"IN LINE";ERRLN	

RUN the program.

The error message reads ERROR #14 IN LINE 20. List line 20. The quantity given for TAB is an illegal quantity, since it exceeds 255.

Figure 1. Accessing the 16 Function Keys

Function Number	f Key Only	f Key and SHIFT Key	f Key and CMDR Key	f Key and CMDR and SHIFT Keys
1	f1			
2		f2		
3	f3			
4		f4		
5	f5			
6		f6		
7	f7			
8		f8		
9			f1	
10				f2
11			f3	
12				f4
13			f5	
14				f6
15			f7	
16				f8

Edit line 20 read:

```
20 PRINT TAB(52)
                "TITLE IS ERROR"
```

This statement line will cause the title to be printed in the center of the second screen line.

Run the program again to trap the next error.

The error message reads: ERROR #11 IN LINE 70. List line 70. The syntax error is obvious; PRINT is misspelled.

Edit line 70 to correct the misspelling:

```
70 PRINT I,J,D
```

To locate the next error, enter RUN.

This error message reads ERROR #13 IN LINE 50. List line 50. There is either a missing data statement or insufficient data values in the data statement. To find out which is the case:

```
ENTER: FINDDATA
```

(The FIND command searches a program for a user-specified code, in this case DATA, or a character string, and displays the line numbers of each occurrence.) The response to the FINDDATA command is 110. List line 110 and add the value 55 to the end of the statement line. This statement should now read:

```
110 DATA 15,25,35,45,55
```

On to the fourth error! Enter RUN.

The error message reads: ERROR #10 IN LINE 110. List the program. The problem is crossed loops. Lines 80 and 100 must be edited as follows:

```
80 NEXT J
100 NEXT I
```

Now for the last error in this program. Run the program.

The error message reads: ERROR #12 IN LINE 140. There is no division between the main program and the subroutine. To correct this, enter the following statement line.

```
115 END
```

When the program is error free, ERRN will contain the number 128, which means there are no errors, and ERRLN wil contain the line number of the last statement line read.

Run the program.

The message displayed is: ERROR #128 IN LINE 140, telling you that there are no further errors that the program's error trapping can detect in the program.

Since the program is now error free, remove the error trapping and display statements.

```
ENTER: 10 [RETURN]
       150 [RETURN]
```

Run the error-free program.

Of course, each of your programs will have a different error or errors needing trapping. Fortunately, *Simons' BASIC* will be a very big help!

Do not clear memory. You can use this program with the next two *Simons's BASIC* commands.

KEY and DISPLAY

Simons' BASIC provides 16 function keys—eight more than Commodore BASIC—and all 16 keys are programmable. You can program these keys for any Commodore or *Simons' BASIC* commands. This is especially useful for S.B. commands, enabling you to assign commands using your preferred parameters and eliminating the need for default parameters. For example, if you usually set line numbering at 10,10, you would program a function key as: AUTO 10,10.

The method of accessing the sixteen functions is shown in Figure 1. Note that the odd numbered functions, f1 through f5, only require the function key to be pressed, and the odd numbered functions f9 through f15 require pressing function keys f1 through f5 *and* the Commodore logo key. The even numbered keys are always accessed while pressing SHIFT; f2 through f4 use the function key and SHIFT, while f10 through f16 use the f2 through f4 function key *and* the CMDR *and* SHIFT keys. (Correct the typographical errors for key accessing given on page 2-2 of your S.B. manual.)

The KEY command is used to program the function keys to enter user-specified commands. You choose the function key and the command that is assigned, as shown below.

Command format:

```
KEY function key number,"command"
```

The function key number is, of course, any function key number, one through 16. The command can be any *Simons' BASIC* or Commodore BASIC command. The length of the command is limited to 15 characters, and must be enclosed in quotation marks. Exceeding the 15-character limit will not cause an error message; the command will simply be truncated to 15 characters! This is an easy mistake to catch, since you will be using DISPLAY to list your function key commands.

If you haven't programmed your function keys yet, enter the following commands to program functions f1, f2,f9,f10,f13, and f14.

With *Simons' BASIC* in place:

```
ENTER:KEY 1,"RUN"
KEY 2,"PAGE 10"
KEY 9,"LIST"
KEY 10,"PAGE 0"
KEY 13,"NEW"
KEY 14,"OLD"
```

As soon as the function key is pressed, the command programmed for that key will appear on your screen. You need only press RETURN to enter the command.

Press f1 and RETURN to run the program.

Press SHIFT f2 and RETURN to enter the PAGE 10 command. (The PAGE command breaks a program listing into individual "screen pages," each having the length specified in the PAGE command.)

Now list the program by pressing CMDR f1 and RETURN.

Turn off the PAGE command by pressing SHIFT,CMDR f2 and RETURN.

Again list the program by pressing CMDR f1 and RETURN.

Clear memory by pressing CMDR f5 and RETURN.

Return the program to memory by pressing SHIFT,CMDR f6 and RETURN. (The OLD command retrieves a program cleared from memory by the NEW command.)

This clearly demonstrates the benefits of assigning commands to the function keys. However, the assignments are even more useful when a carriage return is included as part of the function key command. This eliminates the need to press the RETURN key. To do this, add + CHR$(13) to the KEY command.

Command format using the carriage return:

```
KEY function key number, "command" + CHR$(13)
```

To change the f1 and f9 commands to include a carriage return,

```
ENTER: KEY 1,
       "RUN" + CHR$(13)
       KEY 9,
       "LIST" + CHR$(13)
```

Press f1 to run the program, then

Continued on page 126

BY LYNN MINNITI

Automatic Disk Back-Up and Retrieve

The following programs will automatically transfer all your disk programs to tape or from tape back to disk. In this way, you can store your back-ups more safely for long periods.

If you have a disk drive, you know how important it is to make back-up copies of all the programs you've spent countless hours writing. Disks are the most vulnerable type of secondary storage there is and strange things can happen to them. For this reason, large companies almost always use more durable magnetic tape instead of disks for long-term storage.

Home hobbysts, however, almost always use disks for back-up, even if they have a datassette which gives them the means to transfer disks to tape. They use disks because of the countless hours it would take them to transfer all their back-up disks to tape. This excuse can no longer be used, however, because the following programs will automatically transfer all your disk programs to tape or from tape back to disk. In this way, you can store your back-ups more safely for long periods.

Using "Disk-to-Tape"

Carefully type in the program as listed and save a copy before running it. This is important, because "Disk-to-Tape" erases part of itself after it is run the first time. Make a menu list of the disk you want to back-up. Turn your computer off and on to clear it out ("Disk-to-Tape" uses addresses that must be zeroed, and the off-on approach accomplishes this). Load "Disk-to-Tape" and run the program.

You will be asked to input the first program name, then the second and so on. Type in the whole menu, or just the programs you want to copy. Be sure to spell the names correctly, because this is the file name that will be searched for on the disk. If you misspell a name you'll get a FILE NOT FOUND error and although the program will still continue, the misspelled program will not be entered on your back-up tape.

When all the names have been entered, type END. The program will end and prompt you to SAVE "Disk" ON DISK YOU WANT TO COPY. Be sure to save the program under the name of "Disk."

Now, turn your computer off and on to clear it out again, and load the program you just saved as "Disk." Place a blank tape in your datassette and run the program. You will now be asked to PRESS RECORD AND PLAY. Follow this direction and sit back and relax. "Disk-to-Tape" will copy all the programs on your disk. When it's finished, it will tell you so on the screen.

You will find that a full disk will require slightly over one hour's worth of tape to save. When the tape runs out, the datassette will shut off and program execution will pause and await action from you. The screen will display PRESS RECORD AND PLAY. This is your cue to place a new tape in the datassette, and follow the screen instruction. The program will now continue by re-saving the last program it was working with. If you use a C-90 tape (45 minutes per side), you will have to switch tapes only once. You should understand though, that Commodore does not recommend using a tape this long.

Since you will probably be saving "Disk" on a disk that is almost full, it should be obvious that some space (blocks) will have to be left free for the program. The storage requirements for "Disk" vary, because the more programs you are copying, the more data statements you need, which in turn means more storage will be required. As a general rule, try to leave seven to ten blocks free on your disk. This should easily handle all situations.

Unfortunately, one solution to a problem often creates another. Now that you've spared yourself the grief of manually copying all those programs, you shouldn't have to go through that same agony if you ever have to copy the tape you just made back to disk. Enter "Tape-to-Disk" . . .

"Tape-to-Disk" is similar in operation to "Disk-to-Tape," but easier to set up. If the need ever comes to transfer one of your back-ups (or any tape) to disk, "Tape-to-Disk" will be a nice program to have at hand; it will do it all for you automatically.

Using "Tape-to-Disk"

Type in "Tape-to-Disk" and save a copy. Next, load it and save a copy under the name "Tape" on the disk to which you're going to transfer the programs from your back-up tape. (If your disk is new, don't forget to initialize it.) Place the back-up tape in your datassette, and the disk with the program "Tape" on it in your disk drive. Run the program and PRESS PLAY ON TAPE, as the prompt instructs. All the programs on the tape will now be transferred to your disk under the same title used on the tape.

A cassette, however, is a sequential storage medium. That is, it has to run through the first program in order to get to the second, the second to get to the third, etc. Your computer will not have any way of knowing when the last program on the tape has been loaded. It will keep running until it hits the end of the tape and the datassette shuts off. At this point, everything will pause and the program will wait for action from you. If you are finished, you can shut things down. If you have more tapes to save, you will now place your next cassette in the datassette and press PLAY. The program will continue until the tape runs out.

How the Programs Work

The omission of remark statements will make both programs difficult to follow. This is a necessity as the speed and efficiency of the programs require that they be as short as possible. Also, the special eraser lodged in "Disk-to-Tape" will not allow any extra line numbers to be placed in the first part of the program.

As you read how these programs work, you may get the impression that the screen will be a mass of confusion

during program execution. You will not see any screen printing, however, because all of the characters printed to the screen are the same color as the screen background. If you desire to see what is going on, leave the color commands out of lines 10 and 70 in the "Disk-to-Tape" program, and line 10 in the "Tape-to-Disk" program.

Disk-to-Tape

The key to "Disk-to-Tape" is a series of dynamic keyboard sequences. Lines 2–15 are data-entry lines. Line 3 starts a loop that allows the user to enter four program names as PR$. Lines 6 and 7 are counters that will increment the data statement line numbers on which the program names will be entered. Once you complete a loop, line 10 prints the incremented line number plus the program names on the screen as a data statement. If you are continuing to add program names, line 12 will print GOTO 3 on the screen below the data statement and then send the cursor home. Line 13 then loads the keyboard buffer with carriage returns and ends the program. The END command causes the carriage returns to be spilled out of the keyboard buffer one at a time and fools the computer into thinking they are being typed in at the keyboard. This is called a dynamic keyboard routine. In this case, the cursor enters a RETURN on the data statement that has been printed on the screen, which enters the data statement into the program. Another carriage return is then entered on the direct command GOTO 3 which starts the loop over again.

The process will continue until you type the word END. At this point, line 8 will test true and branch the program to line 10, where it again prints the data statement and then allows line 11 to test true. Line 11 will now print on the screen GOTO 14. The program then executes line 13, which again runs the cursor through the necessary RETURN's which will now branch the program to line 14. Lines 14 and 15 simply erase lines 2–15, which are not needed anymore. Now, you have the main program with data statements entered that contain all the names of your programs on the disk.

Once saved on the disk you are going to reproduce, reloaded and run, line 18 will instruct you to PRESS RECORD AND PLAY, while line 19 checks to see if the record and play buttons on the datassette are shut off. At this point they should be off, so line 19 will test true and branch the program to line 100. Line 100 will wait for you to follow the screen instruction, and then the program will move to line 110. If you've followed instructions so far, line 110 will test true and return the program to line 20. Line 20 is a counter that will keep track of the program to be read and searched for in line 50. After line 55 checks for the END you placed in the data statements earlier, lines 70–80 format the screen with the commands:

```
LOAD"(PROGRAM NAME)",8
SAVE"(PROGRAM NAME)"
NEW
LOAD"DISK",8
POKE 198,0:RUN
```

(However, as explained earlier, you will not see this activity.) After the cursor is sent home at the end of line 80, line 90 then loads the keyboard buffer with carriage returns that enter each command as it travels down the screen.

Once the cursor enters the bottom screen command, the keyboard buffer is cleared of any remaining carriage returns and the whole process will start over again. The second time through, the program is exactly like the first time, except location 786 will force line 50 to read the next program to be loaded and saved. The whole process runs over and over again until the test in line 55 tests true, which will end the program and give you the prompt on the screen, FINISHED.

You will find that a full disk will require slightly over one hour's worth of tape to save. When the tape runs out, the datassette will shut off and program execution will pause and await action from you.

If the tape runs out before all programs are copied, the datassette will shut off and the save will default, forcing line 19 to again test true and send the program to line 100. Here the program will wait for you to switch tapes and to PRESS RECORD AND PLAY. Once done, line 110 will now test false and allow line 120 to execute. This line will poke address 787 to one less than present so when the program resumes, the last program being saved will be read and saved again. The reason for this is that the tape probably ran out before the last program was completely saved. For safety, the first program saved on the new tape will be a duplicate of the last program saved on the old tape.

Tape-to-Disk

"Tape-to-Disk" is similar in operation to "Disk-to-Tape" in that it uses dynamic keyboard methods of operation. But here data statements are not needed because your tape will automatically title the programs to enter on your disk.

Line 5 will instruct the operator to PRESS PLAY on his datassette. Line 6 will wait until this is done and then the program will execute lines 10–40 which print the necessary format commands to the screen:

```
LOAD
PRINTCHR$(19):FORP = 1TO2:PRINT
CHR$(17):NEXT:
PRINT"A$ =  "CHR$(34)
SAVEA$,8
LOAD"TAPE",8
POKE198,0:RUN
```

Lines 50–60 will then load the keyboard buffer, with cursor controls and carriage returns.

The command statement line 20 creates is an important key to the operation of "Tape-to-Disk." When the first LOAD statement at the top of the screen is executed, the cassette will start running and load the first program to which it comes. As you know, when the datassette finds a program, the screen displays FOUND (PROGRAM NAME). Here, the command line 20 has created prints A$ = ", which erases the word FOUND, but keeps the (PROGRAM NAME) in tact. The keyboard buffer will then dump two cursor ups and enter a carriage return on this A$ command and A$ will then be assigned the (PROGRAM NAME). The buffer will then use some

more RETURNs to save the program to disk under the (PROGRAM NAME), load the "Tape" program back into the computer and start the process over again. This cycle will keep repeating until the tape runs out, at which time the datassette will shut off.

Additional Hints on Using the Programs

Both programs are dumped from memory and then re-loaded after your back-up program is copied. Therefore you will be able to copy programs to the full memory capabilities of your computer. (Memory expanders can also be used.)

Each back-up session will take much longer to complete than the length of the tape you use suggests. Don't forget—for every program loaded from or saved on tape, two programs must be loaded and/or saved from/on disk. This increases total transfer time significantly.

When using "Disk-to-Tape," the remote possibility exists that your tape will run out and shut your datassette off during the gap that is placed between programs on the tape. In other words, the program in memory never starts dumping on the tape. If this happens, everything will stop and you will not get the PRESS RECORD AND PLAY display on the screen. Don't panic. Simply place a new tape in the datassette, press record and play, and the program will continue without incident.

Neither program will copy protected software, files, or some machine language programs. C

Tape to Disk VIC 20

```
4 REM**TAPE TO DISK/VIC-20**BY
  L.MINNITI*****
5 PRINT"[CLEAR,BLACK,DOWN4]
  PRESS PLAY ON TAPE"
6 WAIT 37151,64,64
10 PRINT"[CLEAR,WHITE,DOWN2]LOAD"
   :PRINT
20 PRINT"[DOWN5]?C[SHFT H](19)
   :F[SHFT O]P=1TO2:?C[SHFT H](17)
   :N[SHFT E]:?"CHR$(34)"A$=[SPACE2]
   "CHR$(34)"C[SHFT H](34)"
30 PRINT"S[SHFT A]A$,8"
   :PRINT"[DOWN4]L[SHFT O]
   "CHR$(34)"TAPE"CHR$(34)",8"
35 PRINT"[DOWN4]POKE198,0:RUN"
40 PRINT"[HOME]";
50 POKE 198,15:FOR T=1 TO 2
   :POKE 630+T,13:NEXT:POKE 633,19
55 FOR T=1 TO 5:POKE 633+T,17:NEXT
60 POKE 639,13:FOR T=1 TO 2
   :POKE 639+T,17:NEXT:FOR T=1 TO 4
   :POKE 641+T,13:NEXT:END
```

Disk to Tape VIC 20

```
2 POKE 786,0:REM********DISK TO
  TAPE/VIC-20******BY L.MINNITI******
  ***
3 FOR T=1 TO 4
4 PRINT"[CLEAR,BLACK,DOWN3]
  PROGRAM NAME?":PRINT"[DOWN3]TYPE-
  [RVS]END[RVOFF]-WHEN FINISHED[DOWN2]
  "
5 INPUT PR$(T)
6 POKE 786,PEEK(786)+1
7 Z=PEEK(786)
8 IF PR$(T)="END"THEN 10
9 NEXT
10 PRINT"[CLEAR,WHITE,DOWN3]
   "(496+Z)"D[SHFT A]"PR$(1)",
   "PR$(2)","PR$(3)","PR$(4)
11 IF PR$(4)=""OR PR$(4)="END"THEN
   PRINT"GOTO14[HOME]":GOTO 13
12 PRINT"GOTO3[HOME]"
13 :POKE 198,2:POKE 631,13:POKE 632,13
   :END
14 PRINT"[CLEAR,WHITE,DOWN2]"
   :FOR T=2 TO 16:PRINT T:NEXT
15 PRINT"[BLACK,DOWN3]SAVE-[RVS]DISK
   [RVOFF]-ON DISK YOU WANT TO COPY"
16 PRINT"[HOME]":POKE 198,15
   :FOR T=1 TO 15:POKE 630+T,13:NEXT
   :END
18 PRINT"[CLEAR,BLACK,DOWN3]
   PRESS RECORD AND PLAY"
19 IF PEEK(37151)>100 THEN GOSUB 100
20 POKE 787,PEEK(787)+1
30 D=PEEK(787)
50 FOR C=1 TO D:READ A$:NEXT
55 IF A$="END"THEN PRINT"[CLEAR,BLACK,
   DOWN5,RIGHT6]FINISHED":END
70 PRINT"[CLEAR,WHITE,DOWN3]L[SHFT O]
   "CHR$(34)A$CHR$(34)",8"
75 PRINT"[DOWN5]S[SHFT A]"CHR$(34)A$
   :PRINT"[DOWN3]NEW"
80 PRINT"[DOWN2]LOAD"CHR$(34)
   "DISK"CHR$(34)",8":PRINT"[DOWN4]
   POKE198,0:RUN[HOME]"
90 POKE 198,10:FOR T=1 TO 10
   :POKE 630+T,13:NEXT:END
100 WAIT 37151,64,64
110 IF PEEK(787)=0 THEN RETURN
120 POKE 787,PEEK(787)-1:RETURN
```

Tape to Disk C-64

```
4 REM**TAPE TO DISK/COM-64**BY
  L.MINNITI***'BKBL
5 PRINT"[CLEAR,WHITE,DOWN4]
  PRESS PLAY ON TAPE"'BAKJ
10 PRINT"[CLEAR,BLUE,DOWN2]LOAD"
   :PRINT'CBAA
15 PRINT"[WHITE,DOWN3]SAVE-[RVS]DISK
   [RVOFF]-ON DISK YOU WANT TO
   COPY"'BAUM
20 PRINT"[DOWN4]?C[SHFT H](19)
   :F[SHFT O]P=1TO2:?C[SHFT H](17)
   :N[SHFT E]:?"CHR$(34)"A$=[SPACE2]
   "CHR$(34)"C[SHFT H](34)"'DISN
30 PRINT"S[SHFT A]A$,8"
   :PRINT"[DOWN4]L[SHFT O]
   "CHR$(34)"TAPE"CHR$(34)",8"'EJPI
35 PRINT"[DOWN4]POKE198,0:RUN"'BATI
40 PRINT"[HOME]";'BBFA
50 POKE 198,15:FOR T=1 TO 2
   :POKE 630+T,13:NEXT:POKE 633,
```

```
   19'IBXL
55 FOR T=1 TO 5:POKE 633+T,17
   :NEXT'GMAM
60 POKE 639,13:FOR T=1 TO 2
   :POKE 639+T,17:NEXT:FOR T=1 TO 4
   :POKE 641+T,13:NEXT:END'OIOR
```

Disk to Tape C-64

```
 2 POKE 786,0:REM*******DISK TO
   TAPE/COM-64****BY L.MINNITI********
   *'CEON
 3 FOR T=1 TO 4'DDSD
 4 PRINT"[CLEAR,WHITE,DOWN3]
   PROGRAM NAME?":PRINT"[DOWN3]TYPE-
   [RVS]END[RVOFF]-WHEN FINISHED[DOWN2]
   "'CBYO
 5 INPUT PR$(T)'BGOE
 6 POKE 786,PEEK(786)+1'DKAH
 7 Z=PEEK(786)'CGUH
 8 IF PR$(T)="END"THEN 10'DIMK
 9 NEXT'BAEH
10 PRINT"[CLEAR,BLUE,DOWN3]"(496+Z)"D
   [SHFT A]"PR$(1)","PR$(2)","PR$(3)",
   "PR$(4)'CFRH
11 IF PR$(4)=""OR PR$(4)="END"THEN
   PRINT"GOTO14[HOME]":GOTO 13'HPTI
12 PRINT"GOTO3[HOME]"'BADB
13 :POKE 198,2:POKE 631,13:POKE 632,13
   :END'EVEG
14 PRINT"[CLEAR,BLUE,DOWN2]"
   :FOR T=2 TO 16:PRINT T:NEXT'GIDH
15 PRINT"[WHITE,DOWN3]SAVE-[RVS]DISK
   [RVOFF]-ON DISK YOU WANT TO
   COPY"'BAUM
16 PRINT"[HOME]":POKE 198,15
   :FOR T=1 TO 15:POKE 630+T,13:NEXT
   :END'JWBN
18 PRINT"[CLEAR,WHITE,DOWN3]
   PRESS RECORD AND PLAY"'BASM
19 IF PEEK(1)>40 THEN GOSUB 100'FISK
20 POKE 787,PEEK(787)+1'DKCB
30 D=PEEK(787)'CGYB
50 FOR C=1 TO D:READ A$:NEXT'FHMF
55 IF A$="END"THEN PRINT"[CLEAR,WHITE,
   DOWN5,RIGHT6]FINISHED":END'FDYO
70 PRINT"[CLEAR,BLUE,DOWN3]L[SHFT O]
   "CHR$(34)A$CHR$(34)",8"'DKAJ
75 PRINT"[DOWN4]S[SHFT A]"CHR$(34)A$
   :PRINT"[DOWN3]NEW"'DHBN
80 PRINT"[DOWN2]LOAD"CHR$(34)
   "DISK"CHR$(34)",8":PRINT"[DOWN4]
   POKE198,0:RUN[HOME]"'EJFP
90 POKE 198,10:FOR T=1 TO 10
   :POKE 630+T,13:NEXT:END'IVRO
100 WAIT 1,16,16'BHHV
110 IF PEEK(787)=0 THEN RETURN'FGPA
120 POKE 787,PEEK(787)-1:RETURN'ELWB
```

BY SHLOMO GINSBURG

Home University

On Polynomials, Part 2: Trial and Error

The majority of equations, including polynomial equations of order five and higher, do not have a closed-form solution. This does not mean that we shall not seek the solutions of such equations. On the contrary, we have here a bigger challenge.

It is well known that a linear equation

$$ax + b = 0 \quad (1)$$

has a solution

$$x = -b/a \quad (2)$$

provided that "a" does not equal zero. If "a" equals zero, we say that x is infinite.

The quadratic equation

$$ax^2 + bx + c = 0 \quad (3)$$

has two roots

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (4)$$

The cubic equation

$$ax^3 + bx^2 + cx + d = 0 \quad (5)$$

has three roots (for "a" not equal to zero), which were explained in Part 1 (July/August, 1984). Even some more complicated equations, not necessarily polynomial equations, may have closed-form solutions. For example, the trigonometic equation

$$\sin x = 0 \quad (6)$$

has an infinite number of solutions given by

$$x = 0, \pm\pi, \pm 2\pi, \pm 3\pi, \ldots \quad (7)$$

The majority of equations, including polynomial equations of order five and higher, do not have a closed-form solution. This does not mean that we shall not seek the solutions of such equations. On the contrary, we have here a bigger challenge. We shall see that the computer is an ideal tool for solving such complicated equations.

Before discussing the first numerical procedure for this class of problems, the trial-and-error approach, we shall briefly describe a solution procedure found in many textbooks—guessing.

Let us try to solve the following cubic equation

$$x^3 - 6x^2 + 11x - 6 = 0 \quad (8)$$

The "game" begins with a "wild guess." For example, we might guess that $x = 1$ is a solution. Next, we verify that indeed

$$1 - 6 + 11 - 6 = 0$$

Now we can divide Equation 8 by $(x - 1)$ to obtain

$$x^2 - 5x + 6 = 0 \quad (9)$$

which is a quadratic equation with roots $x = 2, 3$ (verify that by using Equation 4). Therefore, it is possible, sometimes, to reduce the order of the equation, to obtain one which has a closed-form solution.

Of course, in the case of Equation 8, there exists a closed-form solution, so we need not reduce it. But this case is a simple demonstration of the more general procedure. Apparently, success is dependent on a good guess, which, in general, cannot be made. For instance, try to guess a root of

$$x^3 + 1.34x^2 - 3.225x + 7.0912 = 0$$

The idea of guessing is not as bad as it may seem, but we need to make an "educated guess" instead of a "wild guess." The trial-and-error approach consists of a series of systematic "guesses" or trials, which lead, step by step, toward the solution. In order to demonstrate the procedure, we shall refer again to Equation 8.

First, we need to define an interval or range of x in which we search for a root. This interval may be one in which we assume the solution may lie—an interval which is relevant to the problem, or even one in which we know the solution must exist. Of course, we may search for solutions over the entire range of the definition of y. Note that we need not guess a *solution* at all.

For Equation 8, we shall try to find a root within the closed interval $[0, 4]$—that is $0 < x < 4$.

Next, we choose an initial point in our interval. Here, we begin with $x = 0$. Now we evaluate the expression

$$y = x^3 - 6x^2 + 11x - 6 \quad (10)$$

at $x = 0$. We get $y = -6$. We define a step which leads us from the current point to the next trial

$$x = x + \text{step} \quad (11)$$

We choose our step to be 0.3, so that our new trial point is $x = 0 + 0.3 = 0.3$, corresponding to $y = -3.213$.

We proceed with Equation 11, and we may use the same step, or we can change it. Here, we shall take $x = 0.3 + 0.3 = 0.6$, with $y = -1.344$. We continue with $x = 0.9$, $y = -0.231$, and $x = 1.2$, $y = 0.288$.

At this point, we must stop for a moment. Note that y changes sign when we move from $x = 0.9$ to $x = 1.2$. According to the Intermediate Value Theorem, there exists a value of x which is larger than 0.9 and smaller than 1.2, for which $y = 0$.

It is easy to grasp the idea behind the theorem intuitively. Since the function y is continuous, and it goes from negative to positive values in the open interval (0.9, 1.2), it must pass through $y = 0$ at some point x within that interval.

So, we have narrowed down the region in which we search for a root. But we must take a step *backwards* (negative) from $x = 1.2$, and this step should not be of the same magnitude as the last one (or else we shall return to $x = 0.9$). So, we choose the new step to be half the previous step, $-0.3/2 = -0.15$. Our new $x = 1.2 + (-0.15) = 1.05$ corresponds to $y = 0.092625$.

Since this last value of y is still positive, it is necessary to take another step backwards. Of course, we must taken an even smaller step now, or we shall return to $x = 0.9$ $(1.05 - 0.15 = 0.9)$. So, we choose a step of $-0.15/2 = -0.075$, and our new trial point is $x = 1.05 - 0.075 = 0.975$.

For this value, we get $y = -0.0051890625$, which is negative. That is, the function changes sign

again, and we must step *forward* again. Our next step is 0.075/2 = 0.0375, which results in x = 0.975 + 0.0375 = 1.0125, y = 0.024533203.

Next, we take a step of −0.01875, x = 0.99375, and y = −0.012617432. We shall stop here with an approximation for the root, that is, x = 0.99375, instead of the true root x = 1. The entire process is summarized in Figure 1.

The procedure used for finding an approximation to the first root of Equation 8 can be continued to find the other two roots. Also, the trial-and-error procedure can be used for solving other types of equations, not just polynomial equations.

It should become quite obvious that a graph of the function under consideration is very useful in determining the interval in which to search, as well as the starting points. As a matter of fact, graphical solutions often provide a very good approximation. With high-resolution computer graphics and use of plotters, the graphical solution may well be the best approach in many cases.

The trial-and-error procedure described here for Equation 8 can be performed interactively or automatically. The program at the end of this article demonstrates application of the procedure for Equation 8. Of course, it is possible to use the program for other equations too. All that is needed is to use the expression that interests us in lines 150 and 190. Finally, it should be mentioned that, in order to obtain a solution automatically, a convergence criterion must be specified. That is, we must tell the computer when to stop.

The idea of guessing is not as bad as it may seem, but we need to make an "educated guess" instead of a "wild guess."

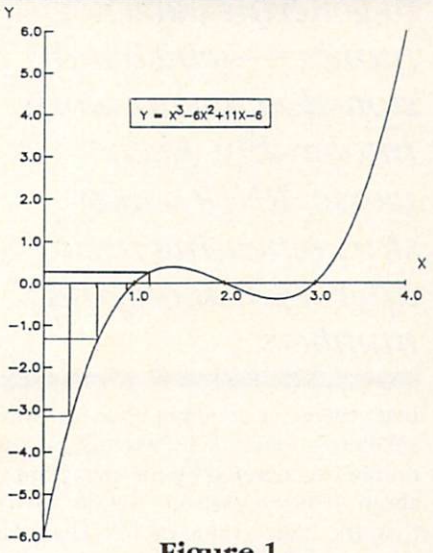

Figure 1.

Acknowledgement goes to Pedro Vargas for help in preparing this graph.

Warning: do not use a test such as

IF Y = 0 THEN [operation] (say, stop the process) since we have seen that, in general, y does not become identically zero. Therefore, you may want to use a measure, such as 0.0001 (or any arbitrary, but significant value) and test convergence by using

IF ABS(Y) < 0.0001 THEN [operation]

One of the shortcomings of the trial-and-error procedure described here is its slow rate of convergence. That is, it might take many computations of y before getting a root.

Sometimes we may accelerate the process by doubling the step, as long as the function does not change sign. If we adopt that procedure in our example, Equation 8, we shall find the second root instead of the first one (using the same initial step as before). By appropriate choice of step size we can solve Equation 8 for all three roots.

References

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Ginsburg, S., "On Polynomial Equations, Part 1: The Cubic Equation", Commodore Microcomputers, Vol. 5, No. 3, July/August 1984.

Trial and Error

```
10 REM ****************************'BC
   CB
20 REM *     -TRIAL AND ERROR-
   *'BRWD
30 REM *      SHLOMO GINSBERG
   *'BQGE
35 REM * USE FOR ANY EXPRESSION
   *'BVYK
40 REM *     BY CHANGING LINES
   *'BRFF
45 REM *        150 AND 190
   *'BLEH
50 REM ****************************'BC
   CF
60 POKE 53280,11:POKE 53281,0'CQLG
70 PRINT"[CLEAR]";'BBDE
80 PRINT"[RVS,WHITE,SPACE12]
   TRIAL AND ERROR[SPACE11]";'BBPL
90 PRINT"[SPACE11]SHLOMO GINSBERG,
    1984[SPACE10]"'BABN
100 INPUT" INITIAL POINT";X'BCWY
110 INPUT" INITIAL STEP";S'BCNA
120 INPUT" CONVERGENCE CRITERION";
    C'BCCE
130 REM'BARX
140 I%=0:K=1'CGIB
150 Y=X*X*X-6*X*X+11*X-6'JLSJ
160 PRINT"[CLEAR]CYCLE=";I%;"X=";X;
    "Y=";Y'BJJH
170 IF ABS(Y)<C THEN 280'EHIG
180 X=X+S:GOTO 260'DHKG
190 Y=X*X*X-6*X*X+11*X-6'JLSN
200 PRINT"CYCLE=";I%;"X=";X;"Y=";Y'BIIB
210 IF ABS(Y)<C THEN 280'EHIB
220 J%=SGN(Y1)*SGN(Y)'EJKC
230 IF J%<>1 THEN K=0.5'FHWD
240 S=K*J%*S'DFFD
250 X=X+S'CDTD
260 Y1=Y:I%=I%+1'DJFG
270 GOTO 190'BDJE
280 PRINT"[DOWN3,RVS,SPACE13]
    THAT'S ALL FOLKS[SPACE11]"'BAVM
290 STOP'BASF
```

BY MARK ZIMMERMANN

Random Thoughts *Generating "Good" Random Numbers*

What if you need to get millions of random numbers for a computer experiment? BASIC's RND(1) takes several milliseconds to generate each number—which may slow down your work intolerably. Even worse, RND(1) may start repeating itself after a few thousand numbers.

Previous columns have discussed random number distributions and how to use them. Most of the time, BASIC's function RND(1) is a fine source of random numbers between zero and one. But sometimes it's not!

What if you need to get millions of random numbers for a computer experiment? BASIC's RND(1) takes several milliseconds to generate each number—which may slow down your work intolerably. Even worse, RND(1) may start repeating itself after a few thousand numbers, and totally fail to give you honest results. And what if you're not using BASIC at all? You'll need to write your own routine to produce random digits, then.

Loops and Traps

Many years ago, I was using a simple program to generate what I thought were "random numbers." The program was suggested by a calculator manufacturer (who should have known better!) and went like this:

```
100 B = (PI + A)↑5
110 A = B − INT(B)
```

In this routine, PI equals 3.1415926 and A starts out with some "seed" value between zero and one. Thereafter, every time the routine is called, A takes on a new "random" value between zero and one.

It's a terrible method, for several reasons. First of all, it's *slow!* Raising a number to the fifth power involves calculating a logarithm, multiplying by five and exponentiating, all of which usually takes 1/30th of a second or more. Secondly, the random numbers generated aren't smoothly distributed, even in theory. If you analyze the algorithm mathematically, you'll find that there is a slight bias toward smaller numbers. The average of the numbers generated by the algorithm is about 0.4999 part in 10,000 lower than the "fair" value of 1/2. That bias may seem small, but it could be important in some critical numerical experiments.

But worst of all, the above routine doesn't stay random for long! If it's called repeatedly, it falls into a trap, a closed loop, generating the same sequence of "random" numbers over and over again, *ad infinitum.* The details of the trap depend on what computer you run the program on, how many significant digits it calculates, etc. On a typical machine, the cycle of numbers repeats every 600 or so calls to the routine, and it takes only 1000 or so calls to fall into the cycle.

Random Road Maps

How, you may ask, does one detect such a trap? One way would be to store each random number generated in a big array. Then, with every new number produced, you could scan back looking for duplicates. If the random number generator is deterministic (so that it always gives the same sequence when started out with the same "seed" value), then as soon as you find a duplicate value, you know the program has fallen into a trap. From that point on, values generated will repeat in sequence forever.

Here's a simple example: suppose your random number generator uses the algorithm above, but the computer keeps track of only one digit after the decimal point. Then starting out with a seed value A = 0.1, the generator produces:

.9 .4 .2 .6 .3 .8 .4 .2 .6 .3 .8 .4 . . .

As you can see, after taking two steps the generator fell into a trap. It repeats the series .4 .2 .6 .3 .8 over and over from then on, forever. That's not very random!

A good way to think about what's happening is to imagine you're looking at a road map. The cities are numbers, the possible results of the random number algorithm. The roads are one-way highways that connect numbers in the order in which they are generated.

Try drawing out the map for the one-digit sample above. Besides the numbers you see there, you need to find out what happens for the other possible input sends. It turns out that 0.0 just leads to 0.0 forever, a very tight loop (or a dead-end, if you prefer). Similarly, 0.7 gives 0.7 as the result. Starting out with 0.5 gives 0.4 as the next value, which gets you into the loop .4 .2 .6 .3 .8 we saw earlier.

The same mapping procedure works for any deterministic random-number generator. On your home computer, of course, the maps will be much bigger. If your machine keeps nine significant digits, for instance, you'll have a billion cities and as many roads to plot.

What's important about these random road maps is not the detailed linkage of the towns. You really want to know how big the closed loops on the map are, and how likely you are to fall into a small trap. It's a very interesting mathematical problem to work out the theory of random maps, and maybe we'll get into that in a future column. For now, the main thing to notice is that there *must* be closed loops, since there are only a finite number of towns. A town may have many roads feeding into it, but each town has exactly one road coming out of it. If the connections among towns are chosen randomly, the average size of a closed loop is about SQR(N)

where N is the number of towns. On the average, you take about SQR(N) steps before you fall into a closed loop. And the chance of falling into a loop of length one (infinite repetition of a single number) is about 1/SQR(N). Our old friend, SQR(N), is returning with a vengeance!

Trap Detection

If the loops that your random number routine leads to are big, it may be tough to detect them. The simple approach of saving all generated numbers in a big array may use up all your memory space before a loop closes. There is, however, a better way.

Look at your road map. Imagine two cars starting out at the same point, driving from town to town, but with one car going twice as fast as the other. Every time the slow car reaches the next city, the fast car has moved along two cities farther.

What will happen when the one-way roads lead into a closed loop? Eventually, the faster car will "lap" the slower one. By the time the slower car has made it around the closed loop once, the faster car will have gone around twice. At some point during that process, the two cars will have to be in the same city simultaneously—a "collision"! If the cars are not in a closed loop, they will never, of course, collide.

Do you see now how to detect traps in a random number generator? All you have to do is to simulate the two cars and watch for a collision. Start out by storing a seed value in variables X and Y. Call your random number generator once, using X as the seed, and store the result in variable X again; reset the seed to Y and call the generator twice, storing the result in Y. If X = Y, you have collided. If not, reset the seed to X and repeat.

It's a little tricky to do this in BASIC with the RND(1) function, since you have to find the RND storage area and peek/poke the values there to read/set the seed. See your computer reference manual for details, which may depend on what system you're running. Many years ago, when I tried this experiment with the Commodore PET, I found that the BASIC RND generator fell into closed loops of length 10,000 or so, long enough to be "random" for most practical purposes.

This random number generator is guaranteed *to produce 100,000 different five-digit random fractions before it repeats.*

Ideal Random Generators

What sort of random road map would be "best" for a random number generator to produce? If you want a lot of numbers, you want the loops to be as big as possible. Ideally, there should be one huge loop that includes all of the billions of numbers.

Also, you'd like there to be no "obvious" relationship between one number and the next generated. You could imagine a sequence that went 0.000000001, 0.000000002, 0.000000003, etc., starting over at zero after 0.999999999. It would have a loop a billion numbers long—but it wouldn't be very "random"!

People have tried many complicated mathematical formulas to generate random numbers. But it's funny—most of the complicated routines aren't very good! When a formula gets too complex to analyze completely on paper, it usually develops flaws that show up at the most unexpected times. The old engineer's slogan still holds: K.I.S.S. = "Keep It Simple, Stupid!"

The best random number generator for general use is the "multiply, add, and truncate" rule. Take the previous random number (or an initial seed value between zero and one). Multiply it by a chosen large, unpatterned number that has about half as many significant digits as your machine normally handles. Add a fractional number (between zero and one). Then truncate (throw away the integer part, leaving only the fraction to the right of the decimal point).

The multiplier should not have any simple patterns in its digits; that is, don't choose something like 111111 (decimal or binary). I like the value 31421 myself. For an additive constant, I use 0.21133. So, my personal algorithm goes:

```
100 B = 31421 * A + 0.21133
110 A = B - INT(B)
```

where A is the random number. For speed in BASIC, you may want to define the constants 31421 and .21133 as variables earlier in the program. That way they don't have to be translated from decimal to binary every time you execute line 100, and the program will work much faster.

This random number generator is *guaranteed* to produce 100,000 different five-digit random fractions before it repeats, if your computer is multiplying and adding accurately enough. The random fractions pass all of the best tests of randomness in their distribution. Note that the leading (most significant) digits are "more random" than the trailing digits. So, if you want to generate random numbers between one and N, just take the fractions from the formula, multiply by N, add one, and take the integer part.

Test of Randomness

Ways to test random number generators is a subject for a textbook itself. I'll just mention a few of the better tests here. Realistically, you should be spending more time *using* the numbers you generate than *testing* them!

Simple statistical tests can be used to insure that the average distribution of your random numbers is good. For instance, the mean value of N random numbers should come out about 1/2, within roughly plus or minus 1/SQR(N). If many trials give a result too far from 1/2, that's grounds for suspicion. A mean value *too close* to 1/2 is equally bad! Really random numbers should have some fluctuations about the mean.

A very powerful test is the "runs test," in which you look at the average length of ascending (or descending) runs of random numbers. For example, in the sequence .9 .5 .7 .8 .2, the middle three digits are an ascending run of length three. If you tally up the number of runs of length one, two, three, etc., you can compare the results with the theoretically expected result: the chance of a run of length K is 1/K! − 1/(1+K)!. Thus, runs of length one have probability 0.5, length two has chance 0.3333 . . . , length three has chance 0.125, length four has chance 0.03333 . . . , etc. (A

technical note: be sure to skip the number generated after the end of each run you tally. That number is biased (since it is a run-terminator) and is not a fair start for the next run.)

One more test for you to consider is a graphical one. Take two outputs of the random number generator. Convert the first into an X coordinate value, and the second into a Y value, and plot them on the screen. Repeat, until a picture builds up. The human eye is excellent in detecting subtle patterns—so if you see suspicious clusters of points or lines, consider flunking that random number generator! If you can work out three-dimensional plotting routines, you might try plotting triples of random numbers to look for three-point correlations too.

BASIC RND Function

A long time ago, when I first got my 8K original-model Commodore PET (with the calculator-style keyboard), I spent some time reading through the contents of the BASIC read-only memory chips. In particular, I studied the random number generator routines. The results were quite interesting.

Even if you're not mathematically inclined, you can still read Knuth for the anecdotes, history and practical pointers.

The BASIC RND function was very much like the "ideal" algorithm given above. It consisted of (effectively) a multiplication, addition and truncation. But on top of the good method given here, the designers apparently tried to "be a bit more random." They included instructions to the computer to swap a few of the bytes around in the final answer to make it "better."

In fact, this extra swap made things worse. As I mentioned earlier, the PET's RND function tended to fall into loops of length 10,000 or so, with the same numbers coming up over and over again in a long cycle. The simple "multiply, add and truncate" method would have avoided that.

How did I first discover the flaw in the generator? Actually, I was doing a computer experiment where random values accumulated in bins, plotted on the screen. I expected the differences between bins to fade away like 1/SQR(N) as more points were plotted. Instead, after 10,000 or so points, the differences stopped shrinking. I knew something had to be wrong then! The square-root-of-N rule won again.

Further Reading

There are many elementary statistics books which you can look into for further help in developing random number generators and tests. The best computer reference is probably Chapter 3 ("Random Numbers") in Knuth's *Art of Computer Programming,* Vol. 2, "Seminumerical Algorithms." Even if you're not mathematically inclined, you can still read Knuth for the anecdotes, history and practical pointers on random number generation. C

Progress at your own pace,

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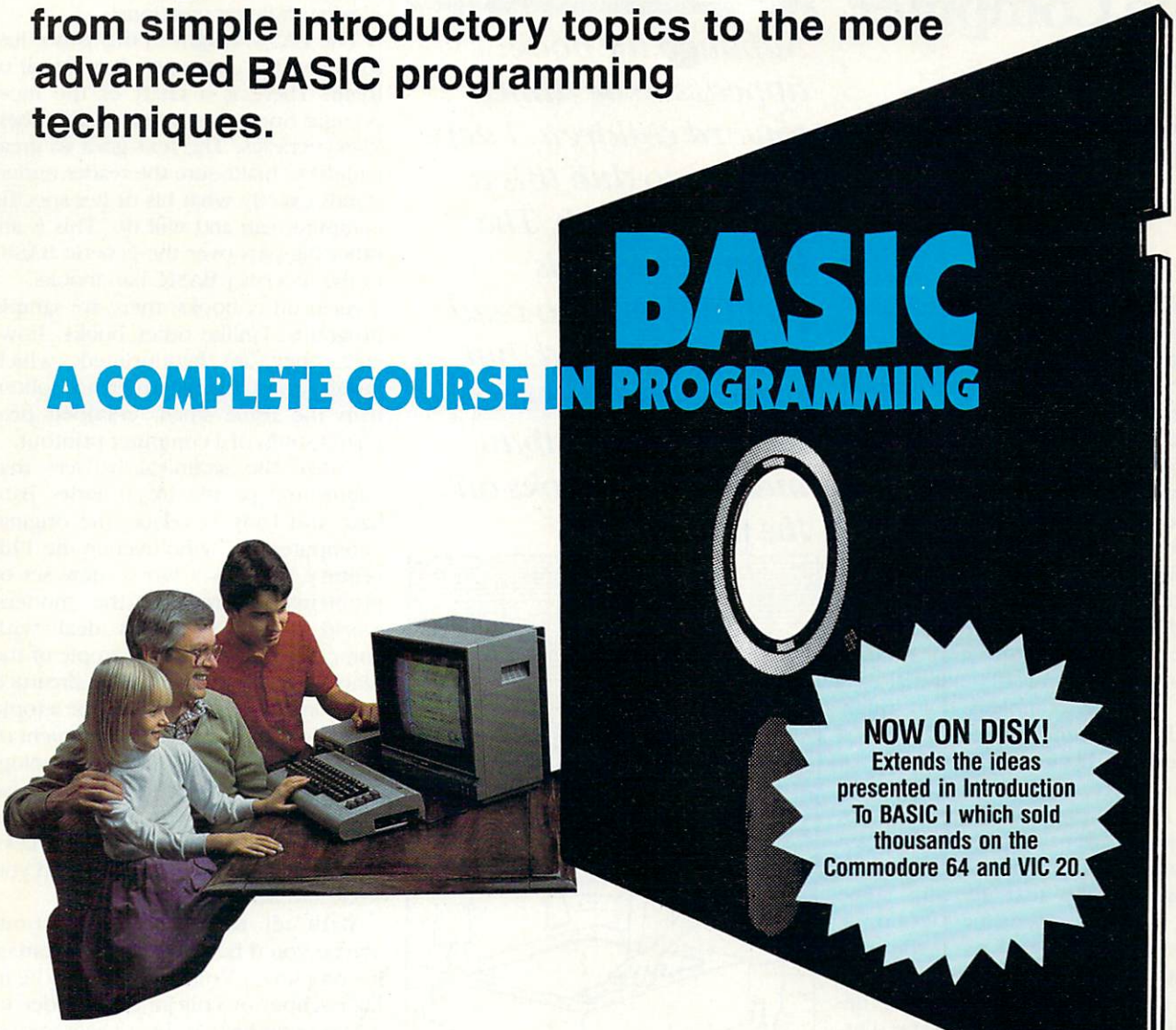


An excellent course for those who have mastered Commodore's Introduction To BASIC I as well as those who are total programming beginners. Interactive design exposes the user to a variety of programming techniques and challenging quizzes. A proven way to keep track of your learning progress. In addition, a comprehensive manual will guide you step by step through the various programs with an easy to use tutorial approach. A truly *complete* course. Whether you own a Commodore 64, Commodore 16, or Plus/4 there will be a version available for you. Look for it on your store shelf soon!

COMMODORE

EDUCATIONAL SOFTWARE

REVIEWED BY LINDA LEE

The Computer Primer

Author: Ann Cavanaugh
Publisher: Trillium
Box 921
Madison Square Station
New York, NY 10159

Author Ann Cavanaugh does an exquisite job of blending history, technology and practicality into *The Computer Primer,* subtitled "A Complete Guide for Gifted Beginners." *The Computer Primer* leaves little to the imagination. How ironic that a book dealing with such a sophisticated topic would be handprinted! But, this only adds to its charming appeal.

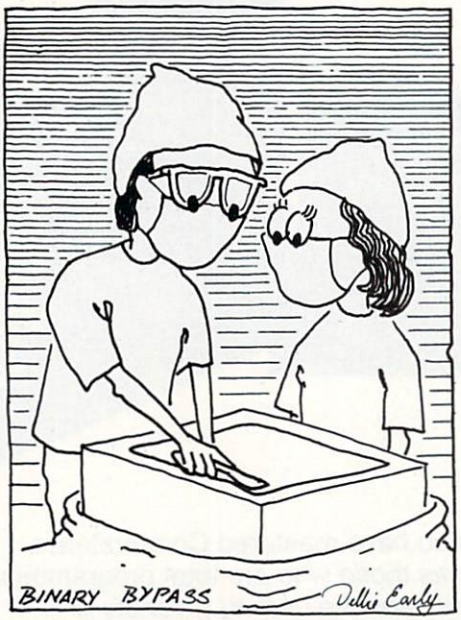
Although the book appears to be aimed toward children, I defy anyone to dub this a children's book. The language used is certainly easy to read and understand, but the material covered is more complete than many adult books on the market.

The book begins with a history of the computer, dealing with everything from fingers, digits and the abacus, to microcomputers. The hand-drawn characters, Chip and Cory, appear throughout the text to add some color. Their pertinent messages drive home points as well as guide you through the charts. Have you ever tried to verbalize the difference between batch processing and time sharing? The exercises throughout the chapters demand just that and much more. They really make you think.

One of the outstanding features is a chapter called "Binary Bypass." This chapter contains a rare chart that lists the "Illions." Starting with million, the list takes you right up to centillion, (303 zeros) and the rarely seen googolplex, ten and googol zeros. It also includes an in-depth look at the decimal system, charts on various number systems, metrics, where the months of the year and days of the week came from, and the binary system. Exercises on binary arithmetic and conversion practice from binary to decimal and back again are included.

The chapter on computer circuitry is a down-to-earth approach to a complicated subject. Do you know the difference between serial and parallel, why the binary system works so well for computers, or what people mean when they talk about switches? There's also a complete listing of ASCII codes.

Although the book appears to be aimed toward children, I defy anyone to dub this a children's book. The language used is certainly easy to read and understand, but the material covered is more complete than many adult books on the market.



Only after explanations of types of memory, the arithmetic-logic unit and flowcharting, does Cavanaugh approach BASIC. Of course, by this point, you literally know a computer inside-out. But, before you can begin programming, there is just one more thing. You must know how to type or programming can be a long, tedious task. So, included with the technical reading is a touch typing course, complete with finger positions!

The BASIC taught in this is not just for a specific computer. It is for all of them! There is a chart of the most popular home computers, listing their idiosyncrasies. The text goes to great lengths to make sure the reader understands exactly what his or her specific computer can and will do. This is another big plus over the generic BASIC or the speciality BASIC handbooks.

As in other books, there are sample programs. Unlike other books, however, they are handprinted, which makes them much easier to follow than the usual small, cramped program listings of a computer printout.

Unlike the technical barriers that confronted people like Charles Babbage and Lady Lovelace, the original "computerists," who lived in the 19th century, there is a whole new set of problems confronting the modern world. These problems deal with computer ethics. Would people of the nineteenth centry have ever dreamed that computer crimes would be a topic for legislators? Or that displacement of workers would result from technological advances? An intriguing exercise in this chapter asks you to be on a congressional committee and write laws governing computer ethics. Could you write and defend them?

With all this new information, maybe you'd be interested in a career in computers. You don't have to be in high school or college to consider it. Nor do you have to be a programmer or an engineer. *The Computer Primer* gives insight into various computer-related jobs that may be what you've been looking for.

Are we done yet? Not quite! In addition to the usual glossary and additional programs, the book is completed with charts containing geometric formulas, metric conversion formulas, and even planet weights. This is a big help when you are doing complicated programs and can't remember the formula for a cone or the conversion from pounds to kilograms.

The Computer Primer is ageless and timeless. Twenty years from now there will still be a place for the facts. Only one complaint. It should have been bound in leather. But then, a good book always looks dog-eared from use. C

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THE COMPATIBLE COMPUTER YOU'VE BEEN WAITING FOR

The name only hints at the power of this computer. With three completely different operating modes, this computer is more than simply an upgrade. It's almost like getting three computers for the price of one.

BY JIM GRACELY, TECHNICAL EDITOR

Ask a Commodore 64 owner what kind of computer they would like to see Commodore produce next. They would probably chuckle and say, "A compatible upgrade of the 64." Well, you can stifle that chuckle, because Commodore has done just that. The new computer, introduced in January at the Winter Consumer Electronics Show, is called the Commodore 128, and it's the one you've been waiting for.

The name only hints at the power of this computer. With three completely different operating modes, including the long awaited Commodore 64-compatible mode *and* CP/M, 40- and 80-column screen capabilities built in, a numeric keypad and the most extensive version of BASIC Commodore has ever released, this computer is more than simply an upgrade. It's almost like getting three computers for the price of one.

The Operating Modes

The Commodore 128 has three main operating modes with two submodes for a total of five possible configurations. Briefly, the three main modes are a Commodore 64 mode, a 128K mode with an extended version of BASIC, and a CP/M mode. The two submodes are optional 80-column screens in both the 128K and the CP/M mode.

The 128 defaults to the 128K mode with a 40-column screen when first powered up. If the 40/80-column key is down (locked like a shift lock) when the power is turned on, the 128K 80-column mode will be activated.

The two exceptions to this are when either a Commodore 64 cartridge is plugged into the expansion (game) port or the CP/M utility disk (included with computer) is in the disk drive when the computer is turned on. If a cartridge is plugged in, the computer will power up in the Commodore 64 mode. If the CP/M disk is in the optional 1571 disk drive, the computer will power up in the CP/M mode.

Once in the 128K mode, you can switch to either the 64 mode or the CP/M mode through BASIC commands. The command GO 64 will reset the computer into the Commodore 64 mode. The command "BOOT" with a CP/M disk in the drive will reset the computer in the CP/M mode.

Once the 128 is in the CP/M mode, an ASSIGN statement can be used to switch a 40-column to an 80-column screen.

The Commodore 64 Mode

In the Commodore 64 mode, the Commodore 128 is a 64. In other words, the internal architecture of the 128 in the 64 mode is identical to the 64 itself. When the 64 mode is initialized, the 40-column screen will display the familiar "38911 bytes free" message. The BASIC and Kernal ROMs are the same as in the 64 and both the SID chip and the VIC II chip are present.

What is the level of this compatibility? According to Commodore, all commercially available software for the Commodore 64 will run on the 128 in the Commodore 64 mode. In fact, when the 128 first powers up, it checks the expansion (game) port for a cartridge. If there is a cartridge for the 64 present, the 128 automatically switches to 64 mode and will run the cartridge.

Keep in mind, however, that the 64 mode does

mmodore 128

Personal Computer

not permit an 80-column screen, nor does it allow access to the 128K of RAM or the extended version of BASIC. If you have a favorite 64 program that you would like to run, this is the mode to be in. If you want to write your own game or applications package, then the 128K mode is definitely the place for you.

The 128K Mode

In the 128K 40-column mode, the computer is like a big Commodore 64. They aren't completely compatible in this mode, but everything you're used to will be there. The sound is generated with a SID chip and the screen is handled with the VIC II chip. Along with 128K of RAM, there is a 48K operating system running the extended version of BASIC.

The 128K of RAM is split into two 64K banks. The lower bank is for the text portion of BASIC programs. The upper bank is for the storage of variables, arrays and strings. This configuration allows a BASIC program to occupy a maximum of almost 64K regardless of the number or size of any

strings or arrays. Because of the power of the extended BASIC, a 64K program on the 128 is equivalent to a much larger program on a Commodore 64.

The 128K 80-column mode is the same as the 128K 40-column mode except that an additional video chip (8563) takes over from the VIC II chip. This new chip produces an RGB video output signal that is compatible with all RGB monitors. This new video chip still supports all the colors of the VIC II chip, and the bit-mapped screen modes.

Both of the 128K modes incorporate the numeric keypad, three banks of keys at the top of the keyboard (including the HELP key, the 40/80-column key and the four additional cursor keys). All Commodore 64 peripherals are compatible with the 128K mode (with the exception of the 1702 monitor when in 80-column mode). In addition, the 128K mode is also compatible with a new Commodore series of Commodore fast disk drives (both single and dual).

If you just plug in the computer and flip the power switch to ON, a 40-column screen will light up with the message 122365 bytes free. You are in the default mode of the computer with a 40-column screen and 128K of RAM available for programming. If you press and lock the 40/80 key on the top of the keyboard before turning on the computer, you will power up in the 80-column, 128K mode.

The CP/M Mode

In the CP/M mode, the 128 runs under CP/M Plus version 3.0 using a built-in Z80A processor. The CP/M mode will still allow access to both the SID chip and the VIC II chip, and defaults to the 40-column screen. Using an ASSIGN statement within CP/M, the video chips can be switched, creating an 80-column screen.

Although the CP/M Plus disk format is different from the CP/M disk format used on the 64, it will read any 64 CP/M disks. The new disk format allows more of the available disk space to be used for storage of files.

Extended BASIC Version 7.0

The extended version of BASIC, available within the 128K mode of the 128, is the most powerful version of BASIC ever created by Commodore. In addition to all of the commands, statements and functions of BASIC 2.0 (VIC 20 and Commodore 64) the extended version adds another 20 commands, 35 statements and 13 functions. There is also a built-in monitor with 14 commands.

If you want to get a quick feel for what this BASIC includes, just imagine the Commodore 64 with a Super Expander

The Modes

The Commodore 128 has three major operating modes with two additional sub-modes. These modes are as follows:

Commodore 64 Mode

> Standard Commodore 64 kernals are in place.
> BASIC 2.0 for operating system.
> VIC II chip for 40-column composite video output.
> SID chip for standard audio output.
> 64K of RAM available.
> Full compatibility with all Commodore 64 peripherals, including datasette, joysticks, user port and serial bus devices.
> Full compatibility with all 64 software on disk, cassette or cartridge.
> 8502 microprocessor at 1 Mhz.

Standard 128 Mode

> New Commodore 128 kernal.
> BASIC 7.0.
> VIC II chip for 40-column composite video output.
> SID chip for standard audio output.
> 128K of RAM available.
> Enhanced keyboard (numeric keypad, tabs, HELP key . . .).
> Full compatibility with all serial devices plus access to fast serial drive.

80-Column 128 Mode

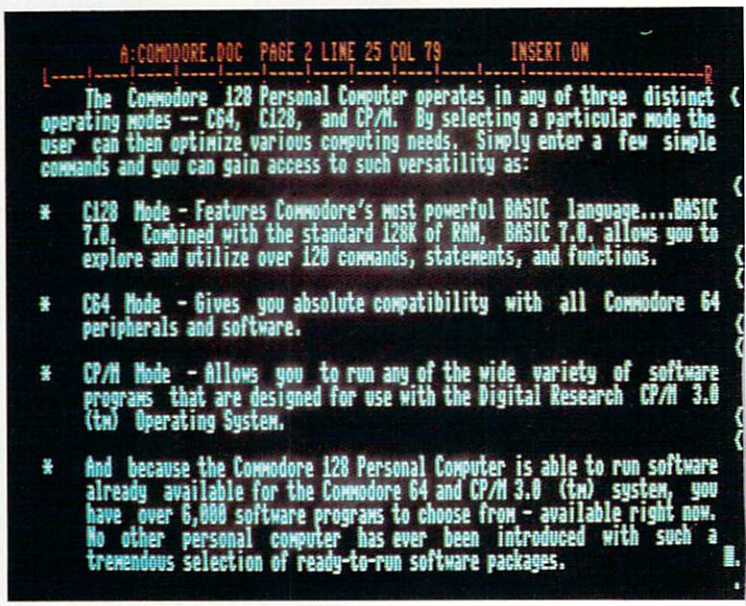
> Same as above except uses 8563 video chip instead of VIC II chip for 80-column RGB output.

Standard CP/M Mode

> CP/M version 3.0.
> VIC II chip for 40-column composite video output.
> SID chip for standard audio output.
> 128K RAM available.
> Enhanced keyboard.
> Full compatibility with all serial devices plus access to fast serial drive.

80-Column CP/M Mode

> Same as above except uses 8563 video chip instead of VIC II chip for 80-column RGB output.



cartridge plugged in, then add the structured programming commands and the programming aids from *Simons' BASIC,* and then throw in all of the BASIC 4.0 (PET/CBM) disk-handling commands.

The extended version of BASIC, available within the 128K mode of the 128, is the most powerful version of BASIC ever created by Commodore.

Graphic Commands

The graphic commands built into the Commodore 128 allows you to draw, move, fill and manipulate points, lines and shapes on a high-resolution screen when you are in 128K mode. Split screens with text and graphics are possible with a single command, and there are a number of commands specifically for working with sprites. Some of the new graphic commands are:

GRAPHIC: This command allows you to choose normal text screen, high-resolution screen, split screen with text and high-resolution, multicolor high-resolution or split screen with multicolor and text.

CIRCLE: This command allows you to draw all or any portion of any polygon anywhere on the screen, using any color, X radius, Y radius, rotation and angle between sides. This command has nine parameters to allow you to draw anything from an arc of a circle to a decagon.

BOX: This command allows you to draw a rectangle of any size anywhere on the screen. The rectangle can be rotated through any angle and can either be an outline or a filled-in shape.

PAINT: This command allows you to fill any closed area on the screen with any of the available colors.

DRAW: With this command you can draw a dot, a line between any two points on the screen or a shape (you can use multiple sets of points in the same command).

There are also commands to select single or double width lines (WIDTH), to print letters on a high-resolution screen (CHAR), select the colors for all sources (COLOR), locate the current pixel location (RDOT), or find the current graphic (RGR) or color (RCLR) mode.

The sprite commands can be considered a separate subset of graphics and include commands for setting up the sprites (SPRITE) and the sprite collision registers (COLLISION), moving the sprites (MOVSPR), and loading and saving sprites (SPRSAV). There are also two new functions to allow you to check for sprite collisions (BUMP) and request all the parameters for any sprite (RSPRITE), the speed and position of a sprite (RSPPOS) and the last sprite multicolor values used (RSPCOLOR).

Music

The extended version of BASIC in the new computer's 128K mode has five commands that make music much easier to work with. The five commands allow you to set parameters and notes for all three voices so that full three-part melodies

Anyone who is familiar with Commodore's PET/CBM computers will appreciate the power of the disk and file-handling commands that are included in BASIC 7.0

can be played. The commands are:

VOL: This is a familiar command that allows you to set the volume of the three voices.

ENVELOPE: The 128 predefined ten different instrument sounds that can be used with any of the three voices. If you want to change the settings for any of the sounds, this command allows you to modify the ADSR envelope, the waveform and the pulse width (for pulse waveforms).

FILTER: This command allows you to define all the parameters for filtering any of the three voices.

TEMPO: This command allows you to assign a tempo in which a defined set of notes is to be played.

PLAY: Allows you to play a string of notes including commands for the voice, octave, note duration, envelope and filter.

SOUND: Allows creation of complex sound effects.

A Monitor for All Modes

Some observant readers are going to realize that you can't use a 1702 monitor when the Commodore 128 is in the 80-column mode. The 1702 monitor is called a composite video monitor. The 128, however, requires what is called an RGBI monitor for 80-column mode. But since you can't use an RGBI monitor when working in 40-column mode, it would seem that you would have to own two monitors to use the 128. Luckily, this is not the case.

Commodore has announced a new monitor (tentatively called the 1902) which is selectable for either composite or RGBI or RGB analog input. The monitor is compatible with the Commodore 64, Commodore 16, Plus/4, Commodore 128 and other computers using either RGBI, RGB analog or composite output.

Most of the standard features are included such as built-in speaker, volume, color, tint, brightness and contrast controls. In addition, there is a 1/8" miniature headphone jack. If you like to play your games with the volume blasting, you can now do so without bothering the neighbors.

—Jim Gracely

Disk and File-Handling Commands

Anyone who is familiar with Commodore's PET/CBM computers will appreciate the power of the disk and file-handling commands that are included in BASIC 7.0 These commands include:

DIRECTORY/CATALOG: These commands let you view the disk directory without loading it into the computer. You can view either all the files, or use combinations of wildcards (*) and don't cares (?) to choose only selected files to view.

DSAVE/DLOAD: These are disk save and load commands. To save a file called TEST on your 1541, you just type DSAVE "TEST." To load the same file, use DLOAD"TEST."

DISK FORMATTING COMMANDS: There are separate direct commands for formatting a new disk (HEADER), scratching a file (SCRATCH), validating a disk (COLLECT), renaming a file (RENAME), copying files (COPY) and backing up a disk (BACKUP).

This version of BASIC also supports the DOPEN and DCLOSE commands for opening and closing disk files. Of special interest to relative file buffs is the RECORD command, which simplifies the command to select a record and move the record pointer.

Two disk commands have been added to aid in using the various banks of RAM in the 128. The BSAVE and BLOAD commands enable you to select the bank and addresses to save from or load to.

There are also two completely new disk commands added to this version of BASIC. DCLEAR will clear all open channels to the disk drive and BOOT will automatically load and run the specified disk file.

Programming Aids

The Commodore 128 has a number of commands to help you enter programs, debug programs and polish up programs when you are using 128K mode. Some of these commands are:

AUTO: Using this command will automatically put line numbers on the screen for you as you are entering a program, with a selectable line step.

DELETE: This command will allow you to delete any range of lines in your program. You can delete between a range of lines, up to a line, a single line or everything following a line.

HELP: If you run a program and get a syntax error, or a division-by-zero error, you now have some help. This command (also a separate key on the keyboard) will list the line with the error on the screen and display in reverse field whatever portion it thinks contains the error.

TRON and TROFF: These

two commands turn on and off the trace function on the 128. If you have trace turned on (TRON) when you run a program, as each line is executed, the line number is printed on the screen.

RENUMBER: This command will renumber the lines of your program, starting at any line with any line increment. This command *will* recalculate any GOSUB or GOTO commands that are in your program.

In addition to these programming aids, BASIC 7.0 also provides some programming commands to use within your programs, which give BASIC some of the power of PASCAL and FORTRAN. These include an IF . . . THEN . . . ELSE command, a DO/LOOP/WHILE/UNTIL/EXIT command, a PRINT USING command with accompanying definition command (PUDEF) and the combination of TRAP and RESUME commands for trapping errors within a program. There is also an extension to the IF . . . THEN statement using BEGIN and BEND to define any number of lines to be executed as part of the THEN condition.

Windowing is possible in 128K mode with the WINDOW command. In addition, an RWINDOW function returns the size of the current window and whether it is 40 or 80 columns.

For the machine language programmer, there is the addition of the RREG statement. This command will return the value of the A,X,Y and S registers upon the return from a SYS call.

There are also a couple of new functions included in BASIC 7.0. They include JOY, PEN and POT functions for reading the joystick, paddle and light pen ports, DEC and HEX$ functions for converting from hex to decimal and vice versa, an INSTR function to locate the position of one string within another, and an exclusive OR function (XOR).

The Monitor

The monitor that is built into the 128 is a very nice, Micromon-type monitor. The commands that are available are all the usuals with a memory dump (M), a load (L) and save (S) command, register display (R) and exit (X). In addition there are commands for assembling (A) and disassembling (D) code, comparing (C), transferring (T) and filing (F) memory. Not at all a bad little monitor to work with, and it's nice that it is always in memory and not lost on some disk somewhere. C

How About Some New Disk Drives?

Why buy a brand new upgrade computer if you can't buy a brand new upgrade disk drive to go along with it? Commodore asked that same question and decided to create two upgrade 1541 disk drives.

Yes, the plural noun implies that there is more than one new drive coming. "What? A dual drive?" you ask. How about a double-sided, dual disk drive compatible with the Commodore 64, Commodore 16, Plus/4 and the Commodore 128? If you're not seeing double, then how about a double-sided, *single* disk drive with the same compatibility? Either way you get twice the available space per disk (340K vs. 170K on the 1541) and a total of over half a megabyte (680K) on the dual drive.

Following in the footsteps of the 128, the new disk drive has three operating modes. Put the disk drive in the first mode and it acts just like a 1541. Nothing spectacular, but a good start. Both drives and both sides of the disk are available, but the transfer rate is the same ol' 1541 (about 320 characters per second). This is the mode which must be used when working with the 64.

Not fast enough for you? Then switch the drive into the second mode and it becomes a fast serial drive. This is one of the modes that the 128 can access. The speed is now getting much better. The transfer rate has increased more than six-fold up to about 2000 characters per second.

If you're in this second mode and using the 128 in CP/M mode then you get even a little more speed, with the transfer rate at 3500 characters per second.

The speeds we're now discussing are in the realm of 16000 to 28000 baud (16-28K baud). This is pretty darn fast! But, there are always those in every crowd who are speed demons. Need even more speed? Well the new drives can still deliver.

Using a special set of commands built into the 128, the drive can be used in what is being referred to as the "burst" mode. Contrary to what the name implies, the disk drive stays in one piece. The burst mode is a fast version of the fast serial drive. Now we are talking FAST. How about 15000 characters per second? This is almost 50 times faster than the 1541! The transfer rate in this mode is a staggering 12000 baud (120K baud). That should satisfy most people's speed requirements.

There are apparently some limitations on this mode that have not yet been made clear. However, this speed will be available when working with the 128 in either the 128K or CP/M modes.

Now, just in case you thought that I was done describing the disk drives, I must mention that I have not yet discussed mode three. No, it isn't a faster mode. (You must be kidding!) Rather, it is a mode that makes the disk drive compatible with a competitor's disks. Commodore didn't bother messing with any of the smaller companies, they went right to a biggie—IBM.

In this third mode, the disk drive is compatible with IBM System 34 CP/M disks. This is going to be especially interesting when using the 128 in the CP/M 3.0 mode. Now you not only have CP/M, but easy access to all of those programs out there!

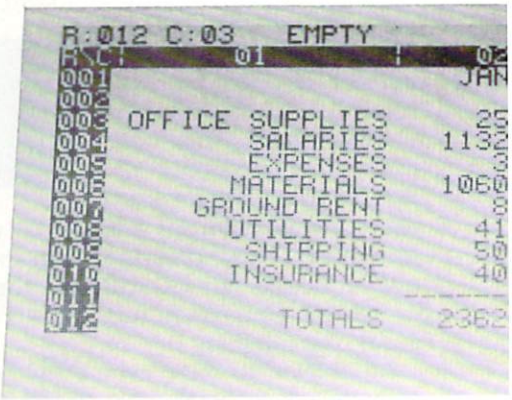
Here are two disk drives some may think are overdue, but Commodore has added so many goodies that it was almost worth the wait.

—Jim Gracely

Commodore Announces its LCD Lap Computer

FIVE POUNDS OF POWER

BY JIM GRACELY



Commodore's new LCD computer is lightweight (five pounds), notebook size and battery powered. Not only that, but it has integrated software and *a modem built in. With 32K of battery-supported memory (so you don't need a disk drive), you can carry all the computing power you need under one arm.*

Commodore has added a new type of computer to its line of products—a truly portable LCD computer. For those of you who think that this is a computer for your Low Cholesterol Diets, maybe I should define LCD. The letters stand for Liquid Crystal Display—the kind of display found on most digital watches.

One of the unique characteristics of this computer is its genuine portability. The SX/64, for instance, was a *transportable* computer, meaning you could take it with you as long as you took your software and blank disks along and could plug it in somewhere. The LCD, however, is completely self-contained. It runs on either four AA alkaline batteries or external power. It comes with eight applications programs built in and has enough RAM so that your files can be stored right in the computer. In addition, when you turn the computer off, the batteries maintain the data in RAM so that the next time you power up your files are still there. That means a disk drive isn't necessary for most common applications.

This is not a computer to compete in the same market as the Commodore 128 and the Plus/4. It is a utilitarian computer for those of you who need a small (2.18" x 11" x 11.75"), light (five pounds), portable computer for use on the road, in the classroom, or simply in a remote room in your house.

Keyboard and Screen

The LCD's keyboard looks very similar to the Plus/4's keyboard. There are 72 keys, including eight function keys and four separate cursor keys. The keyboard is typewriter style rather than "chiclet" or membrane style.

One of the drawbacks to many portable computers on the market is the small screen display. The Commodore LCD, however, has an 80-column by 16-row display for a total of over 1200 characters displayed at once (the 64 can display only 1000). The screen resolution is 480 x 128 pixels for easy reading.

The screen editor for the Commodore LCD is very similar to the screen editor for the Commodore 64. The cursor, insert/delete, clear home, and Commodore keys all operate as on the 64. The escape key allows special screen editing functions to be used, including inserting and deleting lines, moving to the beginning and end of lines, setting screen windows and scrolling the screen up and down.

Applications Software

There are eight pieces of application software built into the ROM of the Commodore LCD. They include:

Word Processor: A full-featured word processor including justification, searches, headers and footers, underlining, bold, centering and cut and paste with a cut buffer.

File Manager: This is a function key-driven database program that is similar to Commodore's *Manager* program for the Commodore 64.

Spreadsheet: This is a function key-driven spreadsheet that is similar to *Multiplan.*

Address Book: This program is designed to eliminate the need for a standard address book. The program can sort by name or zip code and search by name, area code or state.

Scheduler: This is a schedule book program which allows a separate file for each day, supports memo files associated with any entry and has an alarm feature and windowing of each time slot.

Calculator: This program can be called from within any of the other programs and overlays whatever is on the screen without destroying it. When you are finished with the calculator, it is removed from the screen and the screen that was overlayed is replaced. The calculator has three modes, each with a different set of special functions: business, scientific and programmer.

Memo Pad: This program can be called up like the calculator program. It is basically a scratch pad where quick notes can be jotted down and stored.

Telecommunication Package: This is

a function key-driven program to be used with the built-in modem. It has uploading and downloading capabilities, a capture buffer and auto-dial using the LCD's address book files. All parameters are software controllable.

System Architecture

The LCD computer has a 96K ROM which includes the built-in programs, BASIC, I/O routines and a monitor. There is 32K of RAM available for either programming or file and data storage. Remember, whatever is in memory is not destroyed when the power is turned off thanks to the NiCad battery backup.

The LCD's BASIC is being called 3.6 and is very similar to the BASIC used in the Plus/4 and C16 (see Commodore Power/Play, December/January 1984–85), including all the programming aids and graphic commands. The built-in machine language monitor is similar to the monitor in the Plus/4.

The Commodore LCD uses a 65C102 processor running at 1Mhz. This is a CMOS version of the popular 6502 and is one of the reasons the computer will run on batteries. This processor also has eight new instructions and new addressing modes for ten old instructions. The new instructions include: branch always (BRA), stack commands for the X and Y registers (PHX, PLX, PHY, PLY), store zero in memory (STZ) and test and set/reset memory bits with the accumulator (TRB, TSB). The monitor in the Commodore LCD supports these new instructions and addressing modes.

I/O

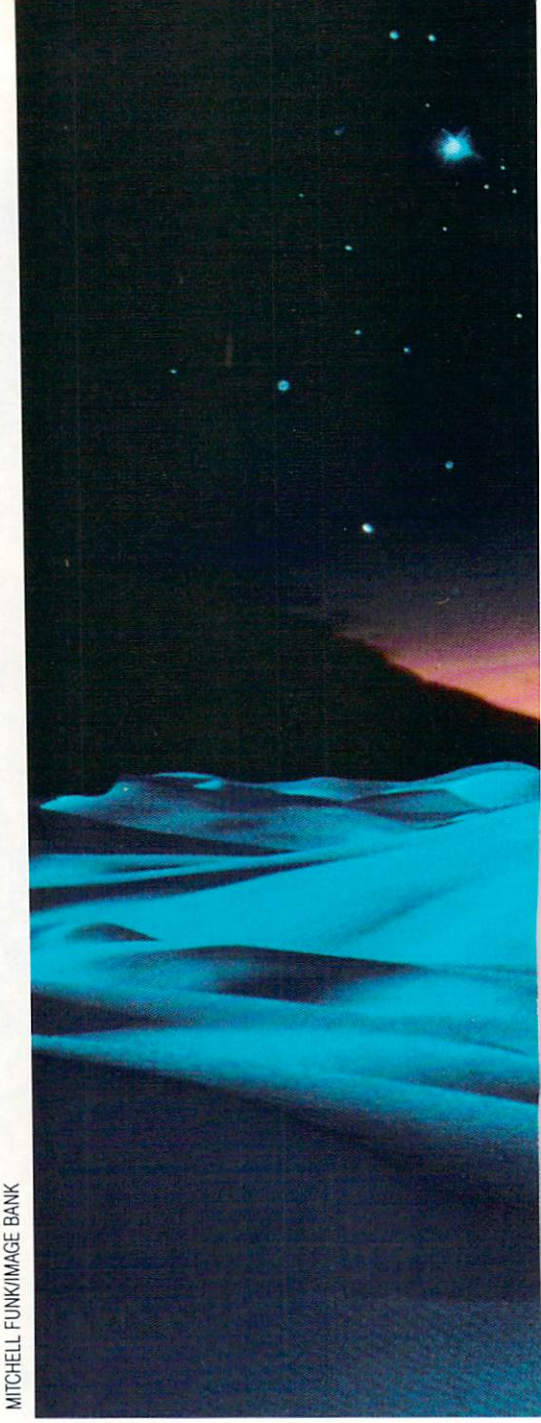
Perhaps one of the most advanced features of this computer is the extensive I/O capabilities built in. There is both an RS-232 and a Centronics parallel port. This combination will allow the LCD computer to communicate with a large variety of peripherals. There is even a port for using a bar code reader, which is compatible with the Hewlett-Packard bar code reader.

For communicating with other computers or transferring files back to the office, the LCD has a 300-baud auto-dial/auto-answer modem built in that can be used with either touch tone or rotary dialing. It also has two modular phone jacks for connecting your phone directly to the modem and a built-in speaker.

The LCD computer has the standard Commodore serial port, which allows the computer to use all of the Commodore 64 serial peripherals including the 1541 disk drive and the MPS 801, MPS 802, MPS 803 and DPS 1101 printers. There is also an expansion port for adding additional RAM or ROM to the computer. C

SKY TRAVEL

BY DR. DANIEL B. CATON
APPALACHIAN STATE UNIVERSITY



MITCHELL FUNK/IMAGE BANK

THIS NEW SOFTWARE PACKAGE FROM COMMODORE CAN PUT A PLANETARIUM IN THE CLASSROOM OR HOME OF EVERY COMMODORE 64 USER! STUDENTS, TEACHERS, AMATEUR ASTRONOMERS OR *ANYONE* WITH A CURIOSITY ABOUT THE STARS WILL ENJOY EXPLORING THE HEAVENS WITH *SKY TRAVEL.*

Man has always been fascinated by the stars and other celestial bodies that fill the night sky. Our curiosity has led us from those first inquisitive glances upward, through studies of the motions of planets, to today's understanding of remote galaxies. Astronomy has the distinction both of being the oldest science and of still providing new discoveries that intrigue us all. Now Commodore has introduced a software package that allows 64 users to explore the sky in a way never before possible!

The *Sky Travel* program turns the computer's screen into a window pointed at the sky. This is similar to a planetarium, except that the entire sky is not displayed at once. The portion of the sky displayed may be changed, providing a magnified view.

Stars are displayed as colored dots which have sizes proportional to their actual brightnesses. (It should be noted, though, that the displayed colors do not represent the actual colors of the real stars.) The constellations are represented by lines connecting the stars and are labelled with abbreviated names. The positions of the moon, sun and any planets that are visible are also indicated.

The real power of the program lies in the variety of viewing conditions that can be changed. For instance:

- The time and date of the view may be changed to any instant from 10,000 years ago to 10,000 years in the future!
- The viewer's geographical location may be changed to virtually anywhere on Earth.
- You may view in any direction, including below the horizon, through a translucent Earth.
- The real-time clock may be stopped, slowed down, sped up or reversed to observe events such as eclipses.

These features and others described below provide a powerful tool to explore many facets of astronomy. In addition, the excellent manual contains many examples with photos, and may

serve as an introductory textbook to observational astronomy.

STARTING OUT

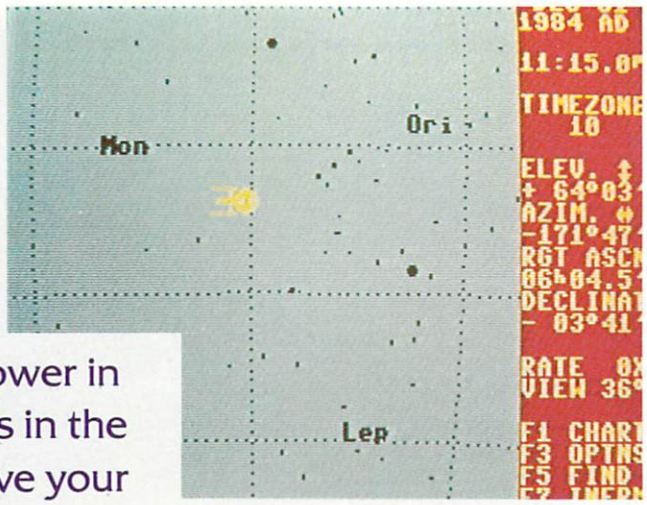
Upon loading, the program displays a view of the sky as it appears in the early morning hours looking south from Washington, D.C. You are looking upward at an elevation angle of 63 degrees, directly at the constellation Leo. Several other constellations are visible, and a labelled arrow points in the direction of the North Celestial Pole (near Polaris, the "North Star"). The rightmost eight columns of the display give information on the time, date and viewing angle.

Such an exciting display makes you want to begin exploring immediately! Anticipating this desire, Commodore has provided a four-page introduction that gives just enough information to get you started. Along with the handy Command Key table, this section will have you taking command of your personal planetarium right away.

The *Sky Travel* program turns the computer's screen into a window pointed at the sky.

A more detailed introduction to the capabilities of *Sky Travel* is presented in the next section of the manual. Then the bulk of the manual provides an introduction to astronomy, using many historical and contemporary events as examples.

You quickly discover that the text portion of the display itself is a "mini manual" with information on what action is performed by pressing various keys. This combination of a three-tiered manual and good screen design with prompting makes for very easy-to-use software—a primary concern for educational applications.



The real power in *Sky Travel* lies in the ability to move your viewpoint to different locations, times and dates.

You start your exploring by steering your window around with the cursor keys or a joystick. Within the window, a cursor may be moved around to select the object to be studied. The initial (default) window spans a 72-degree angle in the sky. For a closer view, you can zoom in on an object by selecting 36-, 18-, or nine-degree wide views. You may look in any direction, including *down* below the horizon through a translucent Earth. The program presents a surprise when you look *straight* down. This ability to see through the Earth helps emphasize the concept of the celestial sphere.

A variety of options is available by pressing the F3 function key. Lines that form the constellations may be removed from or returned to view. Constellation names and planet symbols may similarly be turned on or off. The Deep Sky option adds star clusters, galaxies and nebulae to the view. A Track option causes the program to follow the sun, moon, a planet or Halley's comet, keeping the object located under the cursor. Finally, a Sound option adds sound effects when the cursor is steered around.

After you learn some of the basics, it's time to exploit some of the other modes of operation. These are selected by pressing the function keys.

TRAVELING IN SPACE AND TIME

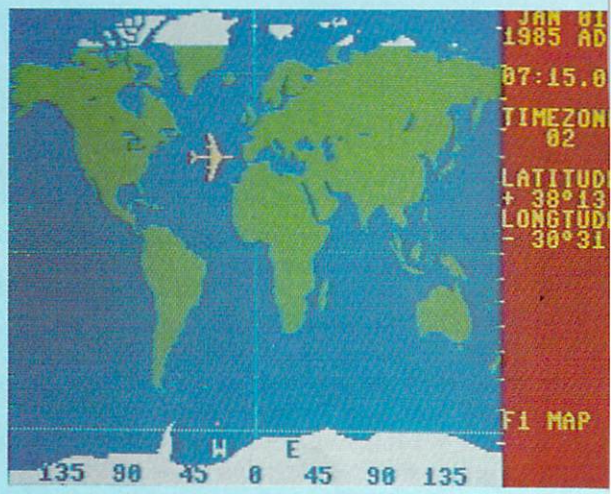
The real power in *Sky Travel* lies in the ability to move your viewpoint to different locations, times and dates. This makes the program a kind of "cosmic spreadsheet" program—a celestial version of *EasyCalc!* You change the conditions and the computer provides the results—a new view. This can lead to a series of "What if . . . ?" questions that can provide a rich educational experience.

Two main modes of operation allow changes to be made: the Set mode and the Map mode. In the Set mode, you can select the time and date. The program can provide accurate computations for dates up to 10,000 years in the future or past. Changing these quantities is a simple matter of moving the cursor over to the desired quantity on the righthand side of the screen and increasing or decreasing each digit (or month name) by pressing the + or − keys. This simple approach avoids inputting invalid values, and is particularly good for educational programs.

The Map mode clears the screen and draws a very nice world map. The righthand side then displays the current latitude and longitude of the observer. To change these coordinates, a cursor is steered around with either the joystick or cursor keys. If the Sound option is enabled, the cursor becomes a jet with sound effects. Pressing the F1 key allows you to select the Set mode or to return to the Sky mode to view the stars.

A Chart mode allows sections of the

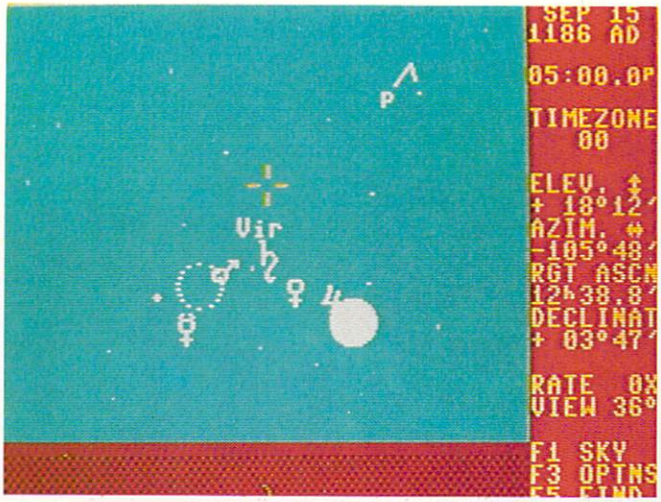
SKY TRAVEL CHALLENGE

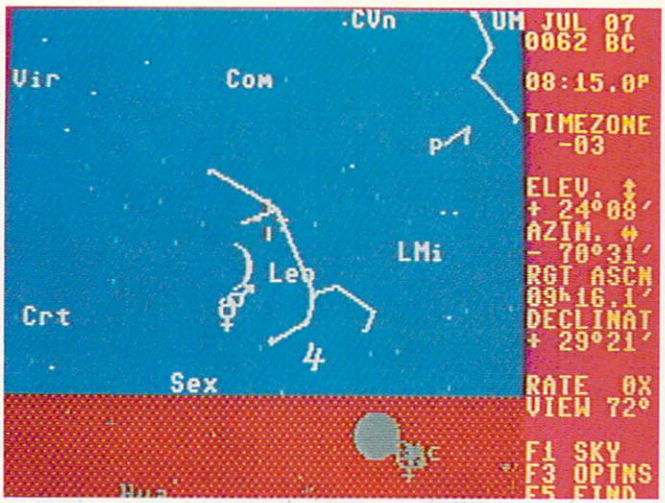


There is buried gold in *Sky Travel.* The creators of the program decided to fill every last nook and cranny of memory left after the astronomy and graphics were finished, so the following undocumented feature was installed.

In the program, you are allowed to view the sky from any place on Earth with a high degree of accuracy. You might expect, therefore, if you were exactly at the latitude and longitude of, for example, Washington, D.C., that you could see the Washington Monument somewhere on the horizon. But you would not expect to see the monument if the date were, say, 1492 AD . . . right? There are, in fact, 11 map tokens in *Sky Travel* (no, the Monument is not one of them), if only you knew what and where they are.

Who will be the first to discover all (or any!!) of these objects? They are practically impossible to bump into accidentally since you have to be pretty accurate in plotting your location on Earth and you have to be looking in the





sky to be displayed along with celestial coordinate lines (right ascension and declination), the way that standard star charts are drawn. A feature that is particularly useful in the Chart mode is the ability to get a hard copy of the chart. Pressing shift-P dumps the current view (chart or regular Sky mode view) to a Commodore 1525 or MPS 801 printer, rescaled to fill the entire page! This can be used to provide maps to take outdoors and compare to the real sky. Educators and other professionals who provide announcements to local newspapers of celestial alignments or events will find this feature useful in preparing figures.

FINDING AND IDENTIFYING CELESTIAL OBJECTS

Two complementary features allow finding and displaying celestial objects or identifying objects that are already displayed. The Inform key (F7) identifies whatever displayed object (star, galaxy, etc.) has been placed under the cursor. A line of information about the object may be read at the bottom of the screen, with manual scrolling in either direction allowing reading and re-reading of the information. The Find key (F5) allows you to have the program locate the sun, moon, any planet, Halley's comet (during its upcoming passage) or any constellation. The display is changed to center the object on the screen. This makes it easy to find any celestial object.

GENERAL COMMENTS

Sky Travel is an excellent program and instructional tool that will find a variety of applications. In the middle- to high-school age range, it can serve as the basis of an entire unit on astronomy, within the usual physical sciences study. For college-level instruction, it can be used with the historical examples in the manual as an interesting demonstration of various phenomena. This would be especially exciting viewed on a projection TV! In fact, this is a very good package for *anyone* interested in learning some astronomy in a fascinating new way.

The manual contains a nice introduction at the public-lecture/planetarium level, as well as a fine listing of additional recommended reading.

Overall, *Sky Travel* is a fine software package that should provide many hours of enjoyment to any user. In fact, it is unique in that it also comprises a never-out-of-date emphemeris to be shelved with your other references! So, next year when you are wondering, "What is that bright object in the west tonight? . . . " C

Dr. Daniel B. Caton is an Assistant Professor of Physics and Astronomy at Appalachian State University, in Boone, North Carolina.

correct direction. What we are going to do is give a set of clues to start you going. Assuming no one will get them all on the first go-round, another set of clues will be given in the next issue of *Power/Play* and another set in the May/June *Commodore Micros*. Finally, we will publish the answers.

First of all, there is a bear somewhere in *Sky Travel* (it appears as if by magic on one of the demo screens which you may have seen at your computer store). All the clues below have the bear as a central theme, so you really don't even know which clue refers to the real bear. Also, not all the information in a clue may be pertinent.

So here we go . . .

CLUES

1. An alert person should have no trouble finding the bear.
2. Stated empirically, if the bear really exists, he gets top billing.
3. See an angry bear, not one but two, on tour, climb high, higher, highest with no visible means of support.
4. Hungry bear, but a half-wit, looks for hamburgers, is disappointed, but we're not, are we?
5. Guilty bear is fugitive, is chased by Canadian police force.
6. How do you expect to find the bear if you are looking for a mosque?
7. Don't cross this one off, because, although suspenseful, you have to wait until the bear comes to it.
8. Betsy says, "Jim, go in and get my pen, and don't worry about the bear."
9. Bear goes 200 steps north, 200 steps east, 200 steps south, and 200 steps west. What color is the bear?
10. Bear has party, gets plastered in style.
11. The bear may be gentle, but he's still pretty big, so watch out!

While your tear your hair out trying to solve these, we hope that you will learn some geography and astronomy. Good luck! C

The Young Astronaut Program:

Our Resource for the Future

BY JIM GRACELY,
TECHNICAL EDITOR

Back in 1908 a man named Lord Baden-Powell started a program called the Boy Scouts. In much the same spirit, on October 17, 1984, President Ronald Reagan launched the Young Astronaut Program to encourage young people to study mathematics, science and technology.

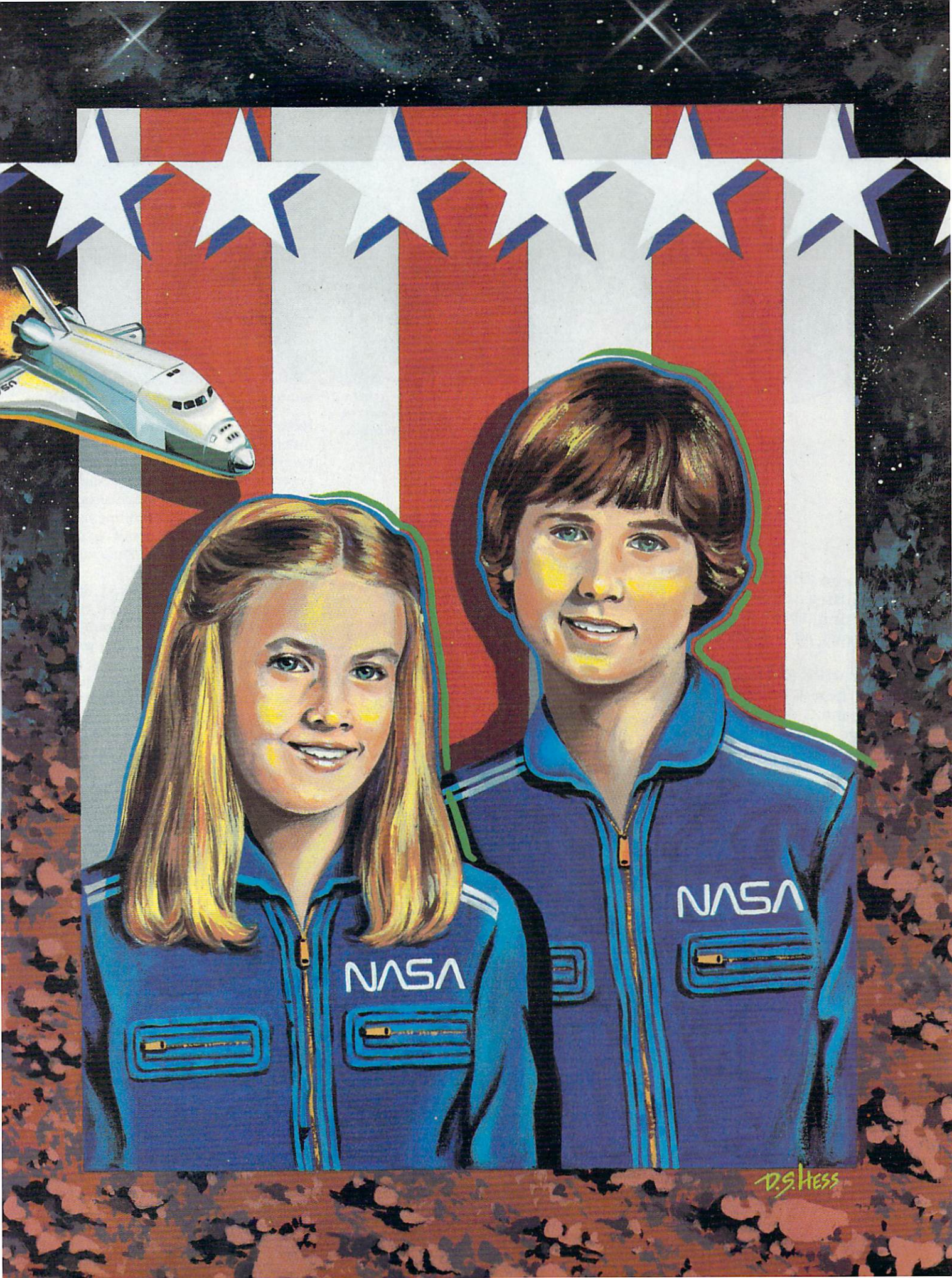
Your school or community organization can sponsor a Young Astronaut chapter. Just send in the coupon at the end of this article to get the program's information package.

Keeping the Space Program Alive

In 1962 President John F. Kennedy announced that the United States was going to be the first nation in the world to send a man to the moon. In the 22 years since that date, the United States has sent not one but 30 men to the moon, with 12 of those men actually walking on the lunar surface. We have sent an unmanned lander to explore Mars and unmanned fly-by's to probe Venus, Jupiter and Saturn. We put a temporary space station called Space Lab into orbit and have demonstrated the use of a reusable space shuttle more than a dozen times.

In addition to these direct accomplishments, the research and experimentation involved in the space program has brought about advances in other fields as diverse as medicine and ecology. The individual spin-offs of this research are too numerous to list.

But in spite of all this excitement,


NASA
NASA
D.S. HESS

U.S. President Ronald Reagan greets Commodore's President Marshall Smith at the launch of the Young Astronaut Program last October.

THE WHITE HOUSE

WASHINGTON

October 5, 1984

I believe that we can rekindle the spirit of scientific adventure in elementary and junior high school students by using the excitement of the United States Space Program as a catalyst.

It is with great pleasure that I announce the launching of a new private sector initiative called the Young Astronaut Program which will ignite in the spirit and minds of elementary and junior high school students and their teachers an enthusiasm for scientific inquiry.

The primary thrust of the Young Astronaut Program will be to develop and deliver programs and materials for use in schools and community organizations that are interested in forming Young Astronaut Chapters. This will occur under the auspices of the Young Astronaut Council.

Many organizations such as NASA, the National Geographic Society, the National Space Institute, and the National Mathematics and Science Teachers Associations have assisted this project with their best and brightest professionals.

The partnership among educators, parents, the business community and many professional groups is a strong indicator of the shared desire to improve the science and mathematics ability of our youth.

I salute the Young Astronaut Program and look forward to its success.

Ronald Reagan

there is a rather disturbing trend in American education. The National Science Foundation reports that only six percent of all high school students take four years of mathematics and only 16 percent take even one course in physics. In the colleges of America, only six percent of the students are studying engineering.

The future of the United States' space program is in the hands of the students of America. If the shuttle program is to develop into a major part of the space program, and if the permanent, manned space station to be launched in the 1990's is to be a continuing program, then the students of today must begin to get excited about learning in the areas of science, mathematics and technology.

This spark of excitement must be generated early in a student's education, before the sense of adventure is replaced by the scents of money and fame. The Young Astronaut Program was formed to ignite and maintain this spark of excitement. The overall purpose of the program is to educate and stimulate young Americans. The result of this education is expected to be many-fold. Some of the possible long-range results of the Young Astronaut Program would include:

- Motivating young students to study science, mathematics and technology.
- Developing a more technologically proficient work force, so the U.S. can continue to be a leader in the high-technology world of the future.
- Preparing young Americans to pursue any of the many aerospace-related careers that will be open in the future.

Commodore's Involvement

The Young Astronaut Program is a private-sector initiative that was first proposed by syndicated columnist Jack Anderson. A private-sector program allows private companies, clubs, churches and civic organizations to become involved in and support activities they think are important. This kind of partnership was behind the 1984 Olympics, for example.

Commodore, as one of the companies sponsoring the Young Astronaut Program, is providing support in a number of ways. The company provided the Young Astronaut Council with Commodore 64 and CBM 8032 systems, along with appropriate software, for use in the Council's offices. In addition, Commodore has made the services of Dr. Daniel W. Kunz available to the Council. Dr. Kunz, Director of Educational Software at Commodore, was nominated by a search committee and then appointed by the White House as Launch Director and Visiting Executive for the Young Astronaut Program.

The Growth and Future

The Young Astronaut Program has already established two growth goals. Its first goal is to form 100,000 Young Astronaut chapters in the next eight years. Its second is to establish a network to distribute information, materials and activity plans so the program can increase its effectiveness.

During the 1984–1985 school year, the program will begin to develop chapters, design materials and build support programs for teachers, students and chapter organizers. Each chapter will receive a launch kit and a membership program package to assist the group in getting local support and increasing membership. In addition, chapters will receive pledge certificates, membership cards and curriculum posters. Teachers and other chapter organizers will receive detailed curriculum suggestions, activity plans and teaching materials. Private sector supporters will offer special products that local chapters can build and use. These products include special computer software (including the astronomy program *Sky Travel* from Commodore), video disks, satellite antennas and receivers (Intersat dishes), textbooks, models and globes.

A Young Astronaut magazine will be developed during the 1984–1985 school year highlighting the space program and activities of other chapters.

One of the program's plans for the future includes a free electronic mail system to be called AstroNet, exclusively for the use of Young Astronauts. National reports will be sent out through the AstroNetwork each month, and the latest data from NASA and the space shuttle missions will be available on the network as well. In addition, the AstroNetwork will be used to notify Young Astronauts about national contests and award programs.

Special direct-broadcast TV programs will also be organized by the Young Astronaut Program. These TV shows would be received using a satellite receiver, which the local chapter could purchase.

Other plans include a national computer bank that would allow access to programs, projects and information about space, and sponsored trips to space shuttle launches, camps and other space-related activities.

How You Can Participate

A Young Astronaut chapter can be formed by either a school, business or community organization. Once it is officially registered with The Young Astronaut Headquarters, a chapter receives study items and other support as these things are developed for the program. The ongoing manned and unmanned missions of the U.S. space program will be the major theme for the curricular material.

Most immediately, each chapter receives a poster showing the space station expected to be launched in the early 1990's. On the front of the poster is a full-color artists's conception of the space station in orbit. On the back of the poster is a description of the illustration and sample activities centering around the space station concept. The activities are divided into both grade groups and subject areas and include both projects and ideas for discussion.

Complete information on forming a chapter is now available from the Young Astronaut Council. To get a head start in forming a chapter in your school or community, the Council suggests the following steps:

- Identify those students, teachers and community groups who may be interested in forming or assisting with a Young Astronaut chapter.
- As a teacher, start a collection of classroom materials that are immediately useful for teaching about space. Make this collection available to other interested teachers and students.
- Start a class project of news clipping, magazine articles and discussions on U.S. space missions.
- As a community member or teacher, contact your child's teacher or principal and discuss the possibility of forming a Young Astronaut chapter, explaining how you can help.

A complete information package will be sent to every elementary school, junior high school, business or community organization that sends a note to the Young Astronaut Council. You can use the coupon at the end of this article to request this information. C

☐ *I'm excited about this program. I want to form a Young Astronaut Charter Chapter.*
Please send me the kit on how to start a Chapter.

NAME_____

SCHOOL/ORGANIZATION_____

ADDRESS_____

_____

CITY, STATE_____

ZIP_____

Mail to: **The Young Astronaut Council**
1015 15th Street, NW
Suite 905
Washington, D.C. 20005

OFFICIAL SPONSOR

KEEP THOSE PET'S WORKING

Although the Commodore 64 has become the darling of educators over the past two years, there are still thousands of Commodore PET's in schools all over the country. These 40-column, monochromatic work horse computers just about never die, although some schools may have put them out to pasture, replacing them with the newer, more exciting Commodore color computers.

But the PET can still be a real plus in school computer programs, especially if you use them to teach contemporary office skills like word processing and data base management. Here are some suggestions from educators who are continuing to work with their durable PET's.

Three Word Processors for the PET

by Sue Dolezal
Stevensville High School, Stevensville, Montana

Several years ago our school purchased a total of 47 PETS. The computers are in good shape and are working well. In the high school computer programming lab my students have access to fourteen 32K/4032 PETS, which share six disk drives.

Although we have taught word processing in the past, it was always on a limited basis. Next year I plan to teach a semester-long computer applications course focusing on word processors, data bases, and spread sheets. A search for appropriate software revealed a number of inexpensive but limited word processors along with three more expensive, professional quality programs. I would like to focus on the three professional packages to show how each fits into a school setting.

Word Pro3 +
Professional Software Inc.
166 Crescent Road
Needham, MA 02194
Retail Price $295.00

The *WordPro* series of word processors has been around for a number of years and has packages for anything from the 16K PET to the Commodore 64. It was the only word processor our school owned until last year and was in use in grades five through twelve.

WordPro3 + for the 4032 is a ROM-based package. It is necessary that a complete set, including manual, diskette, and ROM chip, be purchased for each computer that is to be a word processor. The ROM is easy to install and complete instructions are given in the manual. One of the first lessons given is how to back up the *WordPro* diskette.

A very powerful wordprocessor, *WordPro3 +* has many formatting functions including margin controls, pagination, centering, right and left justification, control of pitch, and spacing. In addition superscripts, subscripts and underlining are available if the printer can handle them.

Inserting and deleting characters, words, lines and paragraphs are easy with this word processor. Once things are deleted they are gone forever, though. *WordPro3 +* does not have a "copy" type of command for reproducing particular blocks of text. Wordwrap is another feature *WordPro* doesn't have. If a word at the end of a line is too long the extra letters just appear on the next line.

WordPro3 + has the ability to link files together to print out a document that is larger than the computer's memory can handle at one time. It also has a search-and-replace feature, which allows the user to scan a whole document for any words which might need replacement. An extra text mode makes memory space available for a file that can be inserted into a document several times or into a series of similar documents. There is a decimal tab for aligning columns of numbers. Column add and subtract can be performed over an entire column or any portion of it.

The *WordPro* manual is set up as a tutorial. It is not an easy manual to read and my younger students have had to get frequent help in finding out how to look up information. There is

a quick reference card that can be attached to the computer keyboard.

PaperClip
Batteries Included
186 Queen Street West
Toronto, Ontario M5V 1Z1
(416) 596-1419
$125.00 Retail

PaperClip first appeared a couple years after *WordPro* and is similar to it in many ways. Several of the *WordPro* features that were most frustrating were eliminated with *PaperClip,* however. Printer formatting is handled through a number of printer files for a variety of printer brands. This gives the user the ability to use the best features of a printer without having to learn any number of escape sequences particular to that device.

Accessing the directory does not erase current text. Alpha and numeric fields can be sorted and sub-sorted. Screen width can be set to allow up to 126 columns and horizontal scrolling over that width is possible. A video output function allows viewing of the left-most forty columns of a page that is to be printed. Many commands are questioned with an "Are you sure" prompt to avoid irreversible mistakes. A table of contents can be created as your document is written. *PaperClip* even displays a word count.

Like *WordPro, PaperClip* has a ROM chip for copyright protection. Its manual includes an eleven-lesson tutorial suitable for beginners. The entire manual is easy to read and use. Appendices include summary pages for over one hundred commands and over forty directives.

Superscript
Precision Software
3003 Summer Street
Stamford, CT 06905
(203) 326-8649
$149.00 Retail ($195.00 with *Superspell*)

Of the three word processing programs reviewed here *Superscript* is the only one which does not make use of additional ROM chips for copy protection. This makes it more easily transportable. Previously when we have wanted to use a word processor in another room of the school we have had to move a computer. This program allows us to simply carry a diskette.

Superscript is produced by the same people who wrote *Easy Script* for the Commodore 64 and has many similarities to that program. It also has many points in common with both *WordPro* and *PaperClip.* In fact many control functions are identical from one package to another and the files created are compatible among the three.

The durable Commodore PET can be used to teach contemporary office skills like word processing and data base management.

Column width in *Superscript* can be set up to 240 and the screen scrolls horizontally as you type in the text. Output to video wraps the line around in multiples of 40. If the line were set to contain 75 columns, for example, forty would print on the first line and thirty-five on the next and so on throughout the text. At the end of each page of output to video, the user has the option of continuing with screen output or beginning printer output—a feature I wish I would have had any number of times in the past!

Superscript allows commands to be placed on a line with text that is to be printed. A minor point perhaps, but it does save memory. Directory access is like that of *PaperClip*—the text is not lost from memory. The user can page back and forth through text one computer screen at a time with the control key and the space bar either shifted or unshifted.

Extra text mode is not available on *Superscript. Superscript* cannot perform columnar arithmetic or sorting. There is no double checking before commands are carried out.

The *Superscript* manual includes a tutorial and a quick reference guide. The index is very complete and that is important when you are trying to find information fast.

Summary

Each of these three word processors possesses features that are unique. Rather than taking a stand and claiming one superior over the others, I am going to purchase all three for my classroom. Since the files are compatible, students will not have to worry about which machine they use on a particular day. Commands are similar enough from one word processor to the next to reduce confusion and frustration.

There is also enough difference, especially in documentation and cost, to allow the students to compare the three packages and draw their own conclusions. Not only will the students be able to learn to use a very useful and powerful tool, they will learn a little more as consumers about judging the quality of software.

Although none of my students have 4032's at home, many of them do have Commodore 64's. Each of these word processors is available in a similar version for that computer, too. Anything they write on their home computer they can bring in and use in class the next day.

Data Bases for the PET

by Glenn Fisher
Computer Specialist
Alameda County Schools, California

What is a Data Base?

A data base is simply a computerized version of a card file, except that data is kept on a disk in RECORDS instead of on file cards. Each individual item in the record is called a FIELD. The two big advantages to using a data base on a computer over other means of storing information are that you can find any information (any field) quickly, and you can re-sort it by any field.

For example, most student information cards are sorted alphabetically by student last name. To find all those students with working parents requires looking at each individual card. A data base can select and print that information. Or, suppose you needed a list of your students in order by birth. You'd have to painfully re-sort all those cards. If the data base has been properly organized, the information can be re-sorted at the press of a key.

School Uses of Data Bases

Data bases have many uses in the classroom. They can manage information about students. They can be used as a tool for students to manipulate and interpret data and relationships between data.

Continued on page 88

WHY THE COMMODORE 64 ISN'T IN A CLASS BY ITSELF.

At Commodore, we think it's easier for school children to learn about a computer by using it rather than by waiting to use it.

So, we sell the Commodore 64™ at about half the cost of comparable computers.

With the money you save on the Commodore 64, you can afford the things you'll really need: more Commodore 64's.

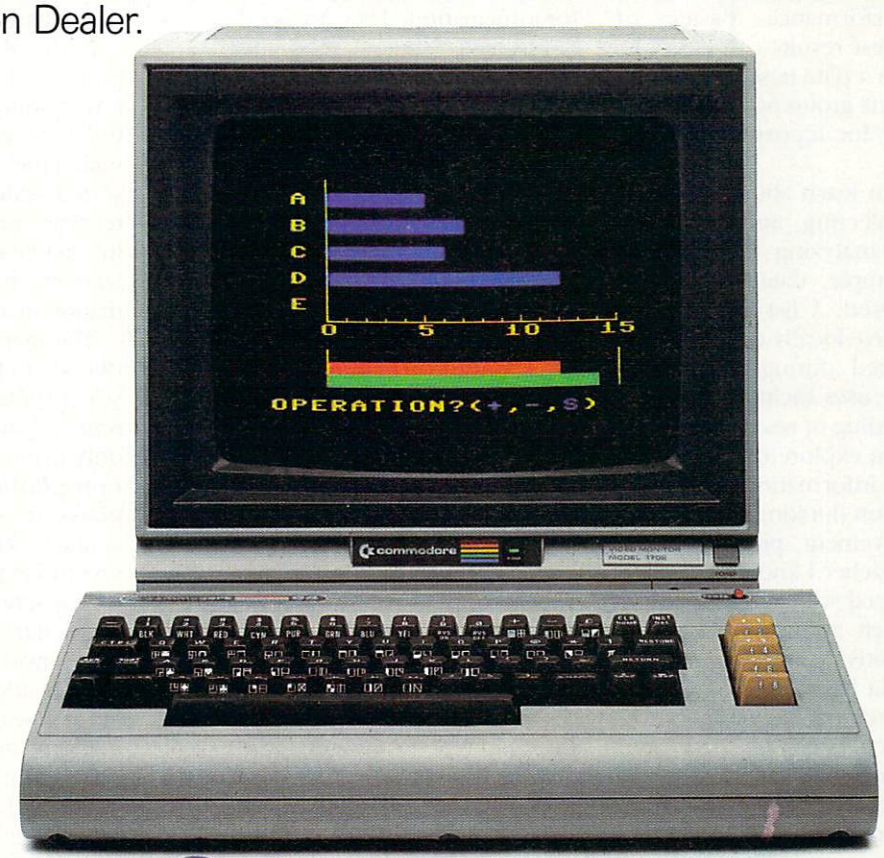
In fact you can create a powerful but economical "Local Network" with 8 computers sharing one disc drive.

The Commodore 64 features: 64K memory, 66 key typewriter-style keyboard, 16 color high resolution graphics, 9 octave music synthesizer and 3-dimensional sprites.

And the same commitment we make to hardware, we're making to software. We have highly rated Logo and PILOT programs. Much of the well recognized MECC™ courseware and the Edufun™ Series from Milliken will soon be available. There are hundreds of other programs, including a wealth of public domain software for the Commodore 64. Our newest additions are 30 early learning programs from Midwest Software.

So you see, the all purpose Commodore 64 really is in a class by itself.

For further information on the Commodore 64 and our 250 Educational Resource Centers, contact your nearest Commodore Education Dealer.



commodore COMPUTERS

Commodore Business Machines Inc., P.O. Box 500M, Conshohocken, PA 19428. Canada—3370 Pharmacy Avenue, Agincourt, Ont. Can. M1W2K4.

Edufun and MECC are trademarks of Milliken Publishing Company and Minnesota Educational Computing Consortium respectively.

Data bases can be used effectively to maintain and manage information about students (such as emergency card information), to maintain membership information for student clubs and activities, for sports records and participation, and for student achievement and performance. Mastery or competency test results can easily be managed with a data base, which can produce reports grouping students for instruction or for reporting progress to parents.

Students can learn about databases by sorting, selecting, and producing reports, and analyzing the information. For example, data about birds might be entered. A list of birds that eat seeds and live locally could be used to provide feed during the winter. Other science uses include classification and recording of research results.

Students can explore data bases using personal information or family tree information (looking for patterns in origin, movement, professions). A high school teacher I know of deliberately mis-entered student personal information (such as height, likes and dislikes) to motivate students to learn to use the data base—they were desperate to correct their record!

Reading teachers can use data bases to manage book report summaries, providing a source of suggested reading. Social studies classes can use data bases for students to analyze information on a specific topic: cities, states, countries, or tribal or ethnic groups. One group of students using data they collected on Indian tribes looked for patterns across tribes—for example, if the major diet staple was meat, what else did the tribes have in common?

Data bases can also help students search for a college, or plan a career.

Why Use a Data Base?

Data bases are a powerful tool for manipulating, sorting and searching for information. They are used widely in business. Students who understand what a data base is and how to use it have a powerful tool at their disposal, and a big advantage in the computerized workplace.

Students involved in the set-up of a data base, have to look at what information is important, how that information should be represented, and what ways they want to retrieve it. This requires clear and careful thinking, planning ahead, and ability to label, identify and organize. Best of all, with a data base, if it isn't right, you can always try again!

We've become an information society and data bases are the information management tool. Students who have learned to use data bases are on the way to coping with our information society.

Two Data Bases for the PET

I would like to look at two data bases available for PET computers: *Flex File* from AB Computers and in Colmar, Pennsylvania, *The Consultant* from Batteries Included in Toronto.

Flex File and *The Consultant,* while fairly equal in their abilities, accomplish tasks in very different ways. *The Consultant* offers more sophistication, is more complex, and (at least initially) is more difficult to use.

Both data bases require you to do some preliminary setup. In *Flex File* this involves calculations of record length and field sizes. In *The Consultant,* it involves specifying on the screen the beginning and end of each field (in effect, you are creating the record form). *The Consultant* allows more than one form per record.

Both data bases provide a reminder prompt of available choices. Both allow reading through the data base in order by any KEY (special fields by which the data base keeps information sorted—adding, changing and deleting records; finding specific information in a key field (for example, a particular student's name); and displaying information in a particular record.

The major differences between the two are in the ability to search for and select specific information, and in the report (print) formats. *Flex File* can only print the results of a search. *The Consultant* allows results to be displayed on screen or printer—a big advantage. *The Consultant* also allows you to print anything you can display on the screen, such as your form, or a particular record. *Flex File* has only two report forms: a mail label format (which allows sorting by key fields, but not searching for particular information), and a report format which only prints information in vertical columns, but allows extensive searching, numerical calculations, and other special features. *The Consultant* offers both these plus its ability to print any screen display. I find *Flex File's* formats limiting, and *The Consultant's* much more powerful and useful. C

REVIEWED BY ELIZABETH DEAL

Machine Language for the Commodore 64 and Other Commodore Computers

Author: Jim Butterfield
Publisher: Brady Communications
Bowie, MD 20715

Nature of the Book

Machine Language for the Commodore 64 and Other Commodore Computers is a tutorial book for users of all Commodore computers. The material is based on the machine language course Jim Butterfield has been giving all over the world during the past several years. In addition, you can get an optional disk from Brady, which includes a number of useful programs that are tied in with the book.

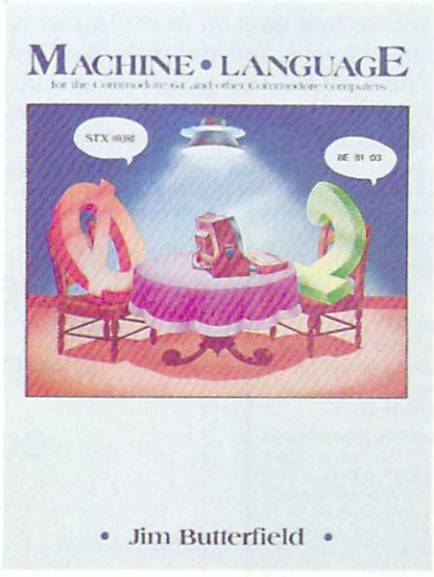
Never mind the title—little distinction is made among the computers, since they all share an identical machine language. Where distinctions need to be made, they are clearly spelled out. Programs run on all machines. Memory maps, chip descriptions and specifications contain material for all machines. The only time this is not the case is with the BASIC-ROM map, where only the 64 version is given.

Who Can Benefit?

Everybody, I say. Beginners, says Butterfield. If you know how to code IF and a FOR . . . NEXT loop in BASIC, you can jump right in and learn some easy, fundamental machine code. As a matter of fact, the coding style and the entire approach is so clear that you can learn better BASIC by learning good machine code first.

More advanced programmers will profit from an in-depth look at the language and the reference charts. Almost anyone interested in computers—and that includes people who have no interest in machine code—will benefit from Butterfield's coherent description of the entire machine and the BASIC setup. After all, whether you code machine language or not, you're occasionally faced with loading into strange places and other such problems. This book explains the coexistence of languages from the user's point of view better than I have ever seen it done.

The material is based on the machine language course Jim Butterfield has been giving all over the world during the past several years.



The overall presentation is clear. For instance, throughout the book all numbers are shown in both hex and decimal so you can't go wrong. The typesetting is also clear; the zeros are square, the letter "O" is round, for example. I see no muddy spots that can cause misunderstanding.

The book invites you to a hands-on experience. The programs are tiny little things that are simple to type in and proofread. The output is immediately visible. Most importantly, the coding style is that of an old pro: clean, clear and worth learning from. I wish I'd had it two years ago; it would have saved me lots of trouble.

Real Computer

Butterfield does not treat machine code as an abstract, separable entity. The applications he presents are real and tie in with how Commodore computers function. No conversions are needed. We finally have a text about real computers—not 65xx in abstract, nor some other computers, but the one you are using. It is a book to learn from, and learn you will.

There is very little in the way of specific pokes into a machine. The code is general to all CBM machines. The differences are handled nicely, not by coding, but by setting up little data tables. So you can leap from one machine to another with no difficulty. At most, several bytes in one place need changing and the conversion is done.

In the reference section, the chip descriptions are done twice: once using the CBM specifications and secondly, showing the functional description of each byte or bit. So you get the best of both worlds—a chip, unconnected to a computer, as well as one used within a machine you know. The charts are clear,although there are several places which seem unreadable due to the use of a "proportional" typewriter. (Why do people use those things in computer texts?!) Hence, what could have been a neatly aligned bit chart looks like a mess of letters. But this happens only in two or three places, and does not cause confusion, because the legends are clear.

Contents

The material covered is well described in the table of contents. Each chapter's subsections are listed. Each right-hand page of the book has a heading which includes the title of the chapter, so thumbing through can bring you to the spot you need. I only wish the appendices also had such headings to indicate which machine we're talking about when chip charts are given.

The book begins with a brief description of the computer's architecture, use of the machine language monitor, coding little subroutines, calling them from BASIC, and learning to debug using the monitor.

All the test flags are described. Each flag is renamed by the author to better show its function, and each is shown in use. This is a chapter to which you

will refer again and again, because the flags control all the works.

For once, somebody shows how to do multi-byte arithmetic: add, subtract, multiply and compare. Again, the emphasis is on real things, such as testing whether an address has been reached. This is useful.

The chapter on addressing modes is probably the hardest material in the whole book but it moves fairly fast and covers a lot of ground. Again, the illustrations, the examples and, of course, the text, make the subject learnable. This is another chapter to which you'll refer often for a refresher. It's the only book I have seen where terms such as "indexed indirect" actually make sense.

Explanations of linking machine code and BASIC, save and load troubles and BASIC pointers (actually much about BASIC's structure) follow. If you haven't yet found a good reason to use this book, this surely is the "all purpose" material aimed at everybody. This is the chapter that more than any other in the book is the confidence builder. Suddenly things fall in place and everything begins to make sense—things you learned and things you already knew.

The descriptions of the stack, interrupts, the various wedges and the interface chips is superb. It really shines in its applicability to the computer you use. If you have ever been puzzled by how, for instance, a DOS-wedge on the test/demo disk works, how people manage to do funny things on the screen while no program seems to be running, or how music can play when no program seems running, then this is the chapter designed specifically for you. It is a treat of simple approaches to things that look so advanced and difficult . . . but aren't.

Some very useful applications follow in a section about input and output. While much of the book has dealt with user-input and screen-output, this section goes on to explain working the tape and the disk from machine code. The programs are tied with BASIC and, indeed, they show the equivalent coding in both languages. Furthermore, the complete assembly listing of Unicopy (copies files from one disk to another in the single drive systems, or single drives in a 4040 system) is an excellent example and a reference work in itself.

The appendices include the chip specifications, memory maps, character sets, uncrashing methods, floating point number representation and a nice, short history of the Commodore machines. The last is interesting: it summarizes the computers Commodore has built and shows how they really are so similar to one another that they can be treated as one.

The end of each chapter has a recapitulation of the key points. Each chapter contains several suggestions for further learning. Some problems are quite easy, others are challenging, but all are food for thought.

Last Word

This book provides a solid background in machine language, programming style and practices, and real computer architecture. The presentation is in delightful Butterfield style, who, as usual, makes difficult subjects understandable. C

BY DAVID R. BROOKS

Scale Tunings for SID

One of the most interesting features of the Commodore 64's sound interface device (SID) is its ability to play notes with any desired pitch. Using this feature you can define the musical scale the SID plays in any way you like. This is in contrast to most keyboard synthesizers, in which the available notes are fixed at the hardware level to correspond to what is commonly called the equally tempered scale. And, in fact, the table found in Appendix E of the *Commodore 64 Programmer's Reference Guide* gives values which, when poked in the appropriate SID registers, produce just such an equally tempered scale.

This scale, although prevalent in Western culture, is not the only possible scale, although other scale tunings are not used as often. However, several other scales are important. So I think it's worth knowing how to derive these scales and calculate the appropriate values to poke into the SID frequency registers.

GENE SMITH

Some Musical History

The history of the western scale begins with the Greeks, who were fascinated by music as a branch of science. Although the idea of a unified world view encompassing philosophy, mathematics and the arts seems foreign to most of us today, the musical scale retains this heritage and is a constant reminder that, at some level, music is the expression of a set of precise mathematical relationships.

The Greek philosphers viewed music as an expression of an orderly and harmonious universe. So it was natural for them to seek a harmonious-sounding musical system that was based on "perfect" musical intervals. To understand what's meant by that, let's go over some basic definitions.

Notes are classified and related to each other according to their frequencies. The frequency of a note is defined as the rate at which the sound waves associated with that note vibrate. The larger the frequency, the higher the pitch. Frequency is expressed in terms of vibrations per second, or what is called Hertz (Hz). The modern standard tuning note A 440, for example, is simply a sound that vibrates at a frequency of 440 Hz.

However, the ability to measure frequency or understand its physical significance didn't exist in the early history of music. The idea of musical intervals, or the "distance" between notes, was first based on simple experiments with a stretched, vibrating string. If you halve the length of a vibrating string, you double its frequency and make it sound what we would call an octave above the original note. Other pleasing intervals can be produced by strings at 2/3, 3/4 or 4/5 the length of the original. These lengths multiply the original frequency by 3/2, 4/3 and 5/4, and produce what we would call intervals of a fifth, fourth and third, respectively. The octave will have a frequency exactly twice that of the fundamental or starting tone. In other words, an octave is an interval with a ratio of 2/1 relative to its fundamental. The intervals produced by these simple integer ratios are called "perfect." You guessed it: this is what the Greeks were looking for!

The Diatonic Scale

Using the concept of intervals, we can precisely define a scale as a series of intervals beginning at the fundamental and ending an octave above.

Table 1. The Diatonic Scale

Note	Interval	Frequency ratio
C	Octave	2/1
B	Seventh	(5/4) (3/2) = 15/8
A	Sixth	(5/4) (4/3) = 5/3
G	Fifth	3/2
F	Fourth	4/3
E	Third	5/4
D	Second	(3/2) (3/4) = 9/8
C	Unison	1/1

The simplest western scale—the "perfect" Greek scale—contains the third, fourth and fifth as I defined them above. In addition, it contains what we would call the second, sixth and

seventh. All these put together make a diatonic scale, which corresponds roughly to what you hear if you play the white keys on a piano, starting at C. Table 1 defines the intervals for this diatonic scale.

Some of these intervals are defined in terms of others: the seventh is defined as a third plus a fifth; the sixth is a third plus a fourth; the second is a fifth minus a fourth. To "add" an interval, multiply by its ratio and to subtract an interval, divide by its ratio.

What's so special about this diatonic scale? The sound of the perfect third, fourth and fifth is often described as very pure or sweet. If you tune the intervals by some other method which departs from simple integer ratios, you produce audible pulsations, called "beats," that add harshness to the sound.

Much of western folk music is based on scales with perfect intervals. Given a choice, singers and instrumentalists tend to favor perfect intervals because they sound the most comfortable. So you could say that the diatonic scale, based on perfect intervals, forms a conceptual and practical reference point for most western music, both folk and classical.

But the diatonic scale is inadequate for all our musical needs, regardless of how pleasing the intervals sound. One problem is that in this scale, roughly speaking, there are no notes corresponding to the black keys on a piano. This brings us to the equally tempered style, which includes these "black notes." The ancient Greeks would have been horrified at this triumph of expediency over perfection.

The Equally Tempered Scale

New scales evolved over the centuries in response the the increasingly complex harmonic ideas being created by composers. Keyboard instruments with fixed tuning particularly began to have problems as soon as they had to deal with pieces involving more than one key (or "tonality," more precisely). Therefore, notes equivalent to the black keys on a piano had to be invented, but strange and unpleasant sounds soon resulted when these new intervals were used within the existing framework for tuning.

Let's take as an example a piece that has a tonality centered around D instead of C. For our purposes, we could think of it as being in the modern key of D instead of in C. The interval corresponding to C-E in our new key of D is D-F sharp. But what is the frequency of F sharp, a note that isn't even defined in the diatonic scale? Clearly, we could make it a perfect third above D, just as E is a perfect third above C. This seems like it should work, and it will, but you'll just have to take my word for it that as more of these "sharped" and "flatted" notes were defined, they eventually led to unacceptable harmonic clashes on the existing keyboard instruments.

The Greek philosphers viewed music as an expression of an orderly and harmonious universe. So it was natural for them to seek a harmonious-sounding musical system that was based on "perfect" musical intervals.

In an effort to solve some of the problems, some early keyboard instruments were actually made with split keys. For example, the front part would play D sharp and the back part would play E flat. We tend to think of these notes as the same, but in fact, they have different harmonic meanings and have to be assigned different frequencies in the older tuning systems.

Faced with a demand for musically acceptable sounds, no matter what key the music was in, 18th century musical theoreticians devised an ingenious solution: the chromatic scale. This scale (corresponding to all the black and white keys on a piano) was divided into 12 intervals, each of which had the same frequency ratio. With this system, D sharp could be assigned the same frequency as E flat, and split keys were no longer required.

When the octave is divided into twelve equal intervals, the resulting frequency ratio is the twelfth root of two. Numerically, it's equal to 1.059463. If you add 12 of these intervals to a fundamental by multiplying this ratio by itself 12 times, you get a value of two, which is the interval of an octave.

This conceptually simple solution is called the equally tempered scale. Only with such a scale (or some practical approximation to it) could J. S. Bach have written his famous set of keyboard pieces, "The Well-Tempered Clavier," which cyled through all the musical keys without the clash of undesirable intervals. This scale (give or take some quibbling about de-

Table 2.
Comparing the Diatonic and Equally Tempered Scales

Note	Diatonic intervals	Equally tempered	Approximate beat frequency
C	261.63	261.63	0
C#/Db		277.19	
D	290.70	293.67	3
D#/Eb		311.13	
E	327.04	329.63	2-1/2
F	348.04	349.23	1
F#/Gb		370.00	
G	392.45	392.00	1/2
G#/Ab		415.31	
A	436.05	440.00	4
A#/Bb		466.16	
B	490.56	493.88	3-1/2
C	523.26	523.26	0

tails) eventually became the standard for keyboard (and other) instruments, as it remains to this day.

Comparing the Diatonic and Equally Tempered Scales

The mathematics of intervals has been a source of considerable aggravation over the years because the calculations have to be done quite accurately to be good for anything. Now, however, the ease with which the frequencies of an equally tempered scale can be calculated is positively sinful. Consider the following BASIC program that calculates the frequencies for an equally tempered scale from A400 to A880:

```
10 F = 440:A = 2 ↑ (1/12):PRINT F
20 FOR I = 1 TO 12
30 F = F*A:PRINT F
40 NEXT
```

In Table 2 we see the differences between the notes of an equally tempered scale and those of a diatonic scale. Note that the black key notes for the equally tempered scales don't have an equivalent in the diatonic scale. The frequency difference between corresponding intervals in the two scales is called the "beat frequency." Its value will give us some idea of how an equally tempered interval will sound compared to a perfect one. The smaller the beat frequency, the closer to perfect the interval will sound.

We'll start this scale on C and give the C a value of 261.63 Hz, which is its value in the standard equally tempered scale. Note that the A in the equally tempered scale will now have a value of 440 Hz, but the A in the diatonic scale will not.

You can see that the equally tempered sixth, the interval C-A, is "wider" than the perfect sixth by about four Hz. This means that the beats associated with the equally tempered sixth have a frequency of about four per second. Two other important intervals are the third (what modern music theory calls the major third) and the fifth. For the equally tempered scale shown here, these two intervals have beat frequencies of about 2-1/2 and 1/2 Hz. The beat frequencies will be greater for the same intervals in higher octaves (because the frequencies are represented by larger numbers) and less in lower octaves.

A difference of several Hertz may not seem of much significance, but the potential annoyance from beats is intensified with electronically generated music. Musicians playing instruments with flexible tuning tend to compensate for such slight deviations from perfect intervals, and the instruments themselves are often subject to slight mistunings or harmonic colorations that mask the beats somewhat. However, electronically generated intervals, and therefore their beat frequencies, will be precise and regular. As a result, the sound of the beats can be very annoying.

If you halve the length of a vibrating string, you double its frequency and make it sound what we would call an octave above the original note. Other pleasing intervals can be produced by strings at 2/3, 3/4 or 4/5 the length of the original.

Because I think the concept of beats is critical to understanding the practical importance of scale tuning in electronic music, I've written a short program called "Beats" that you can use to listen to beats generated by the SID. (See Listing 1.) I've used the triangle waveform with a low pass filter because it's easy to hear beats using this configuration.

The program starts by playing the equally tempered fifth C-G, the one derived from the SID frequency register values in the *Commodore 64 Programmer's Reference Guide.* By pressing the "+" or "−" key, you can poke larger or smaller values in to the register that controls the pitch of the higher of the two notes, thereby raising or lowering the pitch of the G while the C remains constant. The equally tempered fifth is already a little "narrower" than the perfect fifth; pressing the "−" key several times should give a beat frequency of several per second. This should be easy to hear as a regular, pulsating change in volume.

Now make the G sharper and sharper by pressing the "+" key several times. You should hear the beats becoming slower and slower as the interval approaches a perfect fifth. Eventually, the beats will appear again as the interval becomes wider than the perfect fifth. You can also adjust the cutoff frequency of the low pass filter. Raise it by pressing the F1 key and lower it by pressing the F3 key. As you raise the cutoff frequency, the beats become more difficult to hear because they are masked by the increasing complexity of the sound.

Don't worry if this program crashes, as it may if you change some of the parameters too much. Just start over again. If you feel like you've changed the initial values too much or if you have trouble hearing the beats, start over and listen more carefully to the effects of changes in both the note frequency and filter cutoff frequency.

Defining Just and Meantone Temperament Scales

The problem of harsh-sounding intervals in equal-temperament tuning is not new to 20th-century electronic music. Musicians and theorists have struggled for centuries to try to provide harmonic flexibility while retaining the more pleasing sound of perfect intervals. They were not always entirely successful. Early critics of equal temperament, for instance, protested that organs with this tuning gave a "cacophonous and repulsive" sound.

Because organs produce regular and prominent beats much as modern synthesizers do, the resulting tuning compromises that have been applied to organs over several centuries should not be overlooked. Two additional temperaments, just and meantone, are among those used on organs and other keyboard instruments, and are of considerable practical interest for tuning electronic instruments.

Whereas the interval relationships of the diatonic and equally tempered scales were very easy to state, the corresponding relationships for just and meantone temperament are not. In the interests of brevity, I'm going to give just the barest jusitification for some of what I'll present. For additional infor-

Table 3.
Frequency Ratios for Just and Meantone Temperaments

Note	Just temperament	Meantone temperament
C	2	2
B	(3/2) (5/4) = 15/8	(15/8)/(81/80) ↑ 1/4
Bb	(5/3) (16/15) = 16/9	(9/5)/(81/80) ↑ 1/2
A	5/3	(5/3) (81/80) ↑ 1/4
G#	(5/3) (15/16) = 25/16	25/16
G	3/2	(3/2)/(81/80) ↑ 1/4
F#	(3/2) (15/16) = 45/32	(45/32)/(81/80) ↑ 1/2
F	4/3	(4/3) (81/80) ↑ 1/4
E	5/4	5/4
Eb	(9/8) (16/15) = 6/5	(6/5)/(81/80) ↑ 1/4
D	(3/2) (3/4) = 9/8	(9/8)/(81/80) ↑ 1/2
C#	(9/8) (15/16) = 135/128	(25/24) (81/80) ↑ 1/4
C	1	1

mation, you should consult a standard reference work such as *Grove's Dictionary of Music and Musicians.* (I used the fifth edition, edited by Eric Blom, Macmillan & Co. Ltd., New York, 1954.)

The just temperament scale is an extension of the diatonic scale that forms a complete chromatic scale; that is, roughly what you get when you play all the keys of a piano. There are two significant points about such a scale. The first is that the same note may have a different frequency depending on its position relative to the starting notes in a scale. The second point is that sharps and flats have different harmonic meanings and have to be defined with this in mind.

As a result, before we use a just temperament scale, we first have to specify the starting note. In modern terms, this is equivalent to specifying the key a musical piece is to be played in. Secondly, we have to define two frequencies for each black key note, one for the sharped and one for the flatted values. To avoid this, only the following black key notes were usually defined: C sharp, E flat, F sharp, G sharp amd B flat. This restricts us to the modern major keys of C, D, F, G, A and B flat and, with a few additional problems, their relative minors).

One interval I haven't talked much about is critical to defining a complete chromatic scale. The distance from E to F or B to C in the diatonic scale is called a semitone; its frequency ratio is 16/15. Using this interval, we'll arbitrarily define sharps and flats in the just temperament scale as follows: sharps are a semitone *below* the next higher note in the diatonic scale and flats are a semitone *above* the lower note.

The final definitions involve the meantone scale. As composers became harmonically more daring, music was likely to have sections written in keys that were remote from the starting key. On keyboard instruments, this inevitably led to the harmonic clashes I've mentioned before. One solution that pre-dated the equally tempered scale was to change the definition of the interval of a second.

If you refer to Table 1, you can see that the second was defined by going up a fifth from the starting tone and back down a fourth, giving the ratio 9/8. But it can also be defined by going up a sixth and down a fifth, giving a ratio of (5/3) (2/3) = 10/9. The conflicts inherent in having two definitions for the second led to the definition of what's called a meantone. It is halfway between 10/9 and 9/8, or (10/9) (81/80) raised to the ½ power.

I've mentioned these details about defining the meantone only because the ratio 81/80 figures prominently in the definition of the meantone scale. Unless you know this, many of the values in the program I'm going to describe will make absolutely no sense!

As you did for the just temperament scale, you must specify the starting note of a meantone scale before you can assign frequencies; that is, the frequency allocated to each note is a function of its position in the scale. Again, as a practical matter, I've restricted the keys (or starting notes) to C, D, F, G, A and B flat to avoid having to give multiple definitions for the black key notes.

A useful reference point in both the just temperament and meantone scales is the interval of a major third from the fundamental, which remains perfect. In meantone temperament, the chromatic notes are as follows: C sharp, F sharp and G sharp are perfect thirds above A, D and E; B flat and E flat are perfect thirds below D and G.

As previously noted, the sound of perfect thirds is quite different from the harsh-sounding thirds in the equally tempered scale. Programmable frequency registers give us the opportunity to exploit the advantages of meantone tuning with an ease that its originators could only dream about.

Table 3 summarizes the frequency ratios for just and meantone temperament. Although the scale here starts on C, I hope it's clear that the same

Table 4. SID Register Values Example

	SID value:		
Note	Equal	Just	Meantone
C-7	34334	34645	34538
C#-7	36375	36540	36089
D-7	38538	38976	38615
D#-7	40830	41574	41317
E-7	43258	43307	43172
F-7	45830	46194	46194
F#-7	48555	48720	48268
G-7	51443	51968	51646
G#-7	54502	54134	53966
A-7	57743	57743	57743
A#-7	61176	61592	61784
B-7	64814	64960	64558

ratios would apply to the corresponding intervals in any of the six scales I've mentioned above.

SID Frequency Register Values for Equal, Just and Meantone Temperament Scales

The program that ties together all the above discussions is called "Scales." (See Listing 2) You can use it in two ways. First, you can calculate the frequencies for one octave of a just, meantone and equally tempered scale starting on C, D, F, G, A or B flat. Second, you can calculate the SID frequency register values for the highest octave (SID notes C-7 through B-7). Values for the lower octaves are determined by successive divisions of the frequency register value by two. The values for equal temperament will match the ones given in Appendix E of the *Commodore 64 Programmer's Reference Guide.* In "Scales," frequency is converted to the SID frequency register value as follows: SID value = INT(frequency/.06095977).

Rather than printing a series of tables for all the scales I've discussed in this article, I'll leave it to you to use "Scales" to develop for yourself most of the values you might want. As an example, Table 4 gives the SID frequency register values for equal, just and meantone scales starting on C and retaining the standard tuning pitch of A440.

In an effort to solve some of the problems, some early keyboard instruments were actually made with split keys. For example, the front part would play D sharp and the back part would play E flat.

Note that the SID value for A stays the same because of the way I defined this particular scale. Also note that the SID values really do change depending on what kind of temperament you choose.

Finally, here's a brief description of the program "Scales."

Lines 10–110: Set screen background to black, change character display to lowercase and uppercase, define a function to round off to the nearest hundredth, dimension arrays, define note identifiers.

Lines 120–420: Define frequency ratios for equal, just and meantone temperaments. If you want to define your own scale (within the limits of the standard chromatic scale) here's where you make additions or changes.

Lines 430–610: Determine starting note of scale and decide whether you want to retain A440 in the scale or use the equally tempered value of the starting note. If A440 is retained, lines 560–610 define the frequency of the starting note in terms of the position of A in the desired scale. The program responds to lowercase or uppercase designations for the scale and it accepts either "B" or "b" for the scale on B flat.

Lines 620–670: Print the frequencies of equal, just and meantone temperaments.

Lines 680–725: Give you a chance to look at another scale, end the program, or calculate SID frequency register values for the current scale.

Lines 730–930: Calculate the SID values corresponding to values C-7 to B-7 in Appendix E of the *Commodore 64 Programmer's Reference Guide.*

In Conclusion

I hope I've demonstrated that there's more to using the SID than selecting waveforms and ADSR envelopes. And, whatever your musical interests, I hope you'll take into account some of these historical ideas when you program music. After all, part of the electronic music revolution is to free you from convention by giving you the power to define your music in any way you want. The SID has given you control over the definition of a scale. Take advantage of it!! C

Listing 1. Beats

```
10 REM PROGRAM NAME BEATS'BQEC
20 REM DEMONSTRATES BEAT
   FREQUENCIES'BCAG
30 REM WITH THE SID CHIP'BOAD
40 REM DAVID R. BROOKS, JULY 1984'BWPG
50 PRINT"[CLEAR]":PRINT"PRESS [RVS]+
   [RVOFF] TO WIDEN INTERVAL"'CBMK
60 PRINT"PRESS [RVS]-[RVOFF]
    TO NARROW INTERVAL"'BAKK
70 PRINT"PRESS [RVS]F1[RVOFF]
    TO RAISE CUTOFF FREQ"'BAGM
80 PRINT"PRESS [RVS]F3[RVOFF]
    TO LOWER CUTOFF FREQ"'BADN
90 PRINT"PRESS [RVS]RETURN[RVOFF]
    TO STOP"'BAFM
100 S=54272:REM SID REFERENCE
    LOCATION'CCDD
110 FOR L=S TO S+24:POKE L,0:NEXT
    :REM CLEAR SID'HTEF
120 POKE S+5,9:POKE S+12,9
    :REM ATTACK=0,DECAY=9'FCKG
130 POKE S+6,240:POKE S+13,240
    :REM SUSTAIN=15,RELEASE=0'FKWJ
140 POKE S+24,31:FL=158
    :REM VOLUME=MAX, FILTER=LO PASS,
     SET INITIAL CUTOFF'EEIQ
150 F1=INT(261.63/.06097+.5)
    :F2=INT(392.00/.06097+.5)
    :REM FREQUENCY POKES'JCFR
160 H1=INT(F1/256):H2=INT(F2/256)
    :REM HI REGISTER'HFWM
170 L1=F1-H1*256:L2=F2-H2*256
    :REM LO REGISTER'HFSO
180 POKE S+1,H1:POKE S,L1
    :REM POKE FREQUENCY REGISTERS FOR
    VOICE 1'ERNR
190 POKE S+8,H2:POKE S+7,L2
    :REM POKE FREQUENCY REGISTERS FOR
    VOICE2'FSST
200 POKE S+4,17:REM POKE TRIANGLE
    WAVEFORM FOR VOICE 1'DKIH
210 POKE S+11,17:REM POKE TRIANGLE
    WAVEFORM FOR VOICE 2'DLFI
```

```
220 POKE S+22,FL:POKE S+21,0
    :POKE S+23,3:REM POKE CUTOFF FREQ,
     FILTER 1&2 ON'HURN
230 GET Z$'BCFA
240 IF Z$=CHR$(13)THEN FOR I=S TO S+24
    :POKE I,0:NEXT:STOP
    :REM CLEAR SOUND CHIP'MHPP
245 REM +=43, -=45, 133=F1,
     134=F3'BXCK
250 IF Z$=CHR$(43)THEN L2=L2+1
    :IF L2.255 THEN L2=255
    :GOTO 190'KCUN
260 IF Z$=CHR$(45)THEN L2=L2-1
    :IF L2<0 THEN L2=0:GOTO 190'LWVN
270 IF Z$=CHR$(133)THEN FL=FL+5
    :IF FL>255 THEN FL=255
    :GOTO 190'LCCQ
280 IF Z$=CHR$(134)THEN FL=FL-5
    :IF FL<0 THEN FL=0:GOTO 190'LXVQ
300 GOTO 230'BDEX
```

Listing 2. Scales

```
10 REM PROGRAM NAME SCALES'BRFC
20 REM DAVID R. BROOKS, JULY 84'BUJE
30 REM CALCULATES SID POKE VALUES
   FOR'BBDH
40 REM HIGHEST OCTAVE FOR EQUAL,
    JUST'BBUI
50 REM AND MEANTONE TEMPERAMENT'BWAH
60 POKE 53280,0:POKE 53281,0
   :PRINT CHR$(14)'EUQI
70 DEF FN R(X)=INT(X*100+.5)/100'HPFK
80 DIM E(13),J(13),M(13),ER(13),
   JR(13),MR(13),N$(6),PN$(23),
   C(3)'BHKQ
90 FOR I=1 TO 23:READ PN$(I):NEXT'FMRK
100 DATA"[SHFT A]","[SHFT B]B","
    [SHFT B]","[SHFT C]","[SHFT C]#",
    "[SHFT D]","[SHFT E]B","[SHFT E]",
    "[SHFT F]","[SHFT F]#","[SHFT G]",
    "[SHFT G]#","[SHFT A]","[SHFT B]
    B","[SHFT B]"'BOQK
110 DATA"[SHFT C]","[SHFT C]#","
    [SHFT D]","[SHFT E]B","[SHFT E]",
    "[SHFT F]","[SHFT F]#","[SHFT G]
    "'BHME
120 REM EQUAL TEMPERAMENT RATIOS'BWBE
130 F=2^(1/12)'DHFB
140 FOR I=0 TO 12:ER(I+1)=F^I
    :NEXT'HONG
150 REM JUST RATIOS'BKQD
160 C1=16/15:JR(1)=1:REM C'EPFG
170 JR(2)=9/8/C1:REM C#'EMMH
180 JR(3)=9/8:REM D'DJCG
190 JR(4)=9/8*C1:REM E FLAT'EPTK
200 JR(5)=5/4:REM E'DJWY
210 JR(6)=4/3:REM F'DJWA
220 JR(7)=3/2/C1:REM F#'EMID
230 JR(8)=3/2:REM G'DJXC
240 JR(9)=5/3/C1:REM G#'EMOF
250 JR(10)=5/3:REM A'DKFF
260 JR(11)=5/3*C1'DKDG
270 JR(12)=15/8:REM B'DLMH
280 JR(13)=2:REM C'CJOH
290 REM MEAN TONE RATIOS'BOIJ
300 C2=SQR(81/80):C3=SQR(C2):MR(1)=1
    :REM C'HYTG
310 MR(2)=25/24*C3:REM C#'EOID
320 MR(3)=9/8/C2:REM D'ELIE
330 MR(4)=6/5/C3:REM E FLAT'EPTG
340 MR(5)=5/4:REM E'DJAE
350 MR(6)=4/3*C3:REM F'ELDH
360 MR(7)=45/32/C2:REM F#'EORI
370 MR(8)=3/2/C3:REM G'ELFJ
380 MR(9)=25/16:REM G#'DMLJ
390 MR(10)=5/3*C3:REM A'EMRL
400 MR(11)=9/5/C2:REM B FLAT'EQOE
410 MR(12)=15/8/C3:REM B'ENAE
420 MR(13)=2:REM C'CJRD
430 N$(1)="[SHFT A]":N$(2)="[SHFT B]B"
    :N$(3)="[SHFT C]":N$(4)="[SHFT D]"
    :N$(5)="[SHFT F]":N$(6)="[SHFT G]
    "'GKTQ
440 NX(1)=0:NX(2)=1:NX(3)=3:NX(4)=5
    :NX(5)=8:NX(6)=10'GRYP
450 PRINT"[SHFT W]HAT NOTE WOULD YOU
    LIKE TO START ON?"'BAIO
460 PRINT"[SHFT A]LLOWED VALUES ARE
    [SHFT C], [SHFT D], [SHFT F],
    [SHFT G], [SHFT A], [SHFT B]
    B"'BADQ
470 INPUT NS$'BDXG
480 FOR I=1 TO 6:IF NS$=N$(I)OR
    ASC(NS$)+128=ASC(N$(I))THEN
    S=NX(I):GOTO 510'NMKW
490 NEXT'BAEH
500 PRINT"[SHFT N]OTE INPUT ERROR.
    [SPACE2,SHFT T]RY AGAIN..."
    :GOTO 450'CEWK
510 PRINT"[SHFT C]HOOSE FREQUENCY OF
    STARTING NOTE:"'BAEK
520 PRINT"1 - EQUALLY TEMPERED
    VALUE"'BAYI
530 PRINT"2 - RETAIN [SHFT A]440"'BACG
540 C(1)=220*F^S:AF=220'EPFJ
550 GET Z$:IF Z$=""THEN 550'EIJI
560 C(2)=C(1):C(3)=C(2)'CRGJ
570 IF Z$="1"THEN 640'DFUJ
580 IF S=3 THEN C(2)=3/5*2*AF
    :C(3)=3/5/C3*2*AF:GOTO 640'NCVV
590 IF S=5 THEN C(2)=2/3*2*AF
    :C(3)=2/3*C3*2*AF:GOTO 640'NCQW
600 IF S=8 THEN C(2)=4/5*2*AF
    :C(3)=4/5*2*AF:GOTO 640'MASN
610 IF S=10 THEN C(2)=8/9*2*AF
    :C(3)=8/9*C2*2*AF:GOTO 640'NDIP
620 IF S=0 THEN C(2)=AF:C(3)=AF
    :GOTO 640'GTCJ
630 IF S=1 THEN C(2)=8/15*440
    :C(3)=8/15*C3*440'KAKO
640 PRINT"[SPACE6,SHFT S]
    CALE TEMPERAMENT:"'BAMK
650 PRINT"[SHFT N]OTE[SPACE2,SHFT E]
    QUAL[SPACE4,SHFT J]UST[SPACE5,
    SHFT M]EANTONE"'BANP
660 PRINT"-------------------------
    -----"'BANM
670 FOR I=13 TO 1 STEP-1'FFHL
680 E(I)=C(1)*ER(I)'CNAM
690 J(I)=C(2)*JR(I)'CNLN
700 M(I)=C(3)*MR(I)'CNSF
```

```
710 PRINT PN$(I+S);TAB(5);FN R(E(I));
    TAB(14);FN R(J(I));TAB(23);
    FN R(M(I))'IRGQ
720 NEXT'BAED
730 PRINT"[SHFT A]NOTHER SCALE
    (Y/N)?"'BAXK
740 GET Z$:IF Z$=""THEN 740'EIKJ
750 IF Z$="Y"GOTO 450'DFEJ
760 PRINT"[SHFT C]ALCULATE [SHFT S,
    SHFT I,SHFT D] [SHFT P,SHFT O,
    SHFT K,SHFT E] VALUES (Y/N)?"'BAIU
770 GET Z$:IF Z$=""THEN 770'EINM
780 IF Z$<>"Y"THEN PRINT"[SHFT E]
    ND PROGRAM":END'GDOR
790 PRINT"[SHFT S,SHFT I,SHFT D]
    [SHFT P,SHFT O,SHFT K,SHFT E]
     VALUES"'BASS
800 DIM OC$(12)'BHOD
810 C=.06095977'BKFF
820 OC$(1)=" [SHFT C]-7"
    :OC$(2)="[SHFT C]#-7"
    :OC$(3)=" [SHFT D]-7"
    :OC$(4)="[SHFT D]#-7"
    :OC$(5)=" [SHFT E]-7"'FJCV
830 OC$(6)=" [SHFT F]-7"
    :OC$(7)="[SHFT F]#-7"
    :OC$(8)=" [SHFT G]-7"
    :OC$(9)="[SHFT G]#-7"
    :OC$(10)=" [SHFT A]-7"'FKXW
840 OC$(11)="[SHFT A]#-7"
    :OC$(12)=" [SHFT B]-7"'CPGN
850 C1=8:C2=16'CIMK
860 IF S=0 THEN L=4'EECL
870 IF S=1 THEN L=3'EECM
880 IF S=3 THEN L=1'EECN
890 IF S=5 THEN L=11:C1=4:C2=8'GNXR
900 IF S=8 THEN L=8:C1=4:C2=8'GMJJ
910 IF S=10 THEN L=6:C1=4:C2=8'GNXK
920 J=0'BCSG
930 PRINT"[SHFT N]OTE [SHFT E]QUAL
    [SPACE2,SHFT J]UST[SPACE3,SHFT M]
    EANTONE"'BAJP
940 PRINT"--------------------------
    "'BAOM
950 FOR I=L TO 12:DE=E(I)/C*C1
    :DJ=J(I)/C*C1:DM=M(I)/C*C1'MJVY
960 J=J+1'CDHL
970 PRINT OC$(J);INT(DE);INT(DJ);
    INT(DM):NEXT'FWRS
980 IF L=1 THEN 1020'DGKO
990 FOR I=1 TO L-1:DE=E(I)/C*C2
    :DJ=J(I)/C*C2:DM=M(I)/C*C2'NJSD
1000 J=J+1'CDHU
1010 PRINT OC$(J);INT(DE);INT(DJ);
     INT(DM):NEXT'FWRC
1020 STOP'BASU
1030 OPEN 15,8,15:PRINT#15,"S:SCALES"
     :CLOSE 15:SAVE"SCALES",8'ERAF
```

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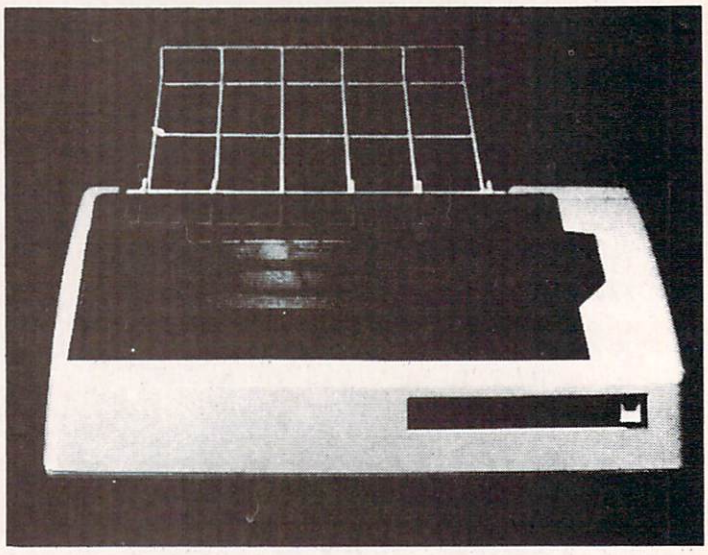

ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890-=
abcdefghijklmnopqrstuvwxyz 1234567890-=

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SPECIFICATIONS

PRINTING METHOD
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PRINT STYLE
Correspondence Quality

PRINT DIRECTION
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COLUMN CAPACITY
80

CHARACTER FONT
8 X 8

LINE SPACING
Programmable

CHARACTER SIZE
0.094" high, 0.08" wide

COPIES
3, including original

RIBBON TYPE
Cartridge

RIBBON LIFE
1.2 million characters

RIBBON CARTRIDGE
Commodore P/N613160550

PAPER WIDTH
3" to 10" tractor or single sheet friction

FORMS
7.5 plus (0.5 X 2 sprocket margins)
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9.5" laterally
5/32" diameter

INTERFACE
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GRAPHICS
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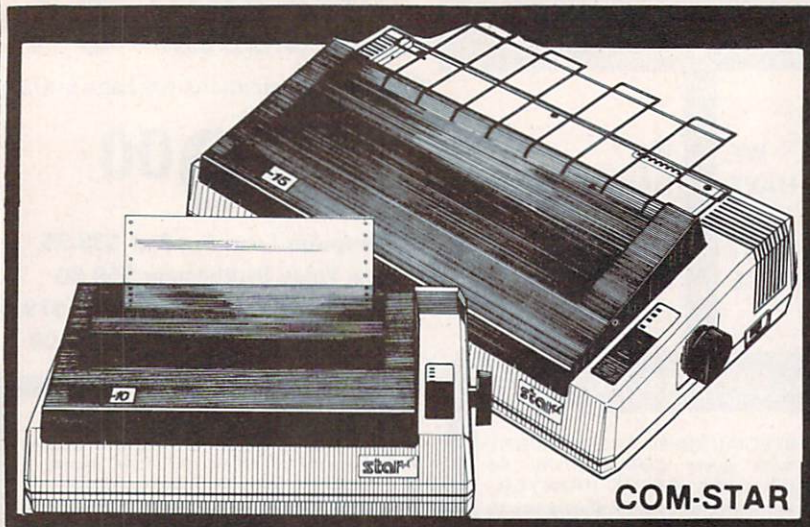

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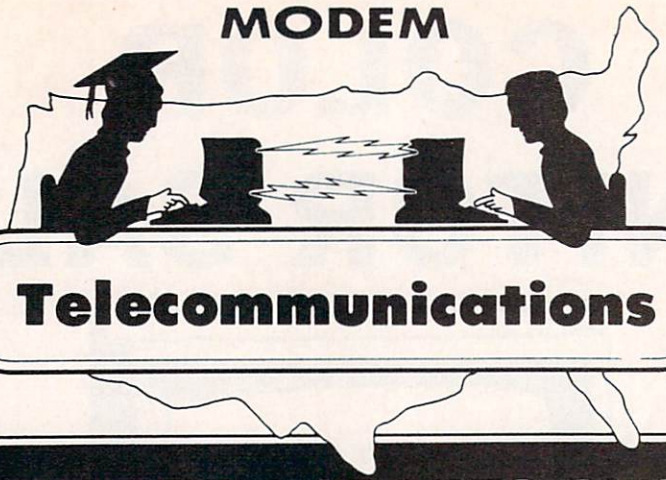

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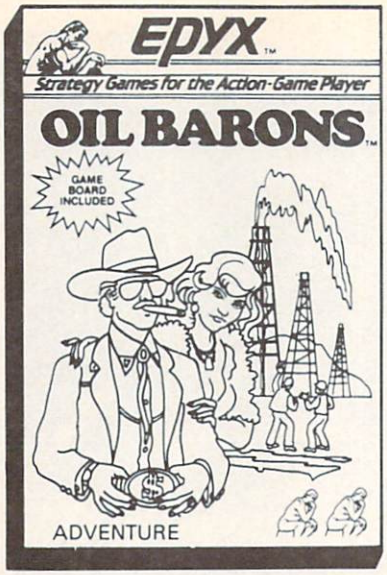

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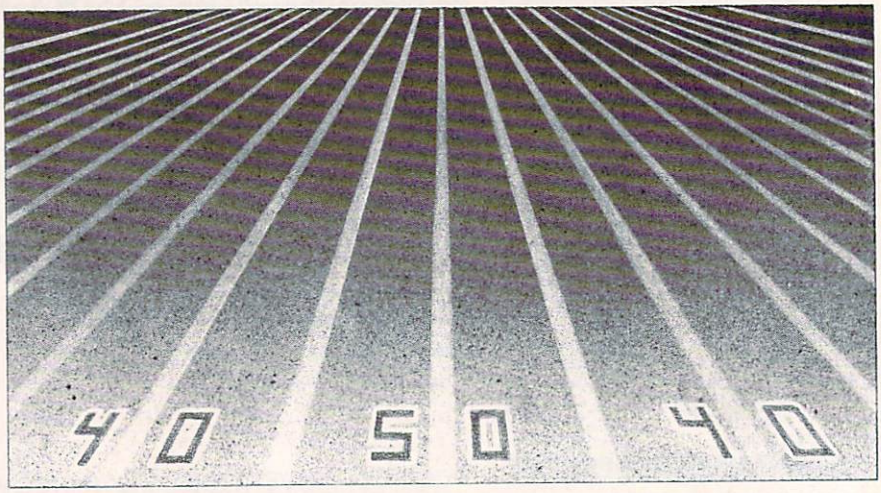
BY TIMOTHY CHOATE

Manager Arithmetic Part 2



STEVE EARLY

Understanding the combinations of "and" and "or" and their effects may take a little thought and practice, but will increase the value of the Arithmetic mode to you.

The Arithmetic mode used in *The Manager,* Commodore's database manager for the Commodore 64, can be a useful tool, once you learn the niceties of how it works.

Although the basics of using *The Manager's* Arithmetic mode are relatively simple to grasp, you may need a little more guidance if you want to use its more advanced features. Part 1 of this article, which appeared in the January/February issue, explained how to use Arithmetic's simpler capabilities. This part will help you learn two of the Arithmetic mode's advanced features, so you can get the most effective use out of your *Manager* software.

When you are using Arithmetic, you will find two commands to be very useful: conditional statements and loops. Conditional statements allow you to perform more than one calculation within different records or to do calculations only within selected records. Loops, on the other hand, make your computer perform an action for as long as a certain condition is true, and stop performing it when the condition becomes false.

Conditional Statements

Conditional statements include "if . . . then . . . endif," "and" and "or." They cause something to occur only if a certain set of conditions is true. If the conditions are not true, *The Manager* will go onto the next statement in your arithmetic. However, if the conditions are true, the statement after the conditions will be executed.

An example of the "if . . . then . . . endif" statement is as follows:

```
if (f2 = 'my name') then 5 to r1
endif
r1 to 0d3
```

The first line of this tells the computer to send a value of five to register one if field two is "my name." Note that parentheses should always be used around the conditions, as shown in this example and that whenever you use an "if . . . then" you must have an "endif" after it to tell the computer that the loop is over. If you forget the "endif", you will get an error message. Also, when you have a condition like this one, which involves an alphanumeric field, you must make the space between the quotes the same as the length of that field. Thus, if field two were 15 characters in length, the condition would be: (f2 = 'my name ').

If your field is numeric (was defined in Create/Revise mode as numeric), the condition might look like this: (n2 = 4). Notice an "n" is used instead of an "f" and no quotes are needed.

The "and" and "or" statements can be used in conjunction with "if . . . then." The "and" specifies that all conditions must be true in order to execute the line. The "or" specifies that if either condition is true, the line will be executed. Of course, you can use more than one "and" or "or" and you can use both words in the "if . . . then" statement.

Examples of how you can use "and" and "or" are as follows:

```
if (f1 = 'y') and (n3 < 20) then . . .
endif
if (f1 = 'y') or (n3 < 20) then . . .
endif
if (f1 = 'y') and (f2 = 'n') and
(n3 > 20) then . . .
endif
if (f1 = 'y') and (f2 = 'n') or (n3 < 1)
or (n5 = 3) then . . .
endif
```

In the first example, the statement after "then" will be carried out only if field one is "y" and numeric field three is less than 20. In the second example, the statement will be carried out if field one is "y" or numeric field three is less than 20. Thus, if either condition is true, the statement will be executed. In the third example, the statement will be executed if field one is "y" and field two is "n" and numeric field three is greater than 20. Thus, in this example all three conditions must be true for the statement after "then" to be carried out.

The trickiest of these examples is the final one. In the final example, the statement will be executed if any one of three sets of conditions is true. These conditions are: field one is "y" and field two is "n", numeric field three is less than one, numeric field five equals three. It does not matter if two of these sets of conditions are false. The statement after "then" will be executed as long as at least one set of conditions is true. This results from the use of "or" here. When "and" and "or" are used in the same statement, the "or" will always separate the two sides into individual conditions (or sets of conditions) and make the overall condition (between "if" and

"then") true as long as one of the conditions is true.

This is a little difficult to comprehend so an illustration may help. For this illustration, assume that W is a true condition, X is a false condition, Y is a true condition and Z is a false condition.

W and X and Y and Z — false
W and X and Y or Z — false
W and X or Y and Z — false
W or X and Y and Z — true
W and X or Y or Z — true
W and Y or X and Z — true
W or Y or X and Z — true
W and Y or X or Z — true
W or X or Y or Z — true
(W or Y) and X and Z — false

Hopefully, this provides a bit more understanding of how the computer decides what is true and false when multiple "and" and "or" statements are being used.

Whenever an "or" is used, it has the same effect as separating two parts of an equation by putting each side in a separate set of parentheses. If more than one "or" is used then this "parentheses effect" will occur more than once. The "and," however, does not have this effect. It involves only the two statements that are immediately to its right and left. Thus, the sixth example above is the same as (W and Y) or (X and Z). Of course, the "parentheses effect" of the "or" will be overridden if the "or" appears in parentheses with two statements, as in the last example.

Understanding the combinations of "and" and "or" and their effects may take a little thought and practice, but will increase the value of the Arithmetic mode to you.

Loops

The "while ... do ... endwhile" loop can be used to make the computer perform something for as long as a certain condition is true. When the condition becomes false, the computer stops performing the action. This is normally used in coordination with subscripts to perform the same operation on several fields or registers. For example, you may want to send the values in a large group of registers to display positions.

An example of the "while ... do ... endwhile" format is as follows:

```
0 to r1
while (r1 < 3) do
... ; statement to be executed
r1 + 1 to r1
endwhile
```

In this example, the first line simply sets register one to zero. This line is usually unnecessary, but it cannot hurt to preset your registers to zero, especially if you have been using them in other calculations and want them to be re-initialized at zero. The second line commences the loop and provides that the loop will continue until register one is equal to or greater than three. The next line would have some sort of operations to be done while the condition (r1 < 3) is true. After this, the register is increased by one. If this "increasing" statement were not there, the loop would continue endlessly in this example. Finally, the "endwhile" signifies the end of the loop and will make the computer go back up to the "while" line and check the condition again. The "endwhile" is necessary to avoid an error message.

The use of conditional statements and loops especially adds great power to The Manager. *Arithmetic mode allows you extra simplicity if you are willing to take some time to experiment.*

As I mentioned, the "while ... do ... endwhile" loop is most often used with subscripts. The use of subscripts makes the loop effective and important. A subscript appears in the form "r(r1)." All registers, fields and display positions can be accessed using subscripts and any register or numeric field can be a subscript to something else.

An example of a "while ... do" loop using subscripts is as follows:

```
1 to r6
while (r6 < 6) do
r(r6) to d(r6)
r6 + 1 to r6
endwhile
```

The loop will send the values of registers one through five to display positions one through five. It begins with register six equal to one so that register one is sent to display position one. Then, register six will increase to two and register two will be sent to display position two. Then, register six will continue to increase and each consecutive register will be sent to the same numbered display position. This process will continue until register six equals six and the condition in the "while ... do" statement becomes false. Using this method saves you the time of sending each register individually to a display position, which is particularly helpful if you have a lot of registers to be sent.

To re-emphasize, subscripts can be used with all data types (fields, display positions, registers) and any register or numeric field can be used as a subscript. Also, arithmetic calculations can be performed within the subscript so that you could have "n(r1 + 3)" or "d(n3 + r2 − 2)."

In addition to the registers that you create, there are several predefined registers in *The Manager*. These were previously specified in the program itself. These registers are numbered from 101 to 105 (not including 103). Register 101 is the most useful of these. Register 101 stands for the current record number. The current record number is useful in searches (e.g., report all records from record number one to record number 20), in reports, in Arithmetic and elsewhere. This register, and any other register, can be accessed from Report Generate mode by typing "r" for data type and, in this case, using 101 as the subscript.

Registers 102,104 and 105 are of little assistance to the user, but they are used by *The Manager* itself. Register 102 reports any fields that have errors (if register 102 does not equal zero then the record will not be saved to disk). Register number 104 lets you know what page in the report you are on (Report Generate). Finally, register 105 tells you what mode you are in. Register 105 will equal zero when you are in the enter, change or delete modes. It will equal one if you are in the search, accumulate, get or index modes and it will equal two if you are in Report Generate.

Registers 101 to 105 (not including register 103) can all be accessed from Arithmetic or Report Generate modes, although the only one that will be of real use to you is register 101.

64 USERS ONLY

An example of using register 101 in your arithmetic is as follows:

r101 to 0d1

This single line will cause your record number to be displayed in display position one on your Enter/Edit screen.

Sending Information to Fields

Another nice function of *Manager* Arithmetic is the ability to send various types of information to fields. You already know that arithmetic results can be sent to display positions. These results can also be sent to fields using the same format as used with display positions. (See last issue.) For example, "r1 to 2f2" will send the number in register one to field two with two decimal places. Remember, just as you do when you send results to display positions, you must define the number of decimal places when you send arithmetic results to fields. Also remember that the field must be long enough to hold the entire number (decimal places and decimal point included) or part of it will be cut off when displayed in the field.

A number can be sent to a field whether the field was defined as numeric or alphanumeric. If the field was defined as alphanumeric, though, it cannot be used in further arithmetic calculations, since the number will be considered as text.

In addition to sending arithmetic results, *Manager* Arithmetic can be used to send literal text or numbers to both fields and display positions. Again, remember that anything that is sent to a field must fit within the defined length of that field or it will be partially cut off when displayed in the Enter/Edit mode. Also, when literals or arithmetic results are sent to fields, anything that was already in those fields will be cleared and overwritten.

To send literal text or numbers to a display position or field, you would use the following format:

'this is literal text' to d1
56 to 0d2
'more literal text' to f3
672 to 0f4
6 to r2

Literal text can be any length when sent to a display position, up to one line long. Even if it is longer than the designated length of the display position, literal text will all be printed on the Enter/Edit screen. The only time you have to watch the length of your literal text is when you send it to a field, as noted above.

Literal numbers are limited by the length of both the fields and display positions they are sent to. Unlike literal text, literal numbers can also be sent to registers.

Remember, you should always define the number of decimal places when you send any number to a field or display position.

Any register or display position can easily be accessed for use in reports. You simply need to use "r" (register) or "d" (display position) for data type. The subscript would be the register or display position number that you want to access. The other data in your print area is filled in using the same methods used with fields.

When you use registers or display positions in reports, the results shown in them will be the same as the results you would have after accumulating in or just entering the Enter/Edit Mode (*The Manager* automatically accumulates the arithmetic when you go into Enter/Edit). In addition, if you sent any data to fields in your arithmetic, that data will appear in your fields in the report even if you had originally entered data into those fields in Enter/Edit (it will have been overwritten permanently.)

Now that you understand the Arithmetic mode more fully, we will look at an example. This example will find the average of a particular numeric field (n3) in a file. The arithmetic would be as follows:

r1 + n3 to r1
r2 + 1 to r2
r1/r2 to 2d1

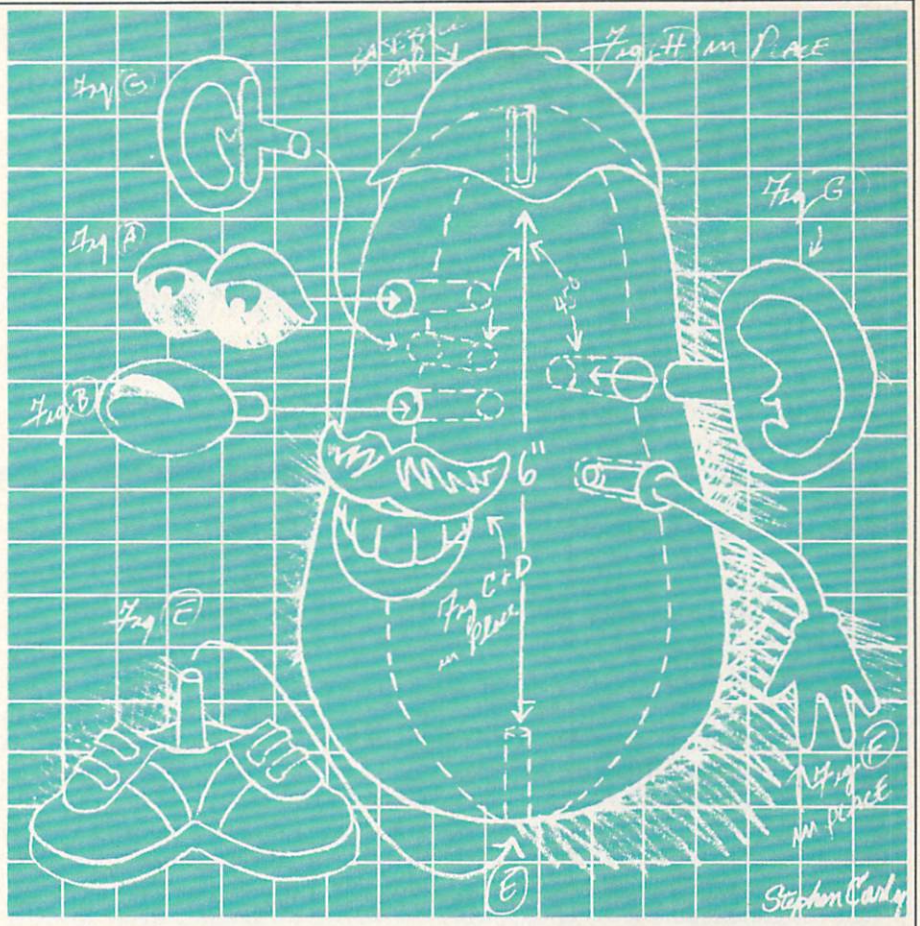
This is all you need to find the average of numeric field three. The first line causes a sum of all of the third fields in the file. The second line finds out how many records you have accessed. Finally, the third line divides the sum of the numeric third fields by the number of fields that have been added into that sum (the number of records accessed) to find the average of numeric field three.

As you can see, *Manager* Arithmetic has many useful features. The use of conditional statements and loops especially adds great power to *The Manager*. Arithmetic mode allows you extra simplicity if you are willing to take some time to experiment. C

BY JAMES CHANDLER, JR.

Tinkertools:

Computer-Aided Design for the 64 with *Simon's BASIC*



When I bought my Commodore 64, I had three tasks in mind for it. I wanted to do accounting and word processing for my small business and I wanted to use the computer to store and edit electronic circuit diagrams.

I found a great selection of useful programs for the first two tasks, but for the third task I found only computer graphics programs. It is an exercise in frustration to draw or edit an electronic diagram with a joystick-driven electronic paintbrush program.

What I needed was a computerized rubber stamp, so I could call up standard figures, leave their footprints on the screen, then connect the symbols together like tinkertoys.

After making several abortive attempts to create a machine language drafting program, I ran across the graphic routines I needed to easily write a computer-aided design (CAD) program. The resulting program is adaptable to many types of two-dimensional drafting in addition to electronics. You can use it, for instance, to create organic chemistry symbols, high-order math symbols, flow charts, fancy lettering layouts, music notation, facemakers (either Mr. Potato Head or police ID simulations) and children's stick-figure cartoons.

Since the program works like tinkertoys, I dubbed it "Tinkertools."

"Tinkertools" allows the creation of up to 81 high-resolution figures (like sprites, but for this application, better). These figures are in a string array(A$) and can be loaded, saved or merged. You draw by placing combinations of figures on the screen.

The location, rotation, identity and size of the figures are stored in a 4K block reserved at the top of user memory. Drawing memory can be edited, saved, loaded and boilerplated.

In summary, the program allows control of a figure set and use of the figure set as a picture processor (similar in intent to a word processor). The final drawing can be printed to an appropriate printer.

Operating Instructions

Loading: After loading *Simons' BASIC,* load and run "Tinkertools."

Load/Save Drawing: The drawing memory is stored to disk as a program file. Typically, drawings load or save in a few seconds. The simpler the drawing, the shorter the file. A maximum of 584 figures can be held in drawing memory, but different files can be superimposed on the screen, allowing boilerplating.

Go to Blank High-Res Screen or Previous High-Res Screen: This enters the drawing mode on either a blank screen or the previously displayed screen. Detailed instructions are given under "Drawing Mode Controls."

View Directory: This menu selection displays the disk directory. Figure files are sequential, and drawing files are in program format. "Tinkertools" load and save routines are not 100% error protected. It would be wise to put a suffix of /D (drawing) or /F (figures) to the files you create so you don't inadvertently load or save something that will crash the program.

Reset or Find Drawing Pointer: The drawing pointer remembers how many entries are made to drawing memory. The pointer is saved with the drawing. To clear a drawing from memory, reset the drawing pointer to zero. After 584 writes or erasures the program tells you the drawing is full so you can save that file and continue drawing with a new file. If the program crashes, the last drawing will remain in memory if you don't lose power or run some other program.

When "Tinkertools" is restarted, it sets the drawing pointer to zero, but you can reset it to some high value (less than 584). Enter hi-res and hit the Commodore logo key and the D key. It will draw whatever is in drawing memory. If garbage is encountered, drawing will halt and the computer will inform the user where good drawing data ends. The drawing can then be salvaged by setting the drawing pointer accordingly. By manipulating the drawing pointer, you can abridge a diagram that began well but ended badly, then continue drawing from the good section.

Create Figures: "Tinkertools" relies heavily on the *Simons' BASIC* DRAW

command. You may want to study how that command works to better understand creating figures. The cursor position, screen colors, rotation and size carry over from the last access to the high-res screen. To create a figure expanded in size or at a particular rotation, set these in high-res mode, then exit to the menu and enter "Create Figures."

Each step in a figure is defined by a cursor key press then a function key press. Pressing a cursor key then F7 or F8 plots a dot in the indicated direction. Pressing a cursor key then F5 or F6 plots a space in the indicated direction. Avoid plotting dots on top of dots or the figure will not look correct when it becomes the cursor. Plotting spaces on top of dots works fine. It is helpful to sketch your figures on grid paper before entry.

When you make an error creating your figure, press E (edit). The figure will disappear. By pressing S (step), the figure will recreate itself one step at a time. Before you reach the error, simply begin keying in the rest of the figure. Press [SHIFT CLR/HOME] to restart from scratch. Press X when the figure is complete. The computer will ask what key to assign the figure to. Strike an appropriate key and the new figure is assigned.

"Tinkertools" allows no more than 255 dots and spaces in each figure, and will automatically force assignment if you try to exceed this number.

Load/Save Figure: As long as the figures of two or more files have different reference keys, they may be loaded on top of each other in the computer then saved as a composite file. For instance, to merge a disk file of letter-figures assigned to the shifted alpha keys and a file of drafting figures assigned to unshifted keys, load both files and save the result. It takes about 15 seconds to load or save a typical set of figures.

Drawing Mode Controls

Alphanumeric Keys and Shifted Alpha Keys: Pressing each key causes the figure represented by that key to appear on the screen. The selected figure is the cursor, and is identified as such because it is flashing.

Cursor Keys: The cursor keys work in the normal fashion. However, cursor speed increases as a key is held down. Tapping a cursor key moves the figure in one-pixel increments but holding the key accelerates the figure across the screen.

The program allows control of a figure set and use of the figure set as a picture processor (similar in intent to a word processor).

F1/F2: If you put a figure in the computer but don't remember its reference key, F1 scans forward through the figure file, flashing each figure in sequence. Scan backward through the figures with F2.

F3/F4: F3 rotates a figure clockwise in 45-degree increments. Rotate counterclockwise with F4.

F5/F6: F5 enlarges a figure in steps, while F6 shrinks it. This is particularly useful when drawing line segments. Call up a line segment figure, use cursor keys to place the figure, orient with F3/F4, then adjust to the proper length with F5/F6.

F7/F8: F7 causes the cursor figure to leave a footprint. If the cursor is left at the same location, no change is seen. But when the cursor is moved or changed, the footprint remains. To erase a footprint, superimpose the proper figure over the footprint and press F8. Drawing memory remembers F7 or F8 keystrokes. It ignores all preparatory movements.

[Commodore logo]M: Returns you to the menu.

[Commodore logo]B: Increments a high-res background color.

[Commodore logo]F: Increments high-res foreground color.

[Commodore logo]D: Displays drawing memory to the high-res screen. If you half complete a drawing and then change screen colors, this will blank the screen. If you hit [Commodore logo]D, the drawing is again displayed. After loading a drawing from disk, enter high-res and hit [Commodore logo]D to display the drawing. To superimpose multiple drawings, load and display a drawing, return to menu, load another drawing, go to previous high-res screen, hit [Commodore logo]D, return to menu, etc.

Left Arrow Key: Outputs hardcopy of a high-res screen to a 1525-type printer. Other printers may work depending on how thoroughly they emulate the 1525.

FigProg

If you use a set of figures frequently, it is convenient to merge figure statements with "Tinkertools." This eliminates having to load figures every time you enter "Tinkertools." Data statements are time-consuming to read, so the ideal way to put figures in "Tinkertools" is with A$(nn) = "xxxxx" statements.

Included at the end of the main program is a short program titled "FigProg," which is an example of a set of figures in the form A$ = xxx. It can be added to the beginning of the "Tinkertools" program to create "Tinkertools + " and includes a complete character set and examples of electronic components.

Using "Tinkertools"

If I get a circuit idea, I sketch it into the computer then save it to disk. I take a nameplate drawing off disk to superimpose on my circuit, inserting date, title, revision number, etc. Then I print a hardcopy. After testing the circuit and thoroughly scribbling all over the hardcopy, I can update the first drawing rather than having to redo the entire diagram. I can also boilerplate standard circuit modules like power supplies or preamps.

Improvements You Can Make

An easy but inelegant modification to "Tinkertools" would add a function to offset a drawing in memory by three-fourths of a screen in any direction. This would allow you to see the edge of the previous screen and draw extensions to it in all directions. Hardcopies from these screens could be manually pasted up and photocopied.

If "Tinkertools" Y coordinate range were expanded from 200 to 800 pixels and the program could window a drawing in 100-pixel vertical steps,

drawings could be made which would cover almost an entire printer page. Considering the scale of the figures I use, that is a lot of detail! The *Simons' BASIC* COPY instruction would have to be modified, however, to avoid linefeeds at the beginning and end of a screen dump.

The main restriction on developing a really heavy duty drafting program for the 64 is limited printer and screen display capability. If one had access to a high-quality drafting plotter, it should be easy to write a program to drive the plotter from "Tinkertools." Then you could generate impeccably drawn color 11 × 14 camera-ready art, with arcs and angles that look like arcs and angles, not ziggy lines.

However, people who can pay $2000 or more for a plotter probably will buy an expensive off-the-shelf CAD system with it. Such systems typically magnify, zoom, rotate in three dimensions and so forth. Without extremely high screen resolution these features are rather useless. Why zoom back to see the entire drawing if all the components shrink down to unidentifiable clumps of dots?

Momentarily forgetting the luxuries thousands of dollars will buy, my 1525 printer hardcopies are neater, more legible and easier to edit than what I could do by hand in the same time. If I need something better, I can still get out a drafting board and spend half a day making the drawing pretty. C

Tinkertools

```
500 POKE 52,112:POKE 56,112:CLR
    :POKE 650,128:CR$=CHR$(13)
    :ZZ$=STR$(999)
502 DIM A$(92):X=160:Y=100:PN=28673
    :POKE PN,112:POKE(PN+1),3
504 PRINT"[CLEAR,DOWN,SPACE12,RED]
    TINKERTOOLS[SPACE2]CAD[BLACK]"
506 PRINT"[DOWN,SPACE10,RED]
    BY JAMES CHANDLER JR[BLACK]"
508 PRINT"[DOWN,SPACE13,RED]
    COPYRIGHT 1984[BLACK]"
510 GOSUB 766:FLASH 2,1:BFLASH 1,2,7
    :F=0:B=1
512 GOSUB 568:OFF:BFLASH 0:GOTO 652
514 IF F>15 THEN F=0
518 IF B>15 THEN B=0
520 POKE 53280,B:ON E GOSUB 696,694
522 PM=2:S=1
524 GET Z$:IF Z$=""THEN GOSUB 578
    :GOSUB 578:I=1:GOTO 524
526 IF Z$=CHR$(17)THEN Y=Y+I:I=I+1
    :GOTO 576
528 IF Z$=CHR$(145)THEN Y=Y-I:I=I+1
    :GOTO 576
530 IF Z$=CHR$(29)THEN X=X+I:I=I+1
    :GOTO 576
532 IF Z$=CHR$(157)THEN X=X-I:I=I+1
    :GOTO 576
534 D=ASC(Z$)-132:IF D<0 THEN 538
536 ON D GOTO 552,556,564,560,554,558,
    566,562
538 D=ASC(Z$)-33:IF D>(-1)AND D<62
    THEN A=D:GOTO 524
540 D=ASC(Z$)-131:IF D>61 AND D<91
    THEN A=D:GOTO 524
542 IF Z$=CHR$(95)THEN GOSUB 614
    :GOTO 576
544 IF Z$=CHR$(191)THEN B=B+1:GOTO 514
546 IF Z$=CHR$(187)THEN F=F+1:GOTO 514
548 IF Z$=CHR$(172)THEN GOTO 616
550 IF Z$=CHR$(167)THEN GOSUB 692
    :GOTO 652
552 A=A+1:GOTO 576
554 A=A-1:GOTO 576
556 RT=RT+1:GOTO 576
558 RT=RT-1:GOTO 576
560 PM=1:GOSUB 578:PM=2:GOTO 576
562 PM=0:GOSUB 578:PM=2:GOTO 576
564 S=S+1:GOTO 576
566 S=S-1:GOTO 576
568 GET Z$:IF Z$=""THEN 568
570 RETURN
572 POKE PN,(INT(W/256))
    :POKE(PN+1),(W-(PEEK(PN)*256))
    :RETURN
574 FOR D=0 TO 300:NEXT D:RETURN
576 GOSUB 578:GOSUB 578:GOTO 524
578 IF A>90 THEN A=90
580 IF A<0 THEN A=0
582 IF Y>200 THEN Y=200
584 IF Y<1 THEN Y=1
586 IF X>318 THEN X=318
588 IF X<1 THEN X=1
590 IF RT>7 THEN RT=0
592 IF RT<0 THEN RT=7
594 IF S<1 THEN S=1
596 GOSUB 762:GOSUB 764
598 IF PM=2 THEN 612
600 W=(256*PEEK(PN))+PEEK(PN+1)
602 POKE W,RT:POKE(W+1),S:POKE(W+2),A
604 POKE(W+3),(INT(X/256))
    :POKE(W+4),(X-(PEEK(W+3)*256))
606 POKE(W+5),Y:POKE(W+6),PM
608 W=W+7:GOSUB 572
610 IF W>(PN+4088)THEN 650
612 RETURN
614 COPY:RETURN
616 ON E GOSUB 696,694
618 PX=(PEEK(PN)*256)+PEEK(PN+1)-1
620 FOR W=(PN+2)TO PX STEP 7
622 RT=PEEK(W):S=PEEK(W+1)
624 IF RT<0 OR RT>7 THEN 640
626 GOSUB 762
628 A=PEEK(W+2):IF A<0 OR A>90 THEN
    640
630 X=(256*PEEK(W+3))+PEEK(W+4)
    :IF X<0 OR X>318 THEN 640
632 Y=PEEK(W+5):IF Y<0 OR Y>200 THEN
    640
634 PM=PEEK(W+6):IF PM<0 OR PM>2 THEN
    640
636 GOSUB 764
638 NEXT W:PM=2:GOTO 524
640 GOSUB 692:PRINT"[CLEAR]
    BAD DRAWING DATA ENCOUNTERED"
642 W=INT((W-PN+2)/7)
644 PRINT"[DOWN]LAST GOOD DATA AT
    DRAWING POINTER "W
646 PRINT"[DOWN3]PRESS (COMMODORE) M
```

```
    TO CONTINUE"
648 W=PX:GOTO 638
650 GOSUB 692:PRINT"[CLEAR]
    DRAWING MEMORY IS FULL":GOSUB 766
    :GOSUB 568
652 PRINT"[CLEAR,DOWN3,PURPLE,SPACE12]
    TINKERTOOLS MENU"
654 PRINT"[DOWN3]0.[SPACE3]
    LOAD DRAWING"
656 PRINT"1.[SPACE3]GO TO BLANK HIRES
    SCREEN"
658 PRINT"2.[SPACE3]GO TO PREVIOUS
    HIRES SCREEN"
660 PRINT"3.[SPACE3]SAVE DRAWING"
662 PRINT"4.[SPACE3]VIEW DIRECTORY"
664 PRINT"5.[SPACE3]RESET DRAWING
    POINTER"
666 PRINT"6.[SPACE3]FIND DRAWING
    POINTER"
668 PRINT"7.[SPACE3]LOAD FIGURES"
670 PRINT"8.[SPACE3]CREATE FIGURES"
672 PRINT"9.[SPACE3]SAVE FIGURES"
674 GOSUB 568:Z=ASC(Z$)
    :IF Z<48 OR Z>57 THEN 674
675 Z=VAL(Z$)+1:ON Z GOTO 678,680,682,
    684,688,698,706,788,710,778
676 GOTO 674
678 GOSUB 768:POKE 780,0:SYS 65493
    :GOSUB 766:GOSUB 568:GOTO 652
680 E=1:GOTO 514
682 E=2:GOTO 514
684 GOSUB 768:POKE 251,1:POKE 252,112
    :POKE 780,251
686 POKE 781,PEEK(PN+1)
    :POKE 782,PEEK(PN):SYS 65496
    :GOSUB 766:GOSUB 568:GOTO 652
688 DIR "$
690 GOSUB 766:GOSUB 568:GOTO 652
692 CSET 0:RETURN
694 CSET 2:RETURN
696 HIRES F,B:RETURN
698 PRINT"[CLEAR]SET DRAWING POINTER
    TO WHAT VALUE? (999 TO ABORT)"
700 INPUT W:IF W=999 THEN 706
702 IF W<0 OR W>584 THEN PRINT"OUT OF
    RANGE VALUE":GOTO 706
704 W=(W*7)+PN+2:GOSUB 572
706 W=(256*PEEK(PN))+PEEK(PN+1)
    :W=(W-PN+2)/7:W=INT(W)
708 PRINT"CURRENT DRAWING POINTER IS
    "W:GOSUB 766:GOSUB 568:GOTO 652
710 A=91:AZ=0:A$(A)="":PM=1
712 GOSUB 696:GOSUB 762
714 GOSUB 568
716 IF Z$="E"THEN 744
718 IF Z$="X"THEN 748
720 IF Z$="S"THEN 746
722 IF Z$=CHR$(19)THEN 712
724 IF Z$=CHR$(147)THEN 710
726 IF Z$=CHR$(29)THEN V=0:GOTO 736
728 IF Z$=CHR$(157)THEN V=3:GOTO 736
730 IF Z$=CHR$(145)THEN V=1:GOTO 736
732 IF Z$=CHR$(17)THEN V=2:GOTO 736
734 GOTO 714
736 GOSUB 568:IF Z$=CHR$(136)OR
    Z$=CHR$(140)THEN V=V+5:GOTO 740
738 IF Z$<>CHR$(135)AND
    Z$<>CHR$(139)THEN 736
740 A$(A)=A$(A)+RIGHT$(STR$(V),1)
    :IF LEN(A$(A))>254 THEN 748
742 GOSUB 764:GOTO 714
744 AZ$=A$(A):GOTO 710
746 AZ=AZ+1:A$(A)=A$(A)+MID$(AZ$,AZ,1)
    :GOTO 742
748 GOSUB 692:PRINT"[CLEAR]"
750 PRINT"HIT KEY WHICH REPRESENTS
    FIGURE":PRINT"(F8 TO ABORT)"
    :GOSUB 568
752 IF Z$=CHR$(140)THEN 652
754 D=ASC(Z$)-33:IF D>( 1)AND D<62
    THEN A=D:GOTO 760
756 D=ASC(Z$)-131:IF D>61 AND D<91
    THEN A=D:GOTO 760
758 PRINT"INVALID KEY":GOTO 750
760 A$(A)=A$(91):GOTO 652
762 ROT RT,S:RETURN
764 DRAW A$(A),X,Y,PM:RETURN
766 PRINT:PRINT"[SPACE6]
    *** ANY KEY TO CONTINUE ***"
    :RETURN
768 PRINT"DRAWING NAME (X TO ABORT)"
    :INPUT F$:IF RIGHT$(F$,
    1)="X"THEN 652
770 L=LEN(F$):IF L>15 THEN PRINT"NAME
    TOO LONG":GOTO 768
772 FOR X=1 TO L:POKE 819+X,
    ASC(MID$(F$,X,1)):NEXT X
774 POKE 780,4:POKE 781,8:POKE 782,1
    :SYS 65466
776 POKE 780,L:POKE 782,3:POKE 781,52
    :SYS 65469:RETURN
778 GOSUB 800:OPEN 8,8,8,"0
    :"+F$+",S,W"
780 FOR A=0 TO 90:L=LEN(A$(A))
    :IF L=0 THEN 786
782 LX$=STR$(INT((L/51)+.99))
    :AX$=STR$(A):PRINT#8,LX$CR$AX$CR$;
784 FOR I=1 TO L STEP 51
    :Z$=MID$(A$(A),I,51)
    :PRINT#8,Z$CR$;:NEXT I
786 NEXT A:PRINT#8,ZZ$:CLOSE 8
    :GOSUB 766:GOSUB 568:GOTO 652
788 GOSUB 800:OPEN 8,8,8,"0
    :"+F$+",S,R"
790 INPUT#8,LX$:INPUT#8,AX$
792 L=VAL(LX$):IF L>5 THEN 798
794 A=VAL(AX$):A$(A)=""
796 FOR I=1 TO L:INPUT#8,Z$
    :A$(A)=A$(A)+Z$:NEXT:GOTO 790
798 CLOSE 8:GOSUB 766:GOSUB 568
    :GOTO 652
800 PRINT"NAME OF FIGURE SET (X TO
    ABORT)"
802 INPUT F$:IF RIGHT$(F$,
    1)="X"THEN 652
804 IF LEN(F$)>15 THEN PRINT"NAME TOO
    LONG":GOTO 800
806 RETURN
```

FigProg

```
6 A$( 0 )="66372577538"
11 A$( 1 )="5061883722756255"
16 A$( 2 )="55668882253275556"
21 A$( 3 )="566633877522056"
26 A$( 4 )="51688775223355506"
31 A$( 5 )="5011883775533725506"
36 A$( 6 )="5066888222706"
41 A$( 7 )="50636828252825506"
46 A$( 8 )="55618828253225506"
51 A$( 9 )="55505551183311777538182225
   55073838205"
56 A$( 10 )="551138777733165"
61 A$( 11 )="3556887755"
66 A$( 12 )="33355555"
71 A$( 13 )="5"
76 A$( 14 )="223806060606"
81 A$( 15 )="065188837775755066 38"
86 A$( 16 )="55555"
91 A$( 17 )="5555555555"
96 A$( 18 )="57565756575657565756"
101 A$( 19 )="575657565756575657565756575
    65756575657565756575657565756575"
102 A$( 19 )=A$( 19 )+"657565756"
106 A$( 20 )="500500500500500500500500
    05005005005005005005005005005005"
107 A$( 20 )=A$( 20 )+"500500500"
111 A$( 21 )="500500500500500500500500
    05005005005005005005005005005005"
112 A$( 21 )=A$( 21 )+"50050050050050
    05005005005005005005005005005005
    0500"
113 A$( 21 )=A$( 21 )+"50050050050050
    05005005005005005005005005005005
    0500"
114 A$( 21 )=A$( 21 )+"50050050050050
    05005005005005005005005005005005
    0500"
115 A$( 21 )=A$( 21 )+"50050050050050
    05005005005005005005005005005005"
116 A$( 22 )="565700005657000056570000
    056570000"
121 A$( 23 )="565700005657000056570000
    05657000056570000565700005657000056"
122 A$( 23 )=A$( 23 )+"70000565700005
    65700005657000056570000565700005657000056"
131 A$( 25 )="22233335555555688888865
    55555688888865555556888888"
141 A$( 27 )="22552828"
146 A$( 28 )="3655527888"
151 A$( 29 )="55566660707070737373737
    666"
156 A$( 30 )="7786"
166 A$( 32 )="11135566665555555255255
    25252572528728282882888828888"
167 A$( 32 )=A$( 32 )+"88866668066666"
171 A$( 33 )="35566666525525525525525
    28828828828828866666"
176 A$( 34 )="55555555566600057777773
    338661000055555555"
181 A$( 35 )="55555555666607070707373
    737376661000056666622227777 11"
182 A$( 35 )=A$( 35 )+"1155555555"
186 A$( 36 )="11133555551861836005555
    55525525525257252872828288"
187 A$( 36 )=A$( 36 )+"28828888888151
    56156156618618618222282572878888
    2005"
188 A$( 36 )=A$( 36 )+"72828"
191 A$( 37 )="55555666666022755522222
    7888222866666"
196 A$( 38 )="77755555222388888882220
    555111111388888"
206 A$( 40 )="55502070773788366060606
    06550702070773788366060606060606"
207 A$( 40 )=A$( 40 )+"55070207077378
    83660606065555"
236 A$( 46 )="11133555551861836555555
    52552552525257252872828828828"
237 A$( 46 )=A$( 46 )+"88288888881515
    633331555556156618"
251 A$( 49 )="55060607070706060607070
    7060606070707065"
256 A$( 50 )="55555555555555555555777
    77777777777777788888888888"
257 A$( 50 )=A$( 50 )+"88888888666666
    6666666666666"
261 A$( 51 )="55555666666000272828222
    725252233866666"
276 A$( 54 )="6155507772888186"
291 A$( 57 )="55255255255255255255255
    25525525525525525525528828"
292 A$( 57 )=A$( 57 )+"82882882882882
    88288288288288288288288288666666
    6800"
293 A$( 57 )=A$( 57 )+"05555511387277
    33333116666666666666668000555553333
    3333"
294 A$( 57 )=A$( 57 )+"6666666"
311 A$( 61 )="1160707072828 28"
316 A$( 62 )="506368377537700566"
321 A$( 63 )="50636887753775556"
326 A$( 64 )="00168837770755"
331 A$( 65 )="056368877775556"
336 A$( 66 )="501688877553377555"
341 A$( 67 )="50168887755337 7"
346 A$( 68 )="5516883777 25556"
351 A$( 69 )="55663387753770056"
356 A$( 70 )="66538222755366"
361 A$( 71 )="056622728836"
366 A$( 72 )="0606338775377005 18"
371 A$( 73 )="8662277555"
376 A$( 74 )="00566828377316188777700
    00056"
381 A$( 75 )="05663338752525633328 66
    6"
386 A$( 76 )="056368377707506"
391 A$( 77 )="5563688775377"
396 A$( 78 )="056368377725552511 88"
401 A$( 79 )="506368877537700051 8"
406 A$( 80 )="516837252052888"
411 A$( 81 )="66553388220577"
416 A$( 82 )="05663387772550625"
421 A$( 83 )="5066333872572506"
426 A$( 84 )="00566333773311877775060
    50756"
431 A$( 85 )="06063338070707073338 06"
436 A$( 86 )="0606333807077 7"
441 A$( 87 )="5066888222756255"
```

BY M. W. CAPRIO

A Gadget for the Commodore 64

GADGET is the name of a machine language utility program that will add both renumbering and appending capabilities to your Commodore 64.

A utility to renumber an entire BASIC program is handy to have in your bag of tricks. With it, you can re-establish the interval between line numbers that may have been obliterated in the course of editing and refining your program. Renumbering a program opens it up and gives you the space to continue making improvements on it. A renumbering routine guarantees that you will never paint yourself into a programming corner.

If I could have only one programming aid, it would surely be a renumbering routine. But if I could have two of them, my second wish would be for a utility to append programs or subroutines that are on a disk to a program that is already in the computer's memory. Many programmers keep notebook listings of multi-purpose subroutines and draw from the collection when one of their library routines is appropriate for the program they are writing. But with a utility for appending, the collection could be on a disk instead of in a notebook, and tacking a subroutine onto a developing program would take seconds instead of minutes.

GADGET is the name of a machine language utility program that will add both renumbering and appending capabilities to your Commodore 64. It is presented here as a BASIC loader called GADGET.BL. This is a BASIC program that has the decimal equivalents of the machine language code for GADGET in its data statements. As the loader runs, it reads its data and pokes each item where it must go in order to get the machine language program into memory. Once the poking is completed, GADGET will be in place. The SYS49449 command on line 170 ties the machine language program to BASIC so you can access it from immediate mode.

If all of this sounds a little opaque to you, don't worry—you only need to know how to work it, not how it works. Figure 1 shows what you can expect to see on the monitor when GADGET.BL runs.

Figure 1. GADGET Monitor Display

```
GADGET—A utility program to append and
       renumber basic programs.
       By M.W. Caprio 9/30/84

          Now Loading

Loading Complete

Use #/Return to renumber.
Use &/Return to append.

Ready.
```

Once GADGET is loaded, you can write programs, load or save them and even use the NEW command. The machine language routine that the loader put into memory will not be lost. It will sit quietly and wait to be called upon to renumber or to append something to the BASIC program you are writing. Of course, when you shut down the computer, GADGET will vanish. It must be reloaded, by running GADGET.BL each time the computer is powered up.

To renumber a program with GADGET, just type the # sign and follow it with the RETURN key. The renumbered version of your program will have its lines re-sequenced from 100, in increments of ten. All of the branching instructions (GOTO, GOSUB, etc.) will be renumbered, too. When renumbering is completed—it's very fast—the READY message will appear. You can then LIST your program to see the renumbered version, which will have replaced the original copy in memory.

There is one minor caveat that you must observe. The destination addresses that are a part of the branching instructions cannot be single digit numbers. If you must use a single digit address, add a leading zero to it (e.g., GOTO 3 should be written as GOTO 03) or it will be treated as an undefined statement number. Destination addresses that point to line numbers that do not exist—undefined statements—will be ignored. The GADGET renumbering routine will not comment on this, nor will it report any other errors that you may have made in your BASIC text. BASIC's error handler will post the error messages when you run your program.

Using GADGET to append a file to a program already in memory requires that you use the ampersand (&) followed by the RETURN key. You will be prompted with: NAME OF FILE? At that point type in the name of the file you want to add, but do not include quotation marks. The file name is limited to 14 characters. Should you exceed that limit, NAME TOO LONG ERROR will appear and you will be returned to BASIC. Any disk error that occurs will be reported simply as FILE ERROR. If the disk drive is plugged in and switched on with a disk in place and with its door closed, the most probable cause of this error would be that the file you've requested cannot be found.

GADGET is compatible with the 64 wedge. Having it and the wedge in memory at the same time puts a great deal of programming at hand.

Typing GADGET will be a chore that no amount of rhetoric can honestly minimize. The data statements alone hold 1,670 numbers. I advise that you use a straight edge to help keep your place and that if you get tired, you stop and save what you've done. You can always reload your partially completed program and continue from where you left off. Since the slightest typographical error in the data statements can crash the program and force you to turn the computer off to reset it, it's a very good idea to save your finished copy *before* you test it. C

GADGET.BL.

```
100 REM *** GADGET.BL ***'BPRX
110 PRINT"[CLEAR]GADGET - A UTILITY
    PROGRAM TO APPEND"'BADG
120 PRINT"[SPACE9]AND RENUMBER BASIC
    PROGRAMS."'BAUG
130 PRINT"[SPACE9]BY M.W. CAPRIO
    9/30/84."'BAAF
140 PRINT:PRINT"[SPACE14,RVS]
    NOW LOADING[RVOFF]"'CBLF
150 FOR I=49152 TO 49459:READ A
    :POKE I,A:T1=T1+A:NEXT I'IAMK
155 IF T1<>37623 THEN PRINT"DATA
    ERROR IN LINES 210-380":STOP'GIRR
160 FOR I=49700 TO 51059:READ A
    :POKE I,A:T2=T2+A:NEXT I'IACL
165 IF T2<>182439 THEN PRINT"DATA
    ERROR IN LINES 390-1190":STOP'GJFS
170 SYS 49449'BFVD
180 PRINT:PRINT"[RVS]LOADING COMPLETE
    [RVOFF]"'CBAJ
190 PRINT:PRINT"USE #/[RVS]RETURN
    [RVOFF] TO RENUMBER."'CBOM
200 PRINT"USE &/[RVS]RETURN[RVOFF]
     TO APPEND."'BARD
210 DATA 73,99,8,78,65,77,69,32,84,79,
    79,32,76,79,78,71,32'BYKH
220 DATA 69,82,82,79,82,78,65,77,69,
    32,79,70,32,70,73,76,69'BAAI
230 DATA 63,84,69,83,84,49,13,255,255,
    255,255,255,255,255,255,255,
    255'BKUL
240 DATA 70,73,76,69,32,69,82,82,79,
    82,165,46,141,2,192,165,45'BDYK
250 DATA 56,233,2,176,3,206,2,192,141,
    1,192,173,1,192,133,43,173'BFTM
260 DATA 2,192,133,44,169,8,162,8,160,
    0,32,186,255,32,211,192,160'BGAN
270 DATA 0,185,22,192,32,210,255,200,
    192,13,208,245,32,211,192,160,
    0'BJYO
280 DATA 32,207,255,201,34,240,249,
    153,35,192,200,192,16,240,58,201,
    13'BLFQ
290 DATA 208,237,152,162,35,160,192,
    32,189,255,169,0,174,1,192,172,
    2'BJLQ
300 DATA 192,32,213,255,166,144,224,0,
    240,23,224,64,240,19,32,211,
    192'BKGJ
310 DATA 160,0,185,51,192,32,210,255,
    200,192,10,208,245,76,228,192,
    32'BKMK
320 DATA 51,165,76,217,192,32,211,192,
    160,0,185,3,192,32,210,255,
    200'BJOK
330 DATA 192,19,208,245,76,1,193,169,
    13,32,210,255,96,166,174,134,
    45'BJYL
340 DATA 166,175,134,46,76,1,193,169,
    1,162,0,160,192,32,189,255,
    169'BIBM
350 DATA 15,162,8,160,15,32,186,255,
    32,192,255,162,15,32,198,255,
    32'BILN
360 DATA 207,255,32,231,255,162,1,134,
    43,162,8,134,44,76,36,193,201'BIYO
370 DATA 38,208,3,76,61,192,201,35,
    208,3,76,36,194,224,128,240,3'BFJP
380 DATA 76,58,164,76,116,164,234,234,
    160,15,140,0,3,160,193,140,1,3,
    96'BMOR
390 DATA 169,0,162,0,157,0,194,232,
    224,36,208,248,169'BTHP
400 DATA 2,141,0,194,169,194,141,1,
    194,160,0,169,1,141,10,194,
    141'BGMJ
410 DATA 8,194,141,12,194,141,28,194,
    169,8,141,11,194,141,9,194,
    141'BIPK
420 DATA 13,194,141,15,194,169,5,141,
    14,194,160,0,162,0,32,214,198'BHWL
430 DATA 173,29,194,32,142,194,141,30,
    194,173,28,194,32,142,194,141,
    29'BLKN
440 DATA 194,177,251,32,142,194,141,
    28,194,238,14,194,173,14,194,201,
    0'BLFO
450 DATA 208,215,238,15,194,76,95,194,
    201,0,208,5,232,224,3,240,1'BGXO
460 DATA 96,173,14,194,141,16,194,173,
    15,194,141,17,194,169,5,141,
    14'BJUP
470 DATA 194,169,8,141,15,194,169,0,
    141,30,194,160,0,32,214,198,
    177'BIOQ
480 DATA 251,201,0,208,45,32,195,198,
    32,195,198,32,195,198,32,195,
    198'BKGS
490 DATA 32,195,198,76,18,198,160,0,
    32,195,198,32,214,198,177,251,
    201'BKDT
500 DATA 34,240,7,201,0,240,6,76,210,
    194,32,195,198,76,179,194,201'BHLK
510 DATA 34,240,225,201,137,240,37,
    201,141,240,33,201,203,240,29,201,
    167'BNIM
520 DATA 240,69,201,145,208,8,162,1,
    142,30,194,76,113,195,162,1,
    236'BIYM
530 DATA 30,194,240,6,32,195,198,76,
    179,194,162,0,32,195,198,32,
    214'BIEN
540 DATA 198,177,251,201,32,240,244,
    201,164,240,240,201,48,48,11,201,
    58'BMGP
550 DATA 16,7,157,2,194,232,76,26,195,
    142,35,194,201,44,208,78,76'BGCP
560 DATA 147,195,234,160,0,32,195,198,
    32,214,198,177,251,201,32,240,
    244'BMDR
570 DATA 201,141,240,194,201,137,240,
    190,201,145,240,165,162,0,201,48,
    48'BNTS
580 DATA 7,201,58,16,3,76,42,195,32,
    195,198,76,179,194,162,0,32'BEGS
```

```
590 DATA 195,198,32,214,198,177,251,
    201,0,240,239,201,58,240,232,201,
    137'BNUU
600 DATA 240,4,201,141,208,232,76,26,
    195,169,0,141,30,194,173,35,
    194'BJBL
610 DATA 201,1,240,212,169,0,205,35,
    194,240,205,141,21,194,141,22,
    194'BKAM
620 DATA 141,23,194,173,0,194,133,251,
    173,1,194,133,252,172,21,194,
    177'BLVO
630 DATA 251,72,24,14,22,194,46,23,
    194,173,22,194,172,23,194,14,
    22'BHDO
640 DATA 194,46,23,194,14,22,194,46,
    23,194,24,109,22,194,141,22,
    194'BIMP
650 DATA 152,109,23,194,141,23,194,
    104,56,233,48,24,109,22,194,141,
    22'BKRR
660 DATA 194,144,3,238,23,194,238,21,
    194,202,224,0,208,177,160,0,
    140'BJTR
670 DATA 24,194,140,25,194,173,8,194,
    141,10,194,173,9,194,141,11,
    194'BJNS
680 DATA 173,10,194,133,251,173,11,
    194,133,252,177,251,162,0,141,26,
    194'BMOU
690 DATA 200,177,251,141,27,194,200,
    177,251,141,28,194,200,177,251,
    141,29'BORV
700 DATA 194,76,126,196,173,26,194,
    133,251,173,27,194,133,252,160,0,
    238'BMPN
710 DATA 24,194,173,24,194,201,0,208,
    3,238,25,194,173,26,194,201,0'BHXN
720 DATA 208,1,232,141,10,194,173,27,
    194,201,0,208,1,232,141,11,
    194'BIAO
730 DATA 224,2,208,16,173,14,194,133,
    251,173,15,194,133,252,234,234,
    234'BMQQ
740 DATA 76,179,194,162,0,76,13,196,
    76,13,196,173,28,194,205,22,
    194'BINQ
750 DATA 208,173,173,29,194,205,23,
    194,208,165,234,24,14,24,194,46,
    25'BKLS
760 DATA 194,173,24,194,172,25,194,14,
    24,194,46,25,194,14,24,194,46'BIBS
770 DATA 25,194,24,109,24,194,141,24,
    194,152,109,25,194,141,25,194,
    24'BKEU
780 DATA 173,24,194,105,100,141,24,
    194,144,3,238,25,194,173,0,194,
    133'BKRV
790 DATA 251,173,1,194,133,252,32,225,
    198,169,0,141,31,194,141,32,
    194'BKWW
800 DATA 162,16,24,46,24,194,46,25,
    194,46,31,194,46,32,194,56,
    173'BGAN
810 DATA 31,194,233,10,168,173,32,194,
    233,0,144,6,140,31,194,141,32'BINO
820 DATA 194,202,208,221,46,24,194,46,
    25,194,173,31,194,24,105,48,
    32'BJJP
830 DATA 26,197,173,24,194,13,25,194,
    208,187,234,76,58,197,72,160,
    0'BIJQ
840 DATA 177,251,168,240,9,177,251,
    200,145,251,136,136,208,247,104,
    160,1'BNUS
850 DATA 145,251,160,0,177,251,24,105,
    1,145,251,96,174,21,194,32,80'BIUS
860 DATA 198,202,208,250,173,0,194,
    133,251,173,1,194,133,252,160,0,
    177'BLPU
870 DATA 251,170,205,35,194,240,67,16,
    4,76,110,197,234,56,237,35,
    194'BJSU
880 DATA 141,21,194,141,20,194,32,96,
    198,76,194,197,234,141,21,194,
    173'BLRW
890 DATA 35,194,56,237,21,194,141,21,
    194,138,174,21,194,141,21,194,
    173'BLHX
900 DATA 14,194,133,253,173,15,194,
    133,254,169,32,145,253,200,32,195,
    198'BNJP
910 DATA 202,208,247,174,21,194,160,1,
    32,80,198,173,14,194,141,28,
    194'BKEQ
920 DATA 133,253,173,15,194,141,29,
    194,133,254,32,195,198,202,177,
    251,145'BONR
930 DATA 253,32,195,198,200,224,0,208,
    243,76,179,194,173,16,194,141,
    18'BLPS
940 DATA 194,173,17,194,141,19,194,
    206,21,194,174,21,194,224,255,240,
    55'BMMT
950 DATA 238,35,194,32,45,198,173,18,
    194,133,251,173,19,194,133,252,
    160'BMTU
960 DATA 0,177,251,200,145,251,173,18,
    194,205,14,194,208,8,173,19,
    194'BKFV
970 DATA 205,15,194,240,195,206,18,
    194,173,18,194,201,255,208,213,
    206,19'BNFW
980 DATA 194,76,222,197,76,67,197,160,
    0,173,12,194,133,251,173,13,
    194'BKVX
990 DATA 133,252,177,251,141,12,194,
    200,177,251,141,13,194,76,179,194,
    234'BOFY
1000 DATA 174,16,194,232,142,16,194,
     208,3,238,17,194,96,234,173,14,
     194'BKTF
1010 DATA 205,16,194,208,11,173,15,
     194,205,17,194,208,3,76,237,198,
     96'BJDF
1020 DATA 234,206,14,194,173,14,194,
     201,255,208,3,206,15,194,96,234,
     234'BLCH
```

64 USERS ONLY

```
1030 DATA 173,12,194,133,251,173,13,
     194,133,252,160,0,177,251,141,33,
     194'BMOI
1040 DATA 24,105,1,145,251,200,177,
     251,141,34,194,234,234,105,0,145,
     251'BLWJ
1050 DATA 173,33,194,208,5,173,34,194,
     240,13,173,33,194,133,251,173,
     34'BKBK
1060 DATA 194,133,252,76,106,198,173,
     16,194,141,18,194,173,17,194,141,
     19'BMXL
1070 DATA 194,206,18,194,173,18,194,
     201,255,208,3,206,19,194,173,18,
     194'BLUM
1080 DATA 133,251,173,19,194,133,252,
     160,0,169,0,145,251,96,72,238,
     14'BJGM
1090 DATA 194,173,14,194,201,0,208,3,
     238,15,194,32,59,198,104,96,
     173'BIUN
1100 DATA 14,194,133,251,173,15,194,
     133,252,96,160,0,169,0,145,251,
     200'BKOG
1110 DATA 192,6,208,249,96,174,16,194,
     172,17,194,232,224,0,208,1,
     200'BIKG
1120 DATA 134,45,132,46,169,100,141,
     28,194,169,0,141,29,194,173,8,
     194'BJRH
1130 DATA 141,10,194,173,9,194,141,11,
     194,160,0,140,30,194,173,10,
     194'BJOI
1140 DATA 133,251,173,11,194,133,252,
     177,251,141,26,194,200,177,251,
     141,27'BOPK
1150 DATA 194,200,173,28,194,145,251,
     200,173,29,194,145,251,162,0,238,
     28'BMCL
1160 DATA 194,173,28,194,201,0,208,3,
     238,29,194,232,224,10,208,238,
     173'BKCM
1170 DATA 26,194,201,0,208,3,238,30,
     194,141,10,194,173,27,194,201,
     0'BHMM
1180 DATA 208,3,238,30,194,141,11,194,
     174,30,194,224,2,240,3,76'BDFM
1190 DATA 19,199,76,36,193'BQDG
1200 END'BACU
```

USER GROUPS

Because our user group listing has become excessively long, we are now publishing only a partial list in each issue. This time we've included all our user groups in states beginning with letters A through M. Next issue we'll publish all the groups in states beginning with letters N through W and all foreign groups. Then the following issue, it's back to A through M, and so on, until we get so many that we have to publish it in three—or four—or more—parts.

ALABAMA

Riverchase Commodore Users Group
617 Grove St.
Birmingham, AL 35209
Ken Browning
(205) 988-1078

The Birmingham Commodore Computer Club
4845 Avenue "V"
Birmingham, AL 35208
Harry Jones
(205) 923-9260

Wiregrass Micro-Computer Society
Commodore SIG
109 Key Bend Rd.
Enterprise, AL 36330
Bill Brown
(205) 347-7564

Huntsville PET Users Club
9002 Berclair Rd.
Huntsville, AL 35802
every 2nd Thursday
Hal Carey

1920-A Avenue C
Brookly
Mobile, AL 36615
Howard Crider
(205) 661-1973

Commodore Club of Mobile
3868-H Rue Maison
Mobile, AL 36608
3rd Thurs. of month
Tom Wyatt
(205) 343-1178

Shoals Commodore Users Group (SCUG)
209 Lakeshore Dr.
Muscle Shoals, AL 35661
2nd & 4th Tues. of month
Geo. Taylor

Tiger Byte
c/o The Computer Store
Midway Plaza
Opelika, AL 36801
1st & 3rd Wed. of month
Jack Parsons

CC & Me
P.O. Box 324
Pinson, AL 35126
Bill Freeman
(205) 854-0650

1734 S. Atmore Ave.
Whistler, AL 36612
William Autry
(205) 452-9740

ALASKA

Alaska 84 Computer Club
c/o Line 49 Management
P.O. Box 6043
Anchorage, AK 99502

First City Users Group
P.O. Box 6692
Ketchikan, AK 99901
James Llanos
(907) 225-5695

COMPOOH-T
c/o Box 118
Old Harbor, AK 99643
(907) 286-2213

ARIZONA

Arizona VIC & 64 Users
904 W. Marlboro Circle
Chandler, AZ 85224
Tom Monson
(602) 963-6149

Central Arizona PET People
842 W. Calle del Norte
Chandler, AZ 85224
Roy Schaher
(602) 899-3622

Canyon De Chelly—Four Corners Users Group
c/o Calumet Consulting
Box 1945
Chinle, AZ 86503
Larry DiLucchio
(602) 674-3421

Gila Hackers
Rt. #1
Globe, AZ 85501
Paul R. Machula
(602) 425-7260

Arizona VIC 20-64 Users Club
232 W. 9th Place North
Mesa, AZ 85201
Donald Kipp

VIC Users Group
2612 E. Covina
Mesa, AZ 85203
Paul Muffuletto

West Mesa VIC
2351 S. Standage
Mesa, AZ 85202
Kenneth Epstein

Catalina Commodore Computer Club
2012 Avenida Guillermo
Tucson, AZ 85710
7 p.m.
George Pope
(602) 296-6766

ARKANSAS

Commodore/PET Users Club
Conway Middle School
Davis St.
Conway, AR 72032
Geneva Bowlin

Commodore Computer Club of Ft. Smith
P.O. Box 6000
So. Station
Ft. Smith, AR 72906
2nd Tues. of month
Joe Ragsdale

P.I.C. Club
c/o Hatfield Public Schools
Box 130
Hatfield, AR 71945
Bob Reed
(501) 389-6164

River City Commodore Club
P.O. Box 4298
North Little Rock, AR 72116
Gary Smith

Arkansas River Valley Commodore Users
401 S. Arlington Dr.
Russellville, AR 72801
Bob Brazeal
(501) 967-1868

The Siloam Commodore Computer Club
P.O. Box 88
Siloam Springs, AR 72761
Ken Emanualson
(501) 524-5624

CALIFORNIA

CA. Area Commodore Terminal Users Society
C.A.C.T.U.S.
P.O. Box 1277
Alta Loma, CA 91701
Darrell Hall

Humboldt Commodore Group
c/o R. Turner
P.O. Box 570
Arcata, CA 95521
R. Turner

VIC 20 Software Exchange
7660 Western Ave.
Buena Park, CA 90620
Vincent Beltz

The Valley Computer Club
2006 Magnolia Blvd.
Burbank, CA 91506
1st Wed. 7 p.m.

San Fernando Valley Commodore Users Group
21208 Nashville
Chatsworth, CA 91311
2nd Wed. 7
Tom Lynch
(213) 709-4736

NVCUG
P.O. Box 1925
Chico, CA 95927
Jim Banks
(916) 343-4611

Amateurs and Artesians Computing
P.O. Box 682
Cobb, CA 95426

Diablo Valley Commodore Users Group
P.O. Box 27155
Concord, CA 94520
(415) 838-2838

Commodore Tech. Users Group C-TUG
P.O. Box 1497
Costa Mesa, CA 92626

Commodore 64 West
P.O. Box 346
Culver City, CA 90232
Charles P. Santos
(213) 398-0913

PUG of Silicon Valley
22355 Rancho Ventura Rd.
Cupertino, CA 95014

Valley Computer Club
P.O. Box 310
Denair, CA 95316

California VIC Users Group
c/o Data Equipment Supply Corp.
8315 Firestone Blvd.
Downey, CA 90241
2nd Tuesday of month
(213) 932-9361

Southern California PET Users Group
c/o Data Equipment Supply Corp.
8315 Firestone Blvd.
Downey, CA 90241
First Tuesday of month
(213) 923-9361

Sixty Fourum
P.O. Box 16098
Fresno, CA 93755
John Damiano

VIC 20 Software Exchange Club
10530 Sky Circle
Grass Valley, CA 95945
Daniel Upton

The Diamond Bar R.O.P. Users Group
2644 Amelgado
Hacienda Hgts., CA 91745
Don McIntosh
(213) 333-2645

C-64 West Orange County Users Group
P.O. Box 1457
Huntington Beach, CA 92647
2nd & 4th Tues. of month
Philip Putman
(714) 842-4484

SPHINX
267 Arlington Ave.
Kensington, CA 94707
Bill MacCracken
(415) 527-9286

Antelope Valley Commodore Users Group
POB 4436
Lancaster, CA 93539
1st Saturday
James Haner
(805) 942-2626

PALS (Pets Around Livermore Society)
886 South K
Livermore, CA 94550
John Rambo

The Exchange
P.O. Box 9189
Long Beach, CA 90810
Michael C. Joseph
(213) 595-1771

San Luis Obispo Commodore Computer Club
1766 9th St.
Los Osos, CA 93402
BBS - (805) 528-7475
Joan Rinehart
(805) 528-3371

South Bay Commodore Users Group
401 - 9th St.
Manhatten Beach, CA 90266
Lloyd Lehrer
(213) 374-1247

Lincoln Computer Club
750 E. Yosemite
Manteca, CA 95336
John Fung

Manteca VIC 20 Users Organization
429 N. Main St.
Manteca, CA 95336
Gene Rong

Napa Valley Commodore Computer Club
c/o Liberty Computerware
2680 Jefferson St.
Napa, CA 94558
ngt. ph. (707) 944-2797
1st&3rd Mon. of month
Mick Winter
(707) 252-6281

Sacramento Commodore Users Group
8120 Sundance Dr.
Orangevale, CA 95662
Robyn Graves
(916) 969-2028

C-64/VIC 20 Users Group
Pasadena City College
Cicadian Room
Pasadena, CA
7p.m. 1st & 3rd Thursdays
Chuck Cypher
(714) 593-4880

SIG (Special Interest Group)
1135 Coronet Ave.
Pasadena, CA 91107
Brian R. Klotz

Commodore Owners of Petaluma (COOP)
877 Grant Ave.
Petaluma, CA 94952
4th Wed.@ La Tercera School
Dave Stroud
(707) 762-8398

Pomona Valley VIC Users Group
1401 W. 9th
Pomona, CA 91766
1st & 3rd Wed. of month 7pm
Mark Joerger
(714) 620-8889

Commodore Users Group of Riverside (CUGR)
P.O. Box 8748
Riverside, CA 92515
2nd & 4th Thurs. @ night
Ken Brown
(714) 689-1452

Jurupa Wizards
8700 Galena St.
Riverside, CA 92509
Walter J. Scott
781-1731

Southern California Edison Commodore Club
P.O. Box 800
Rosenead, CA 91770
Jerry Van Norton

Computer Barn Computer Club
319 Main St.
Suite #2
Salinas, CA 93901
S. Mark Vanderbilt
757-0788

Peninsula Commodore Users Group
549 Old County Rd.
San Carlos, CA 94070
2nd Thurs. of month
Timothy Very
(415) 593-7697

S.D. East County C-64 User Group
c/o Linda Schwartz
6353 Lake Apopka Place
San Diego, CA 92119
Linda Schwartz
(619) 698-7814

San Diego Commodore (PET) User Group
Box 86531
San Diego, CA 92138
3rd Thurs. of month 7-10p.m
Jane Campbell
(619) 277-7214

PET on the Air
525 Crestlake Dr.
San Francisco, CA 94132
Max J. Babin

San Francisco Commodore Users Group
278 - 27th Ave. #103
San Francisco, CA 94121
Roger Tierce
(415) 387-0225

Visions - 64
P.O. Box 26638
San Francisco, CA 94126
David Lee

VIC-Club
1503A Dolores
San Francisco, CA 94110
ages 10 to 16 preferred.
Colin Johnston

20/64 Users Group
P.O. Box 18473
San Jose, CA 95158
1st Sunday
Don Cracraft

LOGIKS Commodore Computer Club
c/o Christ Presbyterian Church
620 Del Ganado Rd.
San Rafael, CA 94903
2nd Wed. of month @ 7
Elmer Johnson
(415) 479-0426

Marin Commodore Computer Club
620 Del Ganado Rd.
San Rafael, CA
2nd Wed. of month 7
(415) 479-0426

South Bay Commodore 64 Users Group
P.O. Box 3193
San Ysidro, CA 95073

SBCUG
4520 Via Vistosa
Santa Barbara, CA 93110
Walter Hausz
(805) 967-3877

The Commodore Connection
2301 Mission St.
Santa Cruz, CA 95060
Bud Massey
(408) 425-8054

Commodore Users Group
4237 Plumeria Ct.
Santa Maria, CA 93455
Gilbert Vela
(805) 937-4174

Commodore 64 West Computer Club
2917 Colorado Ave.
Santa Monica, CA 90404
Don Campbell
(213) 828-9308

Santa Rosa Commodore 64 Users Group
333 East Robles Ave.
Santa Rosa, CA 95407
meets once a month
Garry Palmer
(707) 584-7009

USER GROUPS

Suisun/FF/Vacaville Commodore Users Group
1410 Pelican Way
Suisun City, CA 94585
Charles D. Akula
(707) 426-2077

Commodore Interest Association
c/o Computer Data
14660 La Paz Dr.
Victorville, CA 92392
Mark Finley

Bay Area Home Computer Asso.
1332 Pine St.
Walnut Creek, CA 94598
Cliff Downing
(415) 932-5447

Walnut Creek PET Users Club
1815 Ygnacio Valley Rd.
Walnut Creek, CA 94596

COLORADO

Commodore Users Group
Box 377
Aspen, CO 81612
1st Monday in the evenings.
Ray Brooks
(303) 925-5604

Aurora Market Users Group
c/o Computer Market Place
15200 E. 6th Ave.
Aurora, CO 80012
Roger Oberdier
(303) 367-0901

Colorado Springs Computer Society (CSCS)
Qtrs. 5938-A
Colorado Springs, CO 80913
Michael Brazonis
(303) 576-4219

Colorado Commodore Computer Club
2187 S. Golden Ct.
Denver, CO 80227
Jack Moss at 986-0577

VICKIMPET Users Group
4 Waring Lane
Littleton, CO 80121
Louis Roehrs

Vicdore Users Group
326 Emery Dr.
Longmont, CO 80501
Wayne Sundstrom
(303) 772-2821

CONNECTICUT

Fairfield County Commodore Users Group
P.O. Box 212
Danbury, CT 06810
Linda Retter

The Commodore East Users Group
165 B S. Bigelow Rd.
Hampton, CT 06247
(203) 455-0108

CT Computer Society
180 Bloomfield Ave.
Hartford, CT 06105
last Sat. of month
Harry Hill
(203) 233-3373

Skiff Lane Masons Island
Mystic, CT 06355
John F. Garbarino
(203) 536-9789

New London County Commodore Club
Doolittle Road
Preston, CT 06360
Dr. Walter Doolittle

Commodore Users Group of Stratford
P.O. Box 1213
Stratford, CT 06497
Dan Kern-Ekins
(203) 377-8373

Capitol Region Commodore Computer Club
57 Carter Dr.
Tolland, CT 06084
2nd Mon. of month @ 7 p.m.
Prudence Schifley

VIC Users Club
22 Tunxis Rd.
West Hartford, CT 06107
Edward Barszczewski

Commodore Users Group
Wethersfield High School
411 Wolcott Hill Rd.
Wethersfield, CT 06109
Daniel G. Spaneas

DELAWARE

The Diamond State Users Group
Box 892
Felton, DE 19943
Michael Butler
(302) 284-4495

Newark Commodore Users Group (NCUG)
210 Durso Dr.
Newark, DE 19711
once a month @ Newark H.S.
Bob Black
(302) 737-4686

Brandywine Users Group
P.O. Box 10943
Wilmington, DE 19850
Rick Jeandell
(302) 362-6162

DISTRICT OF COLUMBIA

USO Computer Club
USO Outreach Center
207 Beyer Rd.
Washington, DC 20332
Steven Guenther

FLORIDA

Brandon Commodore Users Group
414 E. Lumsden Rd.
Brandon, FL 33511

Brandon Users Group
108 Anglewood Dr.
Brandon, FL 33511
Paul Daugherty
(813) 685-5138

Clearwater Commodore Club
1532 Lemon St.
Clearwater, FL 33516
Gary Gould
(813) 442-0770

El Shift OH
P.O. Box 548
Cocoa, FL 32922
Sat.mornings/every4to6weeks
Mike Schnoke

Volusia Ct. Commodore Program Exchange
1612 Reynolds Rd.
DeLeon Springs, FL 32028
Rick Stidham

Ram Rom 84
1620 Morning Dove Lane
Englewood, FL 33533
Nancy Kenneally
(813) 474-9450

Gainesville Commodore Users Group
Santa Fe Community College
Gainesville, FL 32602
James E. Birdsell

Gulf Coast Computer Club
c/o St. Petersburg Times Bldg.
Hudson, FL 33567
2nd & 4th Thursdays
847-5049

Sun Coast VICs
P.O. Box 1042
Indian Rocks Beach, FL 33535
Mark Weddell

Commodore Computer Club
P.O. Box 9726
Jacksonville, FL 32208
2nd & 4th Tues. of month
David Phillips
(904) 764-5457

Jacksonville Area PET Society
401 Monument Rd. #177
Jacksonville, FL 32211

VIC/64 Heartland Users Group
1220 Bartow Rd. #23
Lakeland, FL 33801
4th Wed of month at PRC
Tom Keough
(813) 666-2132

South Tampa Commodore 64 Users Group
736 F Second Dr.
Macdill AFB, FL 33621
Ronald S. Clement

6278 SW 14th St.
Miami, FL 33144
Richard Prestien

64 Educators Users Group South FDLRS/South
9220 S.W. 52nd Terrace
Miami, FL 33165
Dr. Eydie Sloane
(305) 274-3501

Miami 20/64
12911 S.W. 49th St.
Miami, FL 33175
(305) 226-1185

PETs and Friends
129 NE 44th St.
Miami, FL 33137
Richard Plummer

The Ultimate 64 Experiance
5740 S.W. 56th Terrace
Miami, FL 33143
Sandy Cueto

Lakeland VIC 20 Users Group
2450 Shady Acres Dr.
Mulberry, FL 33860

64 Educators Users Group North
16330 N.E. 2nd Ave.
North Miami Beach, FL 33162
Robert Figueroa
(305) 944-5548

Commodore 64/VIC 20 User Group
Martin Marietta Aerospace
P.O. Box 5837
Orlando, FL 32855
Mr. Earl Preston (305) 352-3252/2266

VIC Users Club
4071 Edgewater Dr.
Orlando, FL 32804
Ray Thigpen

Suncoast 64s
c/o Little Professor Book Center
2395 U.S. 19 North
Palm Harbor, FL 33563
Curtis Miller
(813) 785-1036

Bay Commodore Users Group
c/o Gulf Coast Computer Exchange
241 N. Tyndall Pkwy.
Panama City, FL 32401
Richard Scofield
(904) 785-6441

The Commodore Advantage
P.O. Box 18490
Pensacola, FL 32523
2nd Friday of month
Deanna Owens
(904) 456-6554

Charlotte County Commodore Club (CCCC)
567 N. Ellicott Circle
Port Charlotte, FL 33952
Lee Truax
(813) 625-1277

Sanibel Commodore Users Group (SCUG)
1119 Periwinkle
Box 73
Sanibel, FL 33957
Phil Belanger
(813) 472-3471

Commodore Computer Club
P.O. Box 21138
St. Petersburg, FL 33742
Chuck Fechko
(813) 522-2547

The Class of 64
c/o The Computer Corner
5208 - 66th St.
St. Petersburg, FL 33709
Joe Spatafora
(813) 541-1185

Commodore Users Group
545 E. Park Ave.
Apt. #2
Tallahassee, FL 32301
Jim Neill
(904) 224-6286

Broward Commodore Users Group
13 Spinning Wheel Lane
Tamarac, FL 33319
Lewis Horn
(305) 726-4390

Tampa Bay Commodore Computer Club
10208 N. 30th St.
Tampa, FL 33612
(813) 977-0877

Tampa Commodore Users Group
P.O. Box 8713
Tampa, FL 33674
(813) 237-2100

South Florida PET Users Group
7170 S.W. 11th St.
West Hollywood, FL 33023
Dave Young
(305) 987-6982

Commodore Connection
P.O. Box 6684
West Palm Beach, FL 33405

GEORGIA

Albany Commodore Amateur Computerist
P.O. Box 5461
Albany, GA 31706
David Via

Atlanta 64 Users Group
P.O. Box 5322
Atlanta, GA 30307
Phil J. Autrey

VIC-tims
P.O. Box 467052
Atlanta, GA 30346
Eric Ellison
(404) 922-7088

VIC Educators Users Group
Cherokee County Schools
110 Academy St.
Canton, GA 30114
Dr. Al Evans

Golden Isles Commodore Users Club
Bldg. 68
Glynco, GA 31524
Richard L. Young

Commodore Club of Agusta
929 N. Willow Wick Dr.
Grovetown, GA 30813
David Dumas

Atlanta Commodore 64 Users Group
1767 Big Valley Lane
Stone Mountain, GA 30083
Ron Lisoski
(404) 981-4253

HAWAII

Commodore Users Group of Honolulu
c/o PSH
824 Bannister St.
Honolulu, HI
MEETS at Kaliho Librar
3rd Fri.every month
(808) 848-2088

Commodore Users Group of Honolulu
1626 Wilder #701
Honolulu, HI 96822
Jay Calvin (808) 944-9380
(808) 848-2088

20/64 Hawaii
P.O. Box 966
Kailua, HI 96734
Wes Goodpaster

IDAHO

64-B.U.G. (Boise Users Group)
403 Thatcher St.
Boise, ID 83702
Rick Ohnsman
(208) 384-1423

GHS Computer Club
c/o Grangeville High School
910 S. D St.
Grangeville, ID 83530
Don Kissinger

Eagle Rock Commodore Users Group
900 S. Emerson
Idaho Falls, ID 83401
Nancy J. Picker

Commodore Users Group
310 Emerald Dr.
Kellogg, ID 83837
Grant Bewick
(208) 784-8751

Pocatello Commodore Users Group
1250 E. Benton
Pocatello, ID 83201
Richard Harker
(208) 232-1607

S.R.H.S. Computer Club
c/o Salmon River High School
Riggins, ID 83549
Barney Foster

U.G.L.I.-User Groups of Lower Idaho
Rt 4
Rupert, ID 83350
Sean Brixey

ILLINOIS

Commodore 64 Users Club
104 Susan Lane
Carterville, IL 62918
Doyne Horsley
(618) 985-4710

Champaign-Urbana Commodore Users Group
2006 Crescent Dr.
Champaign, IL 61821
Steve Gast
(217) 352-9681

2731 N. Milwaukee Ave.
Chicago, IL 60647
Shelly Wernikoff

Chicago Commodore 64 Users & Exchange Club
P.O. Box 14233
Chicago, IL 60614
Jim Robinson

Commodore SIG Cache
Box C-176
323 S. Franklin
Chicago, IL 60606
3rs Sun. of month 11am-1pm
Herb Swanson
(312) 685-0994

McHenry County Commodore Club
227 East Terra Cotta Ave.
Crystal Lake, IL 60014
2nd Sat. at C. Lake Ambutal
John Katkus
(815) 455-3942

PAPUG - Peoria Area PET Users Group
6 Apple Tree Lane
East Peoria, IL 61611
2nd Fri. of month
Max Taylor
(309) 673-6635

COMCOE (Commodore Club of Evanston)
2108 Sherman Ave.
Evanston, IL 60201
Jim Salsbury

Fox Valley PET Users Group
833 Willow St.
Lake in the Hills, IL 60102
Art DeKneef
(312) 658-7321

The C-64 Users Group
P.O. Box 46464
Lincolnwood, IL 60646
or call Darrell(312) 588-0334
David Tamkin
(312) 583-4629

The Commodore 64 Users Group
Suite 100
4200 Commerce Court
Lisle, IL 60532
Gus Pagnotta
(312) 369-6525

Survivors of Sixty-four Users Group (SOSUG)
WESL Institute
Western Illinois University
Macomb, IL 61455
1st Wed. & 3rd Thurs.
Macey B. McKee 837-5378
(309) 298-2106

Mt. Vernon Commodore Users Group (MVCUG)
P.O. Box 512
Mt. Vernon, IL 62864

Central Illinois PET User Group
635 Maple
Mt. Zion, IL 62549
Jim Oldfield
(217) 864-5320

PET VIC Club (PVC)
40 S. Lincoln
Mundelein, IL 60060
Paul Schmidt

USER GROUPS

Fox Valley 64 Users Group
P.O. Box 28
No. Aurora, IL 60542
1st Thurs. of month 7-10p.m
Frank Christensen
(312) 898-2779

Oak Lawn Commodore Users Group
The Computer Store
11004 S. Cicero Ave.
Oak Lawn, IL 60453
Bob Hughes
(312) 499-1300

RAP 64/VIC Regional Asso. of Programmers
10721 S. Lamon
Oak Lawn, IL 60453
Bob Hughes

Commodore Users Club
1707 East Main St.
Olney, IL 62450
David E. Lawless

VIC 20/64 Users Support Group
114 S. Clark St.
Pana, IL 62557
David R. Tarvin
(217) 562-4568

Illinois Valley Commodore Users Group
2330 - 12th St.
Peru, IL 61354
Brian Foster
(815) 223-5141

WIPUG
Rt. 5
Quincy, IL 62301
Edward Mills
(217) 656-3671

ASM/TED User Group
200 S. Century
Rantoul, IL 61866
Brant Anderson
(217) 893-4577

Rockford Area PET Users Group
1608 Benton St.
Rockford, IL 61107

Springfield Area VIC Enthusiasts (S.A.V.E)
P.O. Box 2961
Springfield, IL 62708
1st Tuesday of month
Mike Stout
(217) 522-2706

Springfield PET Users Group (SPUG)
3116 Concord
Springfield, IL 62704
3rd Fri. each month 7pm
Bill Eardley
(217) 753-8500

The Kankakee Hackers
RR #1
St. Anne, IL 60964
Rich Westerman
(815) 933-4407

INDIANA

VIC/64 Users Group
c/o Delco Remy Div. General Motors
2401 Columbus Ave.
Anderson, IN 46014
3rd Wed or Thurs. of month
Richard Clifton
(317) 378-3016

Commodore Computer Club
3814 Terra Trace
Evansville, IN 47711
John Patrick
(812) 477-0739

Computer Workshop VIC 20/64 Club
282 S. 600 W.
Hebron, IN 46341
Mary O'Bringer
(219) 988-4535

Cardinal Sales
6225 Coffman Rd.
Indianapolis, IN 46268
Carol Wheeler
(317) 298-9650

PET/64 Users
10136 E. 96th St.
Indianapolis, IN 46256
Jerry Brinson
(317) 842-6353

VIC Indy Club
P.O. Box 11543
Indianapolis, IN 46201
Fred Imhausen
(317) 357-6906

Commodore Users Group
1020 Michigan Ave.
Logansport, IN 46947
Mark Bender
(219) 722-5205

The National Science Clubs of America
Commodore Users Division
P.O. Box 10621
Merrillville, IN 46411
Brian Lepley orJeff Brown

CHUG (Commodore Hardware Users Group)
12104 Meadow Lane
Oaklandon, IN 46236
Ted Powell

East Central Indiana VIC User Group
Rural Route # 2
Portland, IN 47371
Stephen Erwin

National VIC 20 Program Exchange
102 Hickory Court
Portland, IN 47371
Stephen Erwin
(219) 726-4202

Fulton County Commodore Users
1705-3 Madison
Rochester, IN 46975
2nd Thurs. of month
Jim Tyler
(219) 223-4430

Seymour Peekers
c/o D&L Camera Shop
108 N. Chestnut
Seymour, IN 47274
Dennis Peters

Northern Indiana Commodore Enthusiasts
927 S. 26th St.
South Bend, IN 46615
Eric T. Bean

Western Indiana Commodore Users Group
912 South Brown Ave.
Terre Haute, IN 47803
Dennis Graham
(812) 234-5099

Commodore Owners Of Lafayette (COOL!)
20 Patrick Lane
West Lafayette, IN 47906
Ross Indelicato
(317) 743-3410

IOWA

Commodore Users Group
114 8th St.
Ames, IA 50010

Commo-Hawk Commodore Users Group
P.O. Box 2724
Cedar Rapids, IA 52406
Vern Rotert

Quad City Commodore Computer Club
P.O. Box 3994
Davenport, IA 52808
3rd Tues. of month
Mike Hoeper
(319) 242-1496

Crawford County Commodore Users Group
519 N. 19th St.
Denison, IA 51442
Kenneth Haydon
(712) 263-6274

Commodore Computer Users Group of Iowa
Box 3140
Des Moines, IA 50316
Laura Miller (515) 287-1378
or(515) 263-0963

Newton Commodore Users Group
320 W. 9th St.
Newton, IA 50208
1st Wed. of month
David Schmidt
(515) 792-0814

Siouxland Commodore Club
2700 Sheridan St.
Sioux City, IA 51104
1st & 3rd Monday of month
Gary Johnson
(712) 258-7903

VIC 20 & C-64 User Group
421 W. 6th St
Waterloo, IA 50702
Frederick Volker
(319) 232-1062

KANSAS

Walnut Valley Commodore User Group
1003 S. 2nd St.
Arkansas City, KS 67005
Bob Morris

Salt City Commodore Club
P.O. Box 2644
Hutchinson, KS 67501
Wendell Hinkson

Kansas Commodore Computer Club
101 S. Burch
Olathe, KS 66061
Paul B. Howard

Commodore Users Group
6050 S. 183 St. West
Viola, KS 67149
Walter Lounsbery

Wichita Area PET Users Group
2231 Bullinger
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User Group Support Program

Commodore is creating a program to support Commodore User Groups. It is expected to be in full force by Spring, 1985. The two major components—an electronic bulletin board on CompuServe and a newsletter are now available.

The electronic bulletin board is a dedicated section of the Commodore Information Network of CompuServe accessible only by "Approved" User Groups. It will be used for direct communication as well as Commodore announcements.

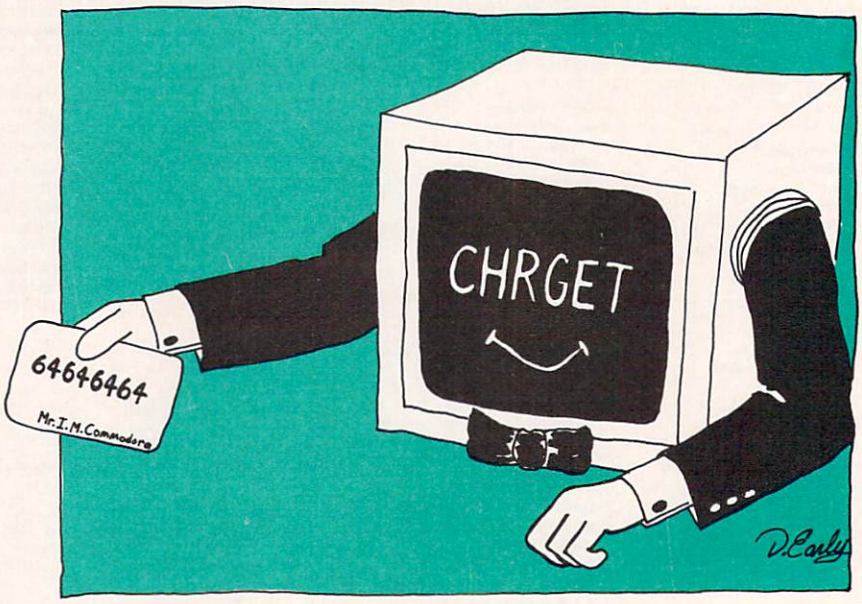
The newsletter, INPUT/OUTPUT, will include announcements, user group programs, calender of events, letters, questions, product specifications, programs, and surveys. It will be a newsletter FOR user groups BY user groups supported by Commodore without advertisements.

For future issues of the newsletter Commodore is accepting announcements of user group activities, articles of interest, letters to the editor, and general questions. Please forward all correspondence with the name of your user group to:

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
Attn: Mario Eisenbacher
Editor, INPUT/OUTPUT

BY ROBERT W. BAKER

The CHRGET Routine for the Commodore 64



Many people have dabbled in using the various machine language routines contained in the Commodore operating system ROM's. But don't forget there's one very useful routine in lower RAM memory.

When the system is first powered on, a small 24-byte subroutine is written in lower RAM memory during the system initialization. This routine is normally referred to as the CHRGET (or CHRGOT) routine. It's generally used to get the next character or BASIC token from a BASIC program line stored in memory.

When the routine is called, any spaces are automatically skipped and the 6502's carry bit is set to indicate the type of character found. If the character is numeric, the carry bit will be cleared (0). Otherwise, the carry bit will be set (1) for all non-numeric characters and BASIC tokens. In either case, the 6502's Z-bit will be clear (0) unless the character was a colon. The character itself is always returned in the 6502's accumulator.

I've included a simple disassembly listing that shows the routine residing from $0073 to $008A (115–138 decimal) in the VIC 20 and Commodore 64. The routine has been slightly relocated from where it formerly resided in the older PET and CBM systems. In the older systems it was located three bytes lower, at $0070 to $0087 hex (112–135 decimal). If you come across any older utility programs for the PET that made use of the CHRGET routine, you might be able to adapt it to the VIC 20 or Commodore 64 by adjusting the addresses accordingly.

Whenever a JSR $0073 is executed in the VIC 20 or Commodore 64, the address pointer stored within the LDA instruction (at $79) is first incremented and then the character is fetched and tested. This is important:

If you are writing a machine language routine, you can use the CHRGET routine directly to read data from anywhere in memory.

remember that the address is incremented first, before the character is fetched. Note that by doing a JSR $0079 a program can refetch the last character without disrupting the address pointer. Also, the two SBC instructions ($85 and $88) effectively set the carry bit as appropriate to indicate the character type in the accumulator.

You can readily see that this is a handy routine that is used heavily by BASIC itself. However, there are a few ways that you can use this routine for your own programs as well.

One method that many people have used successfully is to replace the first three bytes of the CHRGET routine with a JMP instruction. The JMP instruction then goes to another user-written machine language routine to check for some specially desired action. The routine does its thing and then returns to the CHRGET routine. The added routine is always executed whenever BASIC fetches a character from a program line.

This is one simple way to add new BASIC tokens or implement a crude program to trace execution of your BASIC program. When you use this technique you must remember, however, to execute the CHRGET instructions replaced by the JMP instruction before returning to the remainder of the routine.

If you are writing a machine language routine, you can use the CHRGET routine directly to read data from anywhere in memory. First save the current address pointer (from $7A and $7B) somewhere safe in memory. Next set your desired pointer (less one) in the same locations. Remember to use correct 6502 address formats (low byte first, high byte last). Then simply call CHRGET (and/or CHRGOT) as required. When you are finished, don't forget to restore the original address pointer that you

Continued on page 126

CHRGET

```
LOC-DEC/HEX  OBJECT     DISASSEMBLY

 115  0073: E6 7A       INC $7A
 117  0075: D0 02       BNE $0079
 119  0077: E6 7B       INC $7B
 121  0079: AD yy xx    LDA $xxyy
 124  007C: C9 3A       CMP #$3A
 126  007E: B0 0A       BCS $008A
 128  0080: C9 20       CMP #$20
 130  0082: F0 EF       BEQ $0073
 132  0084: 38          SEC
 133  0085: E9 30       SBC #$30
 135  0087: 38          SEC
 136  0088: E9 D0       SBC #$D0
 138  008A: 60          RTS
```

The programs which appear in this magazine have been run, tested and checked for bugs and errors. After a program is tested, it is printed on a letter quality printer with some formatting changes. This listing is then photographed directly and printed in the magazine. Using this method ensures the most error-free program listings possible.

Whenever you see a word inside brackets, such as [DOWN], the word represents a keystroke or series of keystrokes on the keyboard. The word [DOWN] would be entered by pressing the cursor-down key. If multiple keystrokes are required, the number will directly follow the word. For example, [DOWN4] would mean to press the cursor-down key four times. If there are multiple words within one set of brackets, enter the keystrokes directly after one another. For example, [DOWN, RIGHT 2] would mean to press the cursor-down key once and then the cursor-right key twice.

In addition to these graphic symbols, the keyboard graphics are all represented by a word and a letter. The word is either SHFT or CMD and represents the SHIFT key or the Commodore key. The letter is one of the letters on the keyboard. The combination [SHFT E] would be entered by holding down the SHIFT key and pressing the E. A number following the letter tells you how many times to type the letter. For example, [SHFT A4,CMD B3] would mean to hold the SHIFT key and press the A four times, then hold down the Commodore key and press the B three times.

The chart on this page tells you the keys to press for any word or words inside brackets. Refer to this chart whenever you aren't sure what keys to press. The little graphic next to each keystroke shows you what you will see on the screen.

SYNTAX ERROR

This is by far the most common error encountered while entering a program. Usually (sorry folks) this means that you have typed something incorrectly on the line the syntax error refers to. If you get the message "?Syntax Error Break In Line 270", type LIST 270 and press RETURN. This will list line 270 to the screen. Look for any non-obvious mistakes like a zero in place of an O or vice-versa. Check for semicolons and colons reversed and extra or missing parenthesis. All of these things will cause a syntax error.

There is only one time a syntax error will tell you the 'wrong' line to look at. If the line the syntax error refers to has a function call (i.e., FN A(3)), the syntax error may be in the line that defines the function, rather than the line named in the error message. Look for a line near the beginning of the program (usually) that has DEF FN A(X) in it with an equation following it. Look for a typo in the equation part of this definition.

ILLEGAL QUANTITY ERROR

This is another common error message. This can also be caused by a typing error, but it is a little harder to find. Once again, list the line number that the error message refers to. There is probably a poke statement on this line. If there is, then the error is referring to what is trying to be poked. A number must be in the range of zero to 255 to be poke-able. For example, the statement POKE 1024,260 would produce an illegal quantity error because 260 is greater than 255.

Most often, the value being poked is a variable (A,X...). This error is telling you that this variable is out of range. If the variable is being read from data statements, then the problem is somewhere in the data statements. Check the data statements for missing commas or other typos.

If the variable is not coming from data statements, then the problem will be a little harder to find. Check each line that contains the variable for typing mistakes.

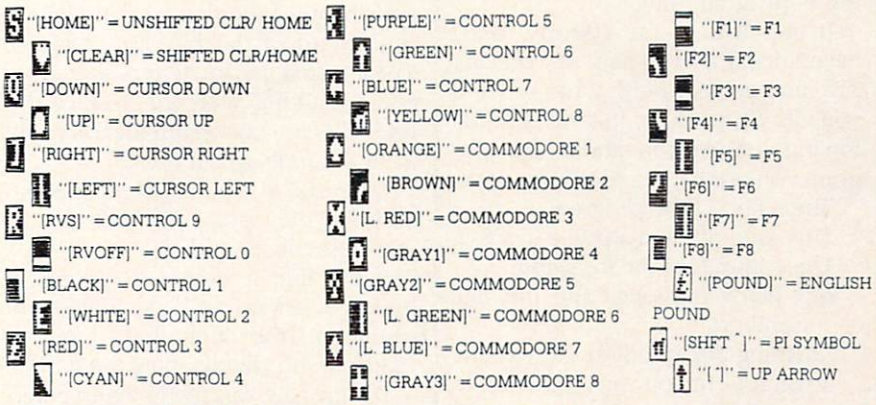
OUT OF DATA ERROR

This error message is always related to the data statements in a program. If this error occurs, it means that the program has run out of data items before it was supposed to. It is usually caused by a problem or typo in the data statements. Check first to see if you have left out a whole line of data. Next, check for missing commas between numbers. Reading data from a page of a magazine can be a strain on the brain, so use a ruler or a piece of paper or anything else to help you keep track of where you are as you enter the data.

OTHER PROBLEMS

It is important to remember that the 64 and the PET/CBM computers will only accept a line up to 80 characters long. The VIC 20 will accept a line up to 88 characters long. Sometimes you will find a line in a program that runs over this number of characters. This is not a mistake in the listing. Sometimes programmers get so carried away crunching programs that they use abbreviated commands to get more than 80 (or 88)

CHART OF SPECIAL CHARACTER COMMANDS



GRAPHIC SYMBOLS WILL BE REPRESENTED AS EITHER THE LETTERS SHFT (SHIFT) AND A KEY ("[SHFT Q,SHFT J,SHFT D,SHFT S]") OR THE LETTERS CMDR (COMMODORE) AND A KEY ("[CMDR Q,CMDR G,COMDR Y,CMDR H]"). IF A SYMBOL IS REPEATED, THE NUMBER OF REPITITIONS WILL BE DIRECTLY AFTER THE KEY AND BEFORE THE COMMA ("[SPACE3,SHFT S4,CMDR M2]").

characters on one line. You can enter these lines by abbreviating the commands when you enter the line. The abbreviations for BASIC commands are on pages 133-134 of the VIC 20 user guide and 130-131 of the Commodore 64 user's guide.

If you type a line that is longer than 80 (or 88) characters, the computer will act as if everything is ok, until you press RETURN. Then, a syntax error will be displayed.

THE PROGRAM WON'T RUN!!

This is the hardest of problems to resolve; no error message is displayed, but the program just doesn't run. This can be caused by many small mistakes typing a program in. First check that the program was written for the computer you are using. Check to see if you have left out any lines of the program. Check each line of the program for typos or missing parts. Finally, press the RUN/STOP key while the program is 'running'. Write down the line the program broke at and try to follow the program backwards from this point, looking for problems.

IF ALL ELSE FAILS

You've come to the end of your rope. You can't get the program to run and you can't find any errors in your typing. What do you do? As always, we suggest that you try a local user group for help. In a group of even just a dozen members, someone is bound to have typed in the same program.

If you do get a working copy, be sure to compare it to your own version so that you can learn from your errors and increase you understanding of programming.

If you live in the country, don't have a local user group, or you simply can't get any help, write to us. If you do write to us, include the following information about the program you are having problems with:

The name of the program
The issue of the magazine it was in
The computer you are using
Any error messages and the line numbers
Anything displayed on the screen
A printout of your listing (if possible)

Send your questions to:

Commodore Microcomputers
1200 Wilson Drive
West Chester, PA 19380
ATTN: Program Problem **C**

How to Use the Magazine Entry Program

The Magazine Entry Program on page 123 is a machine language program that will assist you in entering the programs in this magazine correctly. It is for use with the Commodore 64 only and was written by Mark Robin using the IEA Editor/Assembler. Once the program is in place, it works its magic without you having to do anything else. The program will not let you enter a line if there is a typing mistake on it, and better yet, it identifies the kind of error for you.

Getting Started

Type in the Magazine Entry Program carefully and save it as you go along (just in case). Once the whole program is typed in, save it again on tape or disk. Now RUN the program. The word POKING will appear on the top of the screen with a number. The number will increment from 49152 up to 50052, and just lets you know that the program is running. If everything is ok, the program will finish running and end. Then type NEW. If there is a problem with the data statements, the program will tell you where to look to find the problem.

Once the program has run, it is in memory ready to go. To activate the program, type SYS49152 and press RETURN. When the READY prompt is displayed, type TEST and press RETURN. You are now ready to enter the programs from the magazine.

Typing the Programs

All the program listings in this magazine that are for the 64 have an apostrophe followed by four letters at the end of the line (i.e., 'ACDF). The apostrophe and letters *should* be entered along with the rest of the line. This is a checksum that the Magazine Entry Program uses.

Enter the line and the letters at the end and then press RETURN, just as you normally would.

If the line is entered correctly, a bell is sounded and the line is entered into the computer's memory (without the characters at the end).

If a mistake was made while entering the line, a noise is sounded and an error message is displayed. Read the error message, then press any key to erase the message and correct the line.

IMPORTANT

If the Magazine Entry Program sees a mistake on a line, it *does not* enter that line into memory. This makes it impossible to enter a line incorrectly.

Error Messages and What They Mean

There are six error messages that the Magazine Entry Program uses. Here they are, along with what they mean and how to fix them.

NO CHECKSUM: This means that you forgot to enter the apostrophe and the four letters at the end of the line. Move the cursor to the end of the line you just typed and enter the checksum.

QUOTE: This means that you forgot (or added) a quote mark somewhere in the line. Check the line in the magazine and correct the quote.

PARENTHESIS: This means that you forgot (or added) a parenthesis somewhere in the line. Check the line in the magazine again and correct the parenthesis.

KEYWORD: This means that you have either forgotten a command or spelled one of the BASIC keywords (GOTO, PRINT..) incorrectly. Check the line in the magazine again and check your spelling.

 # OF CHARACTERS: This means that you have either entered extra characters or missed some characters. Check the line in the magazine again. This error message will also occur if you misspell a BASIC command, but create another keyword in doing so. For example, if you misspell PRINT as PRONT, the 64 sees the letter P and R, the BASIC keyword ON and then the letter T. Because it sees the keyword ON, it thinks you've got too many characters, instead of a simple misspelling. Check spelling of BASIC commands if you can't find anything else wrong.

UNIDENTIFIED: This means that you have either made a simple spelling error, you typed the wrong line number, or you typed the checksum incorrectly. Spelling errors could be the wrong number of spaces inside quotes, a variable spelled wrong, or a word mispelled. Check the line in the magazine again and correct the mistake. **C**

Magazine Entry Program

```
1 PRINT "[CLEAR]POKING-";
5 P=49152 :REM $C000
10 READ A$:IF A$="END"THEN 80
20 L=ASC(MID$(A$,2,1))
30 H=ASC(MID$(A$,1,1))
40 L=L-48:IF L>9 THEN L=L-7
50 H=H-48:IF H>9 THEN H=H-7
60 PRINT"[HOME,RIGHT12]"P;
70 B=H*16+L:POKE P,B:T=T+B:P=P+1
   :GOTO 10
80 IF T<>103233 THEN PRINT"MISTAKE IN
   DATA --> CHECK DATA STATEMENTS":END
90 PRINT"DONE":END
1000 DATA 4C,23,C0,00,00,00,00,00
1001 DATA 00,00,00,00,00,00,00,0D
1002 DATA 00,58,C1,5E,C1,66,C1,76
1003 DATA C1,83,C1,8F,C1,EA,EA,EA
1004 DATA 4C,83,C0,A2,05,BD,1D,C0
1005 DATA 95,73,CA,10,F8,60,A0,02
1006 DATA B9,00,02,D9,3C,C1,D0,0B
1007 DATA 88,10,F5,A9,01,8D,10,C0
1008 DATA 4C,1F,C1,60,A0,03,B9,00
1009 DATA 02,D9,38,C1,D0,E0,88,10
1010 DATA F5,A9,00,8D,10,C0,4C,1F
1011 DATA C1,60,A0,03,B9,00,02,D9
1012 DATA 34,C1,D0,E0,88,10,F5,A0
1013 DATA 05,B9,A2,E3,99,73,00,88
1014 DATA 10,F7,A9,00,8D,18,D4,4C
1015 DATA 1F,C1,E6,7A,D0,02,E6,7B
1016 DATA 4C,79,00,A5,9D,F0,F3,A5
1017 DATA 7A,C9,FF,D0,ED,A5,7B,C9
1018 DATA 01,D0,E7,20,5A,C0,AD,00
1019 DATA 02,20,A3,C0,90,DC,A0,00
1020 DATA 4C,EA,C1,C9,30,30,06,C9
1021 DATA 3A,10,02,38,60,18,60,C8
1022 DATA B1,7A,C9,20,D0,03,C8,D0
1023 DATA F7,B1,7A,60,18,C8,B1,7A
1024 DATA F0,35,C9,22,F0,F5,6D,05
1025 DATA C0,8D,05,C0,AD,06,C0,69
1026 DATA 00,8D,06,C0,4C,BD,C0,18
1027 DATA 6D,07,C0,8D,07,C0,90,03
1028 DATA EE,08,C0,EE,0B,C0,60,18
1029 DATA 6D,0A,C0,8D,0A,C0,90,03
1030 DATA EE,09,C0,EE,0C,C0,60,0A
1031 DATA A8,B9,11,C0,85,FB,B9,12
1032 DATA C0,85,FC,A0,00,A9,12,20
1033 DATA D2,FF,B1,FB,F0,06,20,D2
1034 DATA FF,C8,D0,F6,20,54,C3,20
1035 DATA 7E,C3,20,E4,FF,F0,FB,A0
1036 DATA 1B,B9,3F,C1,20,D2,FF,88
1037 DATA 10,F7,68,68,A9,00,8D,00
1038 DATA 02,4C,74,A4,4B,49,4C,4C
1039 DATA 54,45,53,54,41,44,44,91
1040 DATA 91,0D,20,20,20,20,20,20
1041 DATA 20,20,20,20,20,20,20,20
1042 DATA 20,20,20,20,20,20,91,0D
1043 DATA 51,55,4F,54,45,00,4B,45
1044 DATA 59,57,4F,52,44,00,23,20
1045 DATA 4F,46,20,43,48,41,52,41
1046 DATA 43,54,45,52,53,00,55,4E
1047 DATA 49,44,45,4E,54,49,46,49
1048 DATA 45,44,00,4E,4F,20,43,48
1049 DATA 45,43,4B,53,55,4D,00,50
1050 DATA 41,52,45,4E,54,48,45,53
1051 DATA 49,53,00,C8,B1,7A,D0,FB
1052 DATA 84,FD,C0,09,10,03,4C,C7
1053 DATA C1,88,88,88,88,88,B1,7A
1054 DATA C9,27,D0,13,A9,00,91,7A
1055 DATA C8,A2,00,B1,7A,9D,3C,03
1056 DATA C8,E8,E0,04,D0,F5,60,4C
1057 DATA F2,C2,A0,00,B9,00,02,99
1058 DATA 40,03,F0,F2,C8,D0,F5,A0
1059 DATA 00,B9,40,03,F0,E8,99,00
1060 DATA 02,C8,D0,F5,20,D7,C1,4C
1061 DATA 56,C2,A0,0B,A9,00,99,03
1062 DATA C0,3D,3C,03,88,10,F7,A9
1063 DATA 80,85,02,20,1B,C3,A0,00
1064 DATA 20,9B,C1,20,CA,C1,20,31
1065 DATA C2,E6,7A,E6,7B,20,7C,A5
1066 DATA A0,00,20,AF,C0,F0,CD,24
1067 DATA 02,F0,06,20,D7,C0,4C,12
1068 DATA C2,C9,22,D0,06,20,BC,C0
1069 DATA 4C,12,C2,20,E7,C0,4C,12
1070 DATA C2,A0,00,B9,00,02,20,A3
1071 DATA C0,C8,90,0A,18,6D,09,C0
1072 DATA 8D,09,C0,4C,33,C2,88,A2
1073 DATA 00,B9,00,02,9D,00,02,F0
1074 DATA 04,E8,C8,D0,F4,60,18,AD
1075 DATA 0B,C0,69,41,8D,0B,C0,38
1076 DATA AD,0C,C0,E9,19,90,06,8D
1077 DATA 0C,C0,4C,60,C2,AD,0C,C0
1078 DATA 69,41,8D,0C,C0,AD,05,C0
1079 DATA 6D,07,C0,48,AD,06,C0,6D
1080 DATA 08,C0,8D,0E,C0,68,6D,0A
1081 DATA C0,8D,0D,C0,AD,0E,C0,6D
1082 DATA 09,C0,8D,0E,C0,38,E9,19
1083 DATA 90,06,8D,0E,C0,4C,96,C2
1084 DATA AD,0E,C0,69,41,8D,0E,C0
1085 DATA AD,0D,C0,E9,19,90,06,8D
1086 DATA 0D,C0,4C,AB,C2,AD,0D,C0
1087 DATA 69,41,8D,0D,C0,A0,01,AD
1088 DATA 0B,C0,CD,3C,03,D0,20,C8
1089 DATA AD,0C,C0,CD,3D,03,D0,17
1090 DATA C8,AD,0D,C0,CD,3E,03,D0
1091 DATA 0E,AD,0E,C0,CD,3F,03,D0
1092 DATA 06,20,64,C3,4C,7A,C0,AD
1093 DATA 10,C0,D0,11,98,48,68,4C
1094 DATA F7,C0,AD,10,C0,F0,01,60
1095 DATA A9,04,4C,F7,C0,A4,FD,A9
1096 DATA 27,91,7A,A2,00,C8,BD,0B
1097 DATA C0,91,7A,C8,E8,E0,04,D0
1098 DATA F5,A9,00,91,7A,20,64,C3
1099 DATA 4C,7A,C0,A0,00,B9,00,02
1100 DATA F0,11,C9,28,D0,03,EE,03
1101 DATA C0,C9,29,D0,03,EE,04,C0
1102 DATA C8,D0,EA,AD,03,C0,CD,04
1103 DATA C0,D0,01,60,A9,05,4C,F7
1104 DATA C0,A9,20,8D,00,D4,8D,01
1105 DATA D4,A9,09,8D,05,D4,A9,0F
1106 DATA 8D,18,D4,60,20,41,C3,A9
1107 DATA 81,20,77,C3,A9,80,20,77
1108 DATA C3,4C,71,C3,20,41,C3,A9
1109 DATA 11,20,77,C3,A9,10,20,77
1110 DATA C3,A9,00,8D,04,D4,60,8D
1111 DATA 04,D4,A2,70,A0,00,88,D0
1112 DATA FD,CA,D0,FA,60,END
```

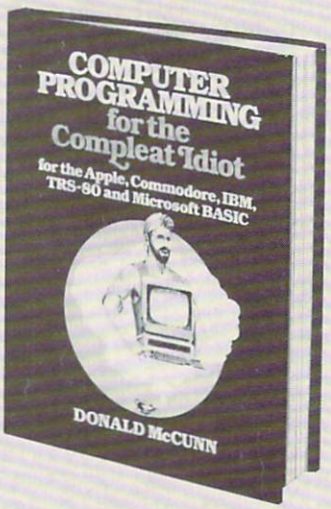
INDUSTRY NEWS

Beginning Programming

Emphasizing practical applications *Programming for the Compleat Idiot* by Donald McCunn explains step-by-step how to develop original programs by translating English instructions into BASIC. Demonstration programs illustrate the basic patterns of instructions needed to accomplish standard tasks such as displaying, storing and retrieving information. Clear guidelines are given for creating an original program from these basic units.

An excellent beginner's guide, this book also offers many useful references for the experienced programmer. The first edition, which sold over 60,000 copies, has now been updated, revised, and expanded to include such things as information about new computer systems, procedures for using forms from manual systems to design original programs, easy-to-use routines for output to printer, suggestions for program variations and guidelines for writing effective program documentation.

The book is published by Design Enterprises of San Francisco and retails for $18.95 (cloth) and $10.95 (paper).



***Computer Programming for the Compleat Idiot* offers practical demonstrations and routines for the programmer.**

Bank Information System

Chemical Bank has announced that its Pronto Home Information and Banking System is now compatible with the Commodore 64.

Using a home computer, a modem and the Pronto software, users can bank at home, allowing them to pay bills, transfer funds, determine their balance, see an electronic statement, track a budget and balance their checkbook. In addition, subscribers can send electronic mail to other Pronto subscribers and access certain information services available through the system. Information Services provide economic and business briefs, tax guides, *Consumer Reports* articles, a guide to all Chemical Bank services and current interest rates and news on the Pronto system.

Second Book of Machine Language

COMPUTE! Publications of Greensboro, North Carolina, has published a follow-up to their first book of machine language. Titled *The Second Book of Machine Language,* the new book is also by Richard Mansfield, senior editor at COMPUTE!.

The Second Book of Machine Language is based on LADS, the Label Assembler Development System, a full-featured, label-based assembler which can be as easy to use as BASIC. LADS emphasizes clarity, to give the reader an in-depth, step-by-step understanding of the development of a machine language program. In addition to learning how to construct this assembler, the reader also gains an advanced language to use in creating other machine language programs.

The book has a suggested retail price of $14.95.

Guide for the Handicapped

Sybex Computer Books has released *Personal Computers and Special Needs* by Dr. Frank G. Bowe, an authority on the special needs of people with disabilities. In his book, Bowe shows how personal computers can help handicapped, disabled or older people overcome their limitations.

Personal Computers and Special Needs explains how those who suffer from vision impairment, hearing loss, mobility constraints and learning disabilities can use computers to help them live more independently, work more productively, learn more effectively, and keep in better touch with the world. This sourcebook explains what aids and devices are available, where to get them, and how much they cost. It also covers helpful resources and organizations, and includes a buyer's guide to equipment.

Frank Bowe has been deaf all his life, so he knows how much handicapped people need practical information to help them solve their everyday problems. His book retails for $9.95.

INDUSTRY NEWS

Fulfill Your Music Video Fantasies!

The "Music Video Kit", a two-disk program retailing for $49.95, will enable the Commodore 64 user to now maximize the sound capabilities of the SID chip and combine superior synthesized music and animated graphics to create a high quality musical video on their home computer.

Using a powerful new video and music language, the user is able to invent characters, colors and patterns and then animate them against self-created backgrounds. Or, the user can just choose to sit back and joystick manipulate multitudes of preprogrammed actors ranging from robots to break dancers, flying saucers to musicians. These characters can be animated on any of a dozen high resolution preprogrammed backgrounds including such scenes as city streets, haunted houses, deserts, sunsets and castles.

The musical possibilities are also endless! The user can either create and edit original compositions with the polyphonic synthesizer included in the program, or turn to one of the many songs especially written and composed for the "Music Video Kit."

Photographer's Computer Handbook

Writer's Digest Books of Cincinnati, Ohio, announces *The Photographer's Computer Handbook* by B. Nadine Orabona. This handbook brings together everything photographers need to know to create an automated system designed around their personal requirements.

In addition to discussing hardware, software, and how to design a personalized system, the author also covers in detail the many time-saving profit-generating applications of a computer. Photographers will learn how to set up their systems to streamline standard business operations, including correspondence, bookkeeping, inventory and taxes. Orabona also describes how to use the computer to organize photo files, caption and retrieve photos, store technical data and simplify the submission of photographs to picture buyers. And last but not least, she provides a look at the future of computer technology from a photographer's viewpoint. The book retails for $14.95.

Reading and Spelling Software

Artworx's programs are designed to help improve your child's reading and spelling.

Mark the Monkey is off on new learning adventures helping children grades one through six expand their reading and spelling skills in two new programs, *Monkeynews* and *Monkeybuilder*, for the Commodore 64 by Artworx of Fairport, New York.

Monkeynews provides practice of reading and comprehension skills while allowing the student to control the story direction. It incorporates both multiple choice quizzes and a technique to reinforce story comprehension.

Monkeybuilder puts 256 word sets, designed to increase spelling and vocabulary skills, into 17 different work skill areas. The program uses a unique heuristic design which automatically adjusts the difficulty level up or down by evaluating the student's response for accuracy and speed.

Both are sold for $24.95.

MODEM 300

Continued from pg. 49

communications system takes over and does most of the work for you, unlike some user-hostile systems we encounter in everyday life. You can get on-line with a sequence of four simple steps.

1) Load the *HiggyTerm* terminal software. It is completely menu driven so all you have to do is select options from the main *HiggyTerm* menu. *HiggyTerm* is very friendly, so getting on-line is easy.

2) The program is automatically set for a Touch Tone phone, so if you are using a Touch Tone phone go to the next step. If you have a rotary dial phone, select option three from the menu, then press the "8" key from the protocol menu.

3) Return to the main menu and select option 9, DIAL TELEPHONE NUMBERS. Simply enter the telephone number you are calling into one of the nine number entries.

4) Now press the "D" (for DIAL) key and the numbered key pertaining to the telephone entry on the dialing menu. The system takes over and dials the number for you. Since the setup has an audio output, you can hear the dial tone and the number being dialed. Next, you hear the connection being made and the phone on the other end ringing. Then you hear the phone being answered followed by a high-pitched tone. Now all you do is press the RETURN key when the high-pitched tone stops. At this point you are on-line with the host computer.

The "information age" is moving ahead so rapidly, telecommunications will soon be used by nearly everyone, although right now it's one of the best kept secrets in the home computer industry. Because Commodore traditionally stresses high-performance, low-cost computing, it has brought the benefits of telecommunications into a price range that most people can afford. For this reason, the majority of CompuServe subscribers, for instance, are Commodore owners. Now the new Modem/300 adds a new and powerful dimension to your Commodore computer system, and is probably your best computer buy in price and performance. C

**Check CompuServe for the latest hourly rates and your local CompuServe phone numbers: Customer Service 1-800-848-8990.*

CHRGET

previously saved before returning to BASIC.

If you are writing a stand-alone machine language program, you don't have to worry about saving and restoring the address pointer, since BASIC isn't being called. Just set the pointer as needed and call the routine.

Before I forget, here's another possible use of the CHRGET routine that I haven't seen anyone really talk about. This is an easy way to pass parameters to machine language routines. It is somewhat limited since you cannot pass parameters from BASIC variables, but it may be useful for certain applications.

Remember that the CHRGET routine is always used to reach each BASIC line that is being executed. If you execute a SYS(. . .):. . . . command string, the address pointer in CHRGET ($7A and $7B) will be pointing to the colon following the SYS command. If you have a REM statement following the SYS command, you can use the CHRGET address pointer to know where to read any data from within the REM. If your program reads the data directly without using the CHRGET routine, then BASIC will simply skip over the REM when your routine returns to BASIC.

However, it's even easier to use the CHRGET routine to read SYS call parameters. You still need the colon after the SYS(. . .) to terminate that statement correctly. On the other hand, you no longer need the REM, since calling CHRGET will automatically increment the address pointer past the parameters read. If you read the correct number of characters before returning to BASIC everything will continue as normal. To protect yourself you'll probably want to terminate the parameters with a colon as normal. In your routine, then, you just continue reading data until the colon is found. Remember that the 6502's Z-bit will be set when the colon is found so it's very simple to check for. Thus, you could use something like:

```
100 SYS(12345): "THIS IS A TEXT HEADING": X=45
```

to pass a text string heading to your machine language routine.

As I said before, this method is somewhat limited, since you cannot pass the value of a BASIC variable. Any parameters to be passed must be actually written within the program. C

SIMON'S BASIC

CMDR f1 (for function 9) to list the program.

The function keys will remain programmed until the computer is turned off or the COLD command is entered. (The COLD command clears memory and returns the system to the *Simons' BASIC* title screen.) The functions assigned are *not* affected by clearing memory with NEW.

It's a good idea to write a short program to assign frequently used commands to the function keys and load it whenever you use *Simons' BASIC.* Remember, once you're spoiled by using the function keys, it will be hard to go back to typing and entering commands!

To display function key assignments, use

Command format:

DISPLAY

To review the function key assignments now in memory,

ENTER: DISPLAY

The screen display shows:

```
DISPLAY
KEY 1,"RUN"      KEY 9,"LIST"
 + CHR$(13)       + CHR$(13)
KEY 2,           KEY 10,
"PAGE 10"        "PAGE 0"
KEY 3,""         KEY 11,""
KEY 4,""         KEY 12,""
KEY 5,""         KEY 13,"NEW"
KEY 6,""         KEY 14,"OLD"
KEY 7,""         KEY 15,""
KEY 8,""         KEY 16,""
```

Now try to add a key command for automatic line numbering. Use your own parameters for beginning line number and line number increment in place of 10,10, below.

```
ENTER: KEY 5,"AUTO 10,10"
                + CHR$(13)
```

Now program line numbers can be generated by the stroke of a key!

If you're a *Simons' BASIC* owner, I hope that this tutorial has been helpful. If you're not a *Simons' BASIC* owner, you're missing a lot of Commodore programming power!

Much of this article was excerpted from *Simons' BASIC: A Hands-On Approach,* to be published by Brady Communications Co., Inc., a Prentice-Hall subsidiary. Mrs. Reh has also authored *Hands-On BASIC Workbook For Kids Using the Commodore 64,* also published by Brady Communications. C

 Continued from page 31

filled file, in order to reach the end.

The "G" mode differs from the search format screen's selective printing in that the "G" mode is for visual searching only, and works only on one selected search criterion. The search format screen's global search takes place only in the print mode.

The user can also select zero to 20 specific variables. For example, the user can ask the "G" mode to flag down the records of every person living in New York City, but cannot ask the "G" mode to flag down the records of every person who lives in New York City and who also is female. On the other hand, the search format screen can print records that meet those two conditions.

The "B" (backup) mode allows the user to make safety duplicates of any data disk. Since *Scratchpad 64* can "sense" the type of disk drive being used, both single and dual disk drive copies can be made depending on your hardware.

The "P" mode (print mode) allows the user to obtain a hard copy of any record in any format arrangement. *Scratchpad 64* allows you to print an individual screen, an entire file from start to finish, or selected field lines.

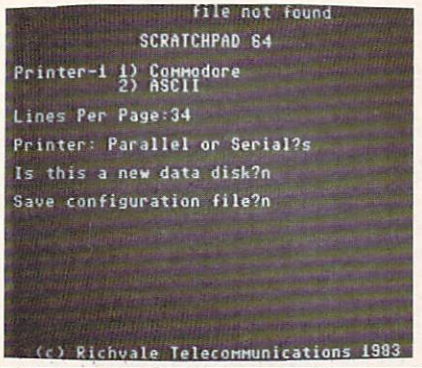
Once inside the "P" mode, the computer will ask the user a series of questions which will establish printing procedure. The first set of questions establishes which screen will be sent to the printer, as defined by the search format screen. The second group of questions deal with the physical size, shape and format of the paper you will use. For example, continuous roll labels, measuring 1.5″ × 3″ require different print criteria than printing on everyday 8.5″ × 11″ paper.

Print columns are also established with these secondary questions. The third set of questions deal with the specific positioning and printing of desired field lines. For example, some records in your customer file may contain such marketing field lines as age, sex or buying habits. However, just because your data base contains such data doesn't mean that you should, or are forced to, print out this incidental or confidential information on mailing labels. In this case, a simple name and address will do just fine.

The last mode, the "Q" mode (for quit) may seem unimportant, but in fact is essential to the proper maintenance of your data diskette. The reason for this is simple, yet alarming. There are so many screen records jammed onto a diskette, that your disk drive must continuously stay on (indicated by the red light), thus leaving the file in an "open" state. This particular aspect of *Scratchpad 64* makes this program record-efficient, yet dangerously volatile as far as data safety is concerned. Therefore, the "Q" mode is the only way the user can transfer new data from the 64's RAM buffer to a 1541/4040 drive, and safely close down the entire file.

It's still a very good idea to make backups after every use, since data can be lost *during* actual use, if a break accident occurs. Power spikes/drops or disk drive mishaps can literally wipe portions of your file clean!

Scratchpad 64 allows you to print an individual screen, an entire file from start to finish, or selected field lines.



Drawbacks

Scratchpad 64 is very slow for many typical business situations. It simply cannot compete against random-access database programs in both execution speed or versatility. However, *Scratchpad 64* costs $40, not $700, and doesn't need $10,000 worth of hardware to make it work well. It works with the Commodore 64 nicely.

A second fault of *Scratchpad 64* is that, although it is advertised as a mailing label program, I personally found it difficult to use for continuous-roll label generation. The reason for this is two-fold. First, *Scratchpad 64* assumes that the paper media comes in even-sized length dimensions, such as 1″ labels. However, most labels come in fractional sizes. And secondly, it forces the user to decide, at the very beginning of each usage, the number of lines on each page of paper.

While it is easy to figure out that an average 8.5″ × 11″ paper has 66 lines per page, it is impossible to calculate non-fractional lines per "page" in a $1^{15}/_{16}$″ × $3^{1}/_{8}$″ label, without rounding off the answer.

An integer number cannot be used to answer this program prompt . . . and there lies the problem! If the user "rounds off" to an integer answer, *Scratchpad 64* will work just fine—until it reaches the end of the imaginary page. Then it will start skipping labels, often restarting the next page sequence in the middle of the next label.

Conclusion

Despite its flaws, *Scratchpad 64* is worth its "admission price." You just have to recognize and work around its limitations. I would recommend *Scratchpad 64* because it is a well organized data program, useful in many light-duty small-business applications, such as a telephone directory or customer filing system. It can be learned and used by anyone in a matter of minutes. *Scratchpad 64* comes complete with clear concise directions, in the form of a well written manual by Marc Swanson. Complicated (for non-computer users) terms such as "sequential data files," "records," "fields," are substituted for more human business terms such as "mailing list," "customer screens," and "line numbers." In short, *Scratchpad 64* is a business program for business people.

Again, the price alone is a great reason to purchase *Scratchpad 64.* But the best reason to purchase this program is that *Scratchpad 64* complements *Script 64* perfectly, like a hand in a glove. Although most sequential data files—even ones the user can create from custom programs—will work functionally with *Script 64, Scratchpad 64* showcases the form letter capabilities of *Script 64.* When used in that one specific respect, *Scratchpad 64* has exceeded my pre-purchase expectations. C

NEXT MONTH

Watch for These Upcoming Issues

Commodore Power/Play, April/May: Don't miss the fun as we bring you our first annual April Fool special issue. Would you believe a column written by Jim Oleofield? No doubt about it, we get silly in April.
AND YOU'LL ALSO FIND:

- A revealing look at sports-type games, including baseball, football, basketball and more.
- Insights into the mind of Douglas Adams, author of the best-selling book *Hitchiker's Guide to the Galaxy,* now a game for the Commodore 64.
- Reviews of the games you've been thinking about buying, including *Boulder Dash, Castles of Dr. Creep* and *Murder on the Zinderneuf.*

Commodore Microcomputers, May/June: How will we use computers ten, fifteen, even fifty years down the road? We take it out of science fiction and into reality in our "Future Computing" issue—where some of our most knowledgeable writers consider what's happening in computing today and what that means for tomorrow.
AND THERE'S MORE:

- Modems are becoming common household appliances in France. Find out how the French are riding a revolutionary telecommunications system into the future. Is the U.S. next?
- An overview of the PROMAL language for the 64.

ADVERTISERS' INDEX

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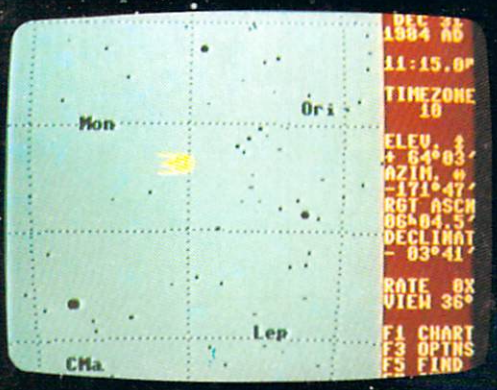
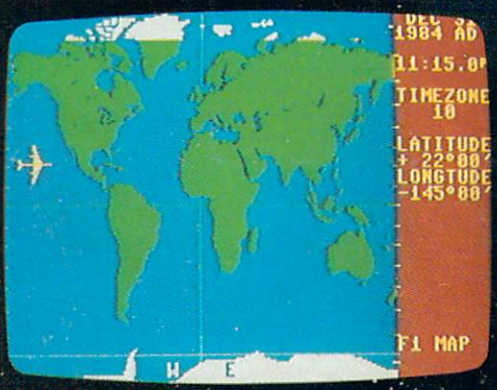
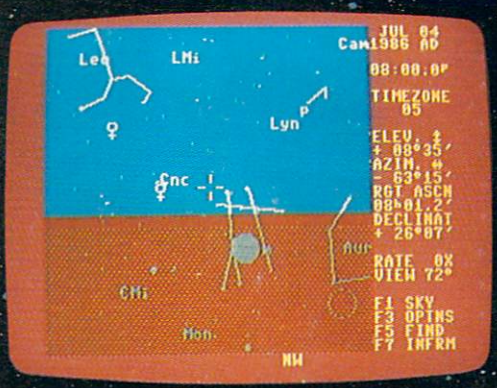


THE CHART MODE



THE MAP MODE



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