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May 1984
A Wayne Green Publication

# RUN

The Commodore 64 & VIC-20 Magazine

Get Organized!
Put a Little Database in Your Life

Journey to the Center of Your C-64

Program of the Month
Magic Music Maker

Can You Survive the
Attack of the
Deadly Dragons?

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Dear Susan,

I've discovered something very exciting that I want to share with you. I've always thought assembly language was too complicated for me to learn and I've been doing all my programming in Basic, or buying software that doesn't do quite what I want. You know, Basic is just too slow for a lot of tasks, and I can't find ready made software to do those specialized things I want to do.

Well, I just bought Panther's C64 Assembler and I found out that assembly language is easier than I thought, and it's also fun.

The C64 Assembler is very "friendly" and the documentation is clear and well written. One very nice feature of the manual is a section for the neophyte assembly language programmer that really helped me understand how to use the machine.

Now I'll be able to write those programs myself instead of waiting for some software manufacturer to guess what I'm looking for! My programs will do exactly what I want, and I'll have fun writing them.

The dealer even told me that Panther is looking for good programs in assembly language, and they're willing to publish and pay royalties for useful programs which meet their standards.

As you know, I don't have any experience yet, so I can't compare assemblers, but Jim's seen it and he's a professional assembly language programmer. He says it's the easiest-to-use and the fastest assembler he's seen for any microcomputer. In fact, he said he's going to buy a Commodore 64 just so he can use it.

Come on over to my place when you have time and I'll show off the assembler for you, or go to the dealer down the street to see it. The whole Commodore community is excited about the C64 Assembler.

I've got to sign off now. I'm anxious to get back to my assembler and finish the program I'm working on. This is fun!

Let's get together soon,

Bob

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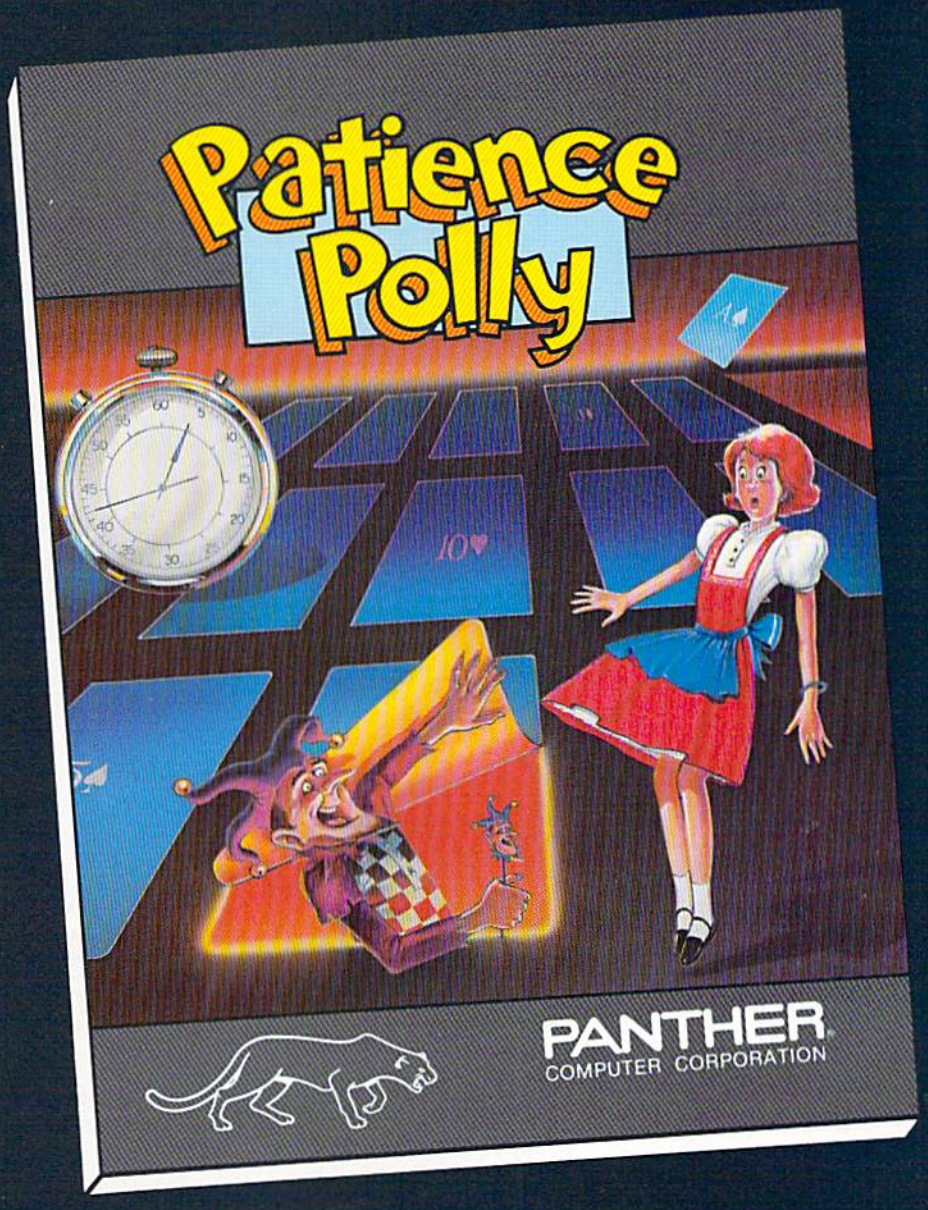


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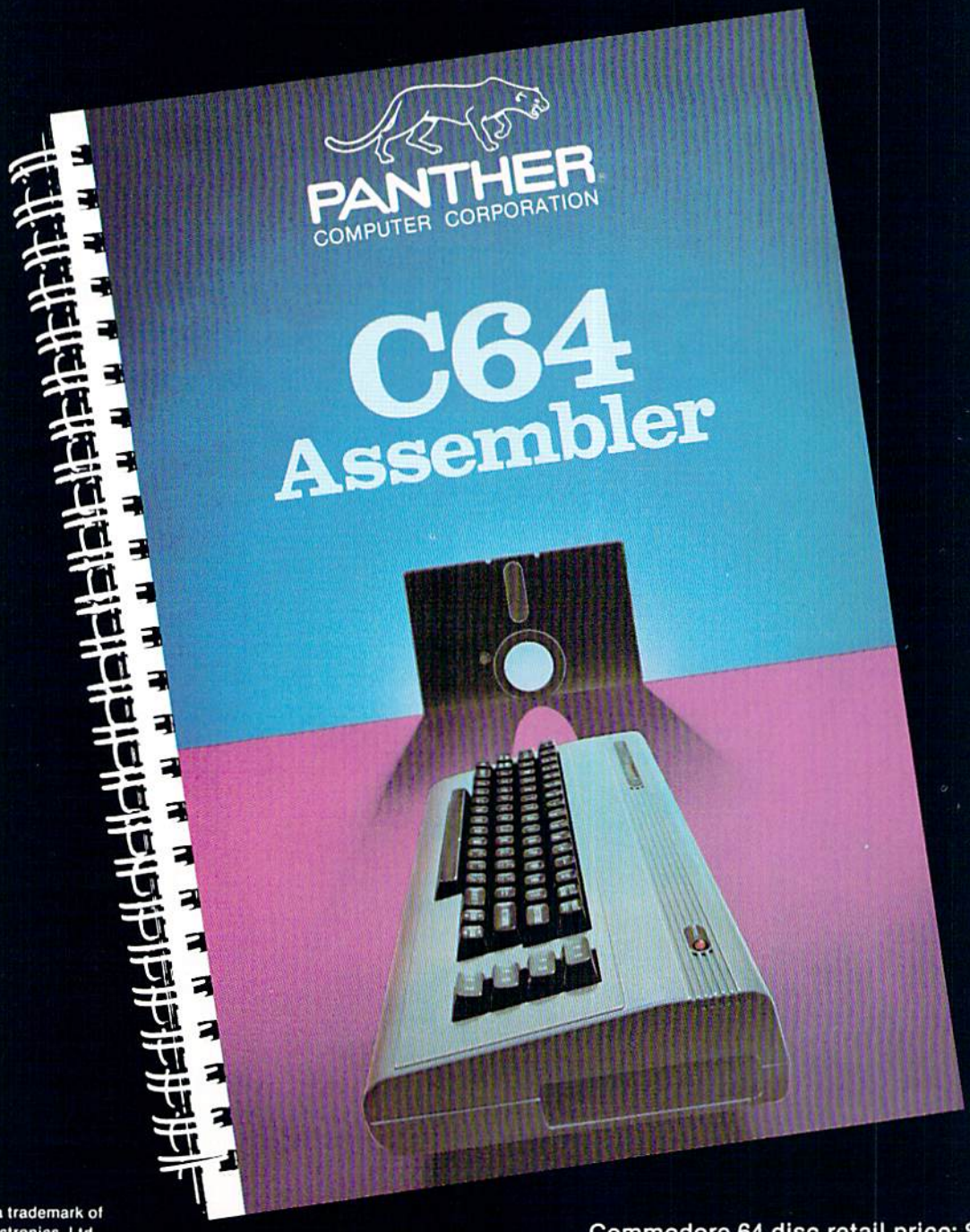


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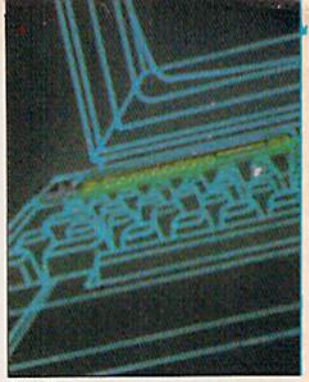

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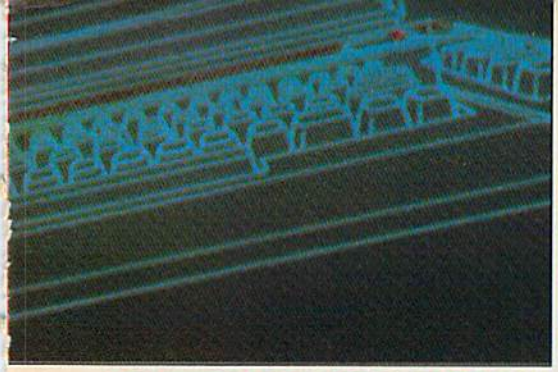

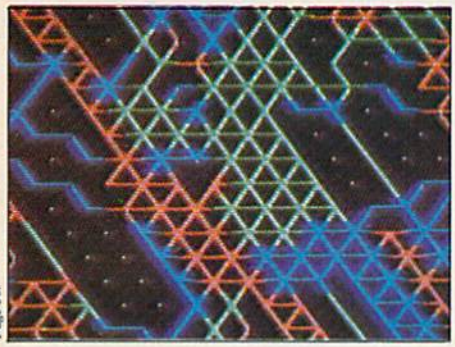

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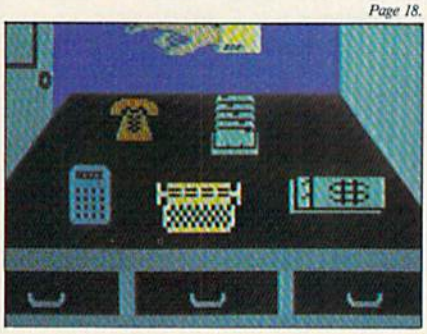


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# RUNning Ruminations

## Deception for Hire

The home computer industry has spawned many success stories about entrepreneurs and astute businessmen who have cashed in on this burgeoning field. Unfortunately, in any field where there is money to be made, there are also con artists with get-rich-quick schemes to take advantage of a lucrative situation.

Some of these schemes are so silly as to be innocuous, while others are cleverly disguised rip-offs that often catch the unwary consumer off-guard.

The microcomputer industry has been relatively free from such goings-on, despite its tremendous potential for growth. (The latest survey results to cross my desk project that 7 million home computers will be sold during 1984.) Which is not to say that the industry has been blemish-free.

Particularly in the early days of microcomputing, there were a few fly-by-night operations that swindled many unsuspecting microcomputer enthusiasts eager to purchase the latest new product development for their systems. More recently, the industry has experienced networking security breaches that have given rise to such movies as "War Games" and attempts to sell industry trade secrets involving at least two major microcomputer manufacturers.

Occasionally, *RUN* will receive a letter or phone call from a reader alerting us to the questionable practices of a computer company or relating unpleasant dealings he has experienced with a manufacturer.

We recently received a query from a suspicious new subscriber who noticed an advertisement in a major city newspaper offering programs published in *RUN* magazine typed onto tape or disk. The company's insistence on cash-up-front before delivering the goods made the customer distrustful.

"Hey, wait a minute," I thought. "We certainly never gave permission to any company to mass-market our published programs. Clearly, what this company is doing is a violation of software copyright law."

So, I decided to check into it, and called the toll-free number listed in the ad. Either there was a typo in the ad or the company has moved its business, because I was not able to make a phone connection.

The company in question billed itself as a typesetting service, not a software supplier. *They are saving their customers the time and tedium it takes to type in programs. And, as a result of this typesetting service, they just happen to be distributing on cassette or disk copyrighted programs.* Ha!

Well, the magazine's legal counsel is now involved, so the matter should be resolved one way or the other very soon.

But if any of our readers come across any similar companies, they should keep in mind the following:

1.) Neither this company, nor any other "typesetting for hire" company, has the permission of *RUN* magazine to distribute programs published in the magazine.

2.) You don't know what you're getting. What if your cassette or disk won't load? Whom will you contact—a toll-free number that doesn't work? No address is given.

3.) If you are averse to typing in your own programs, go to a more reliable source. For instance, *RUN* authors often offer to provide interested readers with a copy of their published programs for a nominal fee to cover postage and copying costs. In addition, *RUN* will be making its published programs available on disk or cassette. Details will be forthcoming in next month's issue.

*RUN* magazine will remain consumer-oriented as well as producer-oriented. We intend to open up the pages of the magazine to responsible representatives from both sides of the industry and establish a dialog between the two parties.

Most manufacturers and distributors are responsible and aboveboard; if this were not the case, they wouldn't be in business for long. But I wanted to alert readers to the shenanigans of this particular company. As I hear of other deceptive schemes, I'll let you know.

Please keep the magazine informed of any ill dealings you may have had with a particular manufacturer or company. By the same token, tell us about particularly commendable experiences you may have had with a company. Send your comments and/or complaints to Rita Rivard, Customer Service Manager, Rt. 101 & Elm St., Peterborough, NH 03458. **db**

## How to type listings from RUN Magazine

Typing in listings can be difficult enough without having to worry about strange graphics characters, charts or tables. That's why we decided to make it easy to enter listings from RUN by translating everything we thought might be confusing in any program.

When you see something between the curly brackets, all you have to do is press the keys indicated. For example:

{SHIFT L}—means hold down the shift key and press the L key at the same time.
{COMD J}—means hold down the Commodore key (it is on the lower left side of the keyboard) and press the J key at the same time.
{SHIFT CLR}—hold down the shift key and press the CLR/HOME key.
{HOME}—press the CLR/HOME key without shifting.
{CTRL 6}—hold down the control key and press the 6 key.
{FUNCT 2}—function 2 (in this case, you hold down the shift key and press the function 1 key).
{CRSR UP} {CRSR DN} {CRSR LF} {CRSR RT}—these are the four cursor directions.
{UP ARROW}—means the arrow key (the one with the pi sign under it).
{LB.}—the British pound sign (£).
{PI}—the pi sign key ($\pi$); (shift and press the up arrow key).

In some instances, when a large number of characters or spaces are repeated in a listing, we will represent them this way: {22 spaces} or {17 CRSR LFs}.

We hope this system will make it easier to enter the listings without having to remember or refer to any charts or conventions. If you have any suggestions as to how we might improve the system to make it even easier, drop us a letter.


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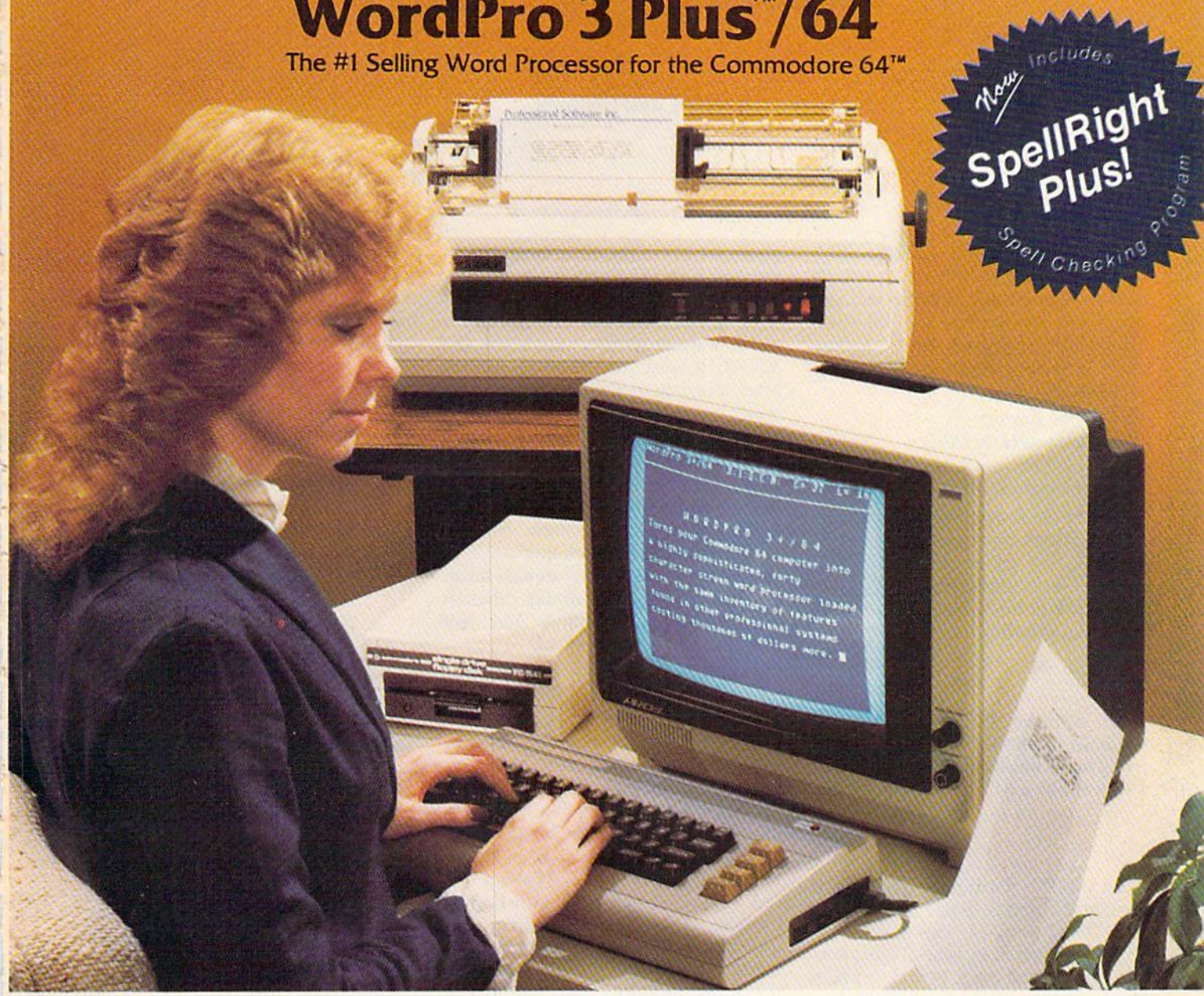


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# Commodore Clinic

**By Jim Strasma**

*Commodore Clinic is a regular monthly column designed to help you, the* RUN *reader, through any troubles or questions you have as you use your new Commodore computer. Send questions along with a stamped self-addressed envelope to:*

*Jim Strasma*
*Commodore Clinic*
*1238 Richland Ave.*
*Lincoln, IL 62656*

*Due to the heavy volume of mail received, please limit each letter to one question. We try to send answers by mail and include as many letters as possible in this column, but we do ask that you not telephone.*

**Hardware**

**Q: It seems *RUN* is putting more emphasis on the C-64. Is the magazine trying to tell me it's time to get rid of my VIC and buy a 64?**

**Kelan Morris**
**North Platte, NE**

A: *RUN*'s stated policy is to split its computer coverage 50/50 between the VIC-20 and the C-64. This policy is being severely tested in light of the growing popularity of the C-64 and Commodore's recent introduction of the new C-264.

Despite rumors to the contrary, Commodore maintains that the VIC-20 is still in production. But in fact, at the recent CES show in Las Vegas, not one new development for the VIC-20 was announced by Commodore. The C-64, as well as the new C-264, seems to be the darling of the software manufacturing set. These factors all influence the editorial coverage in the magazine.

*RUN* will attempt to maintain its 50 percent coverage of the VIC-20. And we are definitely not telling the two million VIC owners to dump their machines in favor of a C-64. Why should you? Your VIC probably still works fine.

Why not keep it and add the new machine or a 64? The VIC will still do everything it ever did, and major companies are still bringing out new programs for it. On the other hand, it may not be worth the money to upgrade or add memory to the VIC. If you really want to sell your VIC, why not give it away, instead? With its huge letters, the VIC-20 is ideal for use in elementary schools and church schools and may be worth more as a charitable donation than on the market (only about $50 loaded in our area currently).

**Q: The following is the system I am proposing: C-64, 80 column card for video, daisywheel printer, modem, Z-80 card and Tandon 5¼ double-sided, double-density soft sector disk drives. It will be half Commodore and half Zenith Z-89. Will this work?**

**Brenda Spiers**
**Talladega, AL**

A: Not quite. The pieces exist, but getting them to work together as you expect will be difficult. The hardest part may be making the Tandon drives media-compatible with your Zenith.

Commodore's DOS is far more advanced than CP/M's, but finding one disk drive that can read both normal commercial Commodore programs and Zenith files will be nearly impossible. Data/20 makes an 80-column card for the 64 that includes a Z80, and offers a CP/M for that board.

Another option would be to turn your C-64 into a terminal on an outboard CP/M system; you'd need an RS-232 adapter and a good terminal program. I'd use the Zenith as the outboard system, and I'd communicate between the two computers via the RS-232 interface.

**Q: I would like to run the power cable on my C-64 straight back instead of out 2 inches, then back, as now. A 4-pin DIN connector would solve this, but I have found no such beast. Any ideas?**

**Darryl Huneycutt**
**Summerville, SC**

A: On my 64, it's a 7-pin DIN connector. Perhaps a reader knows where to find a suitable right-angle plug.

As an alternative, consider having a competent technician unsolder the current connector from the 64's main board, find a place on the back of the computer to add a new hole for the power connector, and then rewire the connector to the main board.

The job should be fairly simple after you decide where to firmly fasten the connector once it's moved, but such work obviously voids your warranty.

**Q: Is there something that will improve the video resolution for early C-64 owners? (See answer below.)**

**Tim Thompson**
**Boston, MA**

**When running a program, I notice a flickering white line or sparkle on many characters. When in immediate mode, this so-called sparkle is much less noticeable. Is there a circuit modification to do away with the problem?**

**Norbert Perry**
**New Port Richey, FL**

A: The well-known sparkle problem only affects very early 64s, although some "new" units are recycled oldies. Most 64s are immune. Owners of early units may exchange their 64 for a "new" one through a full-service dealer for about $75.

To be sure the exchange unit is really a current model, see if its display is as clear as the one on your dealer's display model when plugged into the same TV or monitor. As an alternative, you may lessen the problem by adding two 330 picofarad capacitors to the computer. One goes from pin 30 to pin 20 on the 6567 VIC II chip, and the other goes from pin 14 to ground on the 6510 microprocessor.

If you remove those chips, insert the leads in the sockets, and then reinstall the chips, you will avoid permanently altering your computer.

**Q: I have an unexpanded VIC. Occasionally, after running for a period of time, my TV display starts to fluctuate. After a minute, my whole program is wiped out. The cursor is gone and the**



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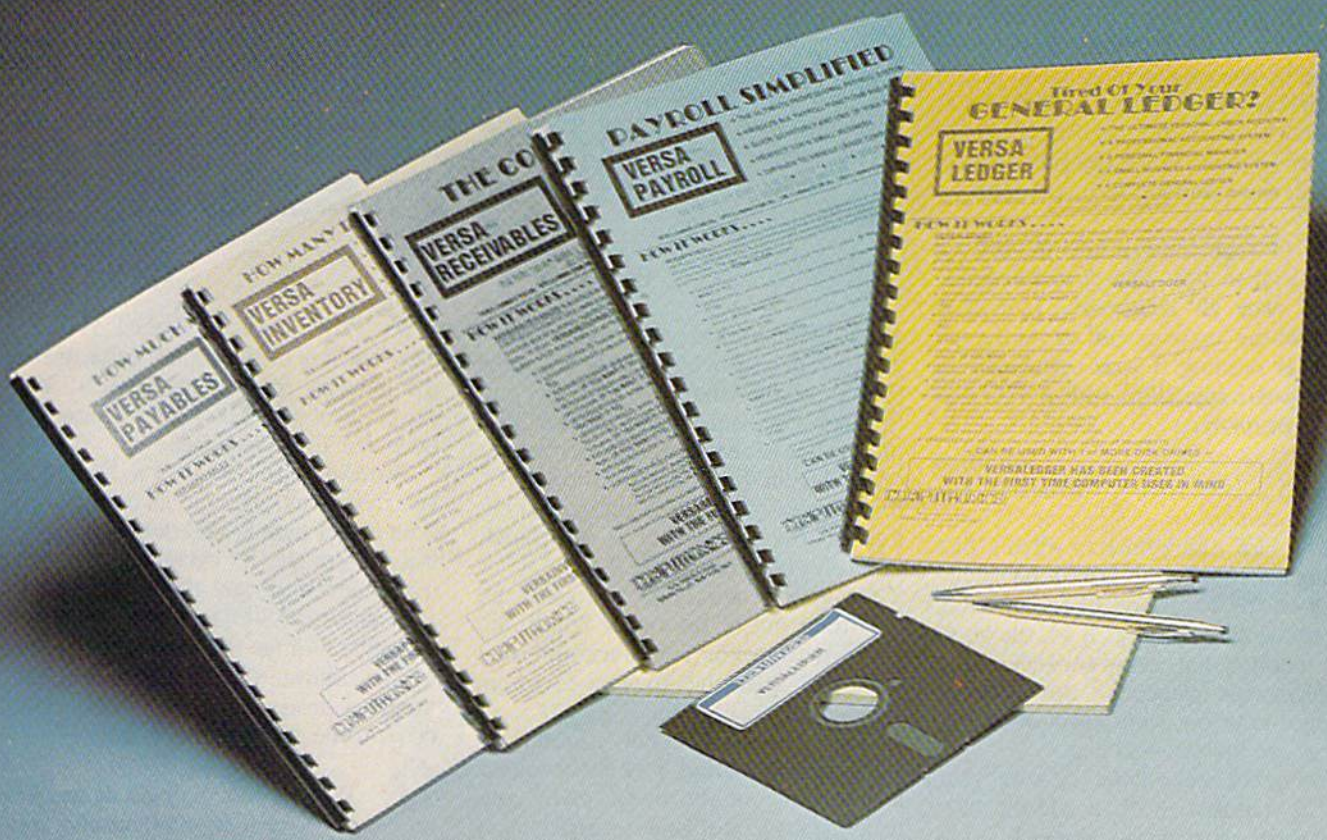


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**screen fills up with random characters. Any suggestions?**

**Jim Peterson**
**Brooklyn Park, MN**

**A:** Your problem appears to be heat-related. The next time it happens, direct a fan's airflow inside the case and try again. If the program then works properly, you or a technician can isolate the problem by cooling the chips one at a time with a can of Frost Test (Freon in an aerosol can). When the guilty chip is cooled, the computer will work again.

**Q: I hope you can help me bring a dead VIC to life. The cursor is gone, along with all characters. I used a cathode-ray oscillograph to verify the clock is running. I also exchanged all seven removable chips with a VIC that works properly.**

**Jim Riggs**
**Riverside, CA**

**A:** First, think back to when it first happened. Had you just done something to the hardware, like connecting or removing something? If so, the interface chip for that connector is likely the problem. For instance, if cartridges are plugged in or out with power on, many things can happen—all bad.

Along the same lines, be sure your VIC is standard, with all add-on parts unplugged. If it works alone, but not with added memory or whatever, the add-on is possibly the problem instead of the computer.

If you haven't already done so, try swapping the 6522 VIA interface chips. They are quite sensitive to minor abuse, such as the plugging-in troubles mentioned. (I assume you've already tried swapping the 6560 VIC video chip.)

If this doesn't help, having Commodore simply exchange the unit with a new one may be cheaper than further repair. Readers report the exchange takes about three weeks through a full-service Commodore dealer, and costs $55, about what many dealers charge for an hour of repair work.

**Q: I have a VIC and 1540 disk drive. I have noticed *RUN* articles referring to the 1541. Does the information also apply to my 1540?**

**Jerry P. Waite**
**Alexandria, VA**

**A:** Yes. The 1540 became the 1541 to cure a bug in the C-64. The change has nothing to do with the VIC except that the 1540 is faster than the 1541. The slowdown was needed to guard against the 64's VIC II chip grabbing control of the computer at an inopportune time. For VICs, the 1540 is preferable and otherwise fully compatible with the 1541.

**Q: I want to change my second 1541 disk drive to unit 9. The operator's manual is very vague about where the device number jumpers are. I count 17 wires on the left side. Which are the jumpers?**

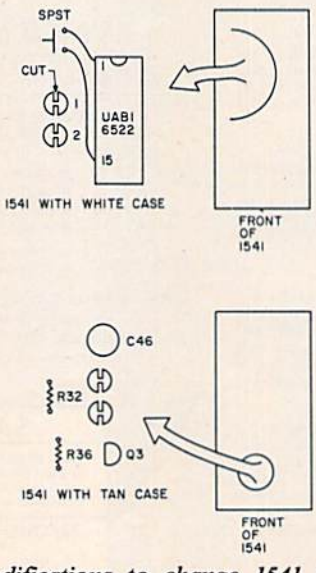
**Jay Reagan**
**Hyde Park, MA**

**A:** The jumper you want isn't a wire; it's one of two round spots on the circuit board that is partially cut through. On older (white) 1541s, it's on the left side of the board toward the rear (viewed from the front), next to UAB1. It is labeled "1." Once the partial cut through the round spot is completed, that drive becomes device 9.

On newer (tan) 1541s, the spots are near the front of the circuit board, between a capacitor and transistor, and unlabeled. (See the drawing for more details.)

After you make the cut, you may restore the disk to unit 8 by either soldering over the cut you made, or by connecting pins 15 and 1 on the 6522 chip at UAB1 (on the older 1541s).

If you connect them with micro test clips and put a single-pole, single-throw switch in line with the wire connecting the clips, you can change from device 8 to 9 and back merely by flipping the switch. Since no permanent change to the 1541 is involved other than following Commodore's recommendations, this upgrade may not even void your warranty.




*Modifications to change 1541 disk drive to device 9.*

**Q: I own a TRS-80 Model 3. Now I'm in the market for a color computer. I was unimpressed with all but the C-64. However, the 1541 disk is only single-sided, single-density. Does Commodore sell a better drive (e.g., SS/DD)?**

**Paul Abraham**
**Cleveland, OH**

**A:** Yes. Their 8250 dual 5¼-inch drive has one of the highest capacities in the industry (over 2 megabytes). You can connect it to a C-64 via a Buscard or other IEEE-488 interface.

However, the 1541 isn't as limited as you may think. Though its data density is no higher than SS-SD drives with only 90K of storage, its variable sectors per track allow it to store 170K per disk, the same as most SS-DD drives.

At the Winter 1984 Consumer Electronics Show, Commodore also announced faster versions of the 1541 drive, to be called the 1542 and 481.

**Q: What is your opinion of the Silver Reed EX-10 typewriter/printer, and what is the best way to interface it with my VIC?**

**Donald Salas**
**Easton, CT**

**A:** I've never used the Silver Reed, but I'm underwhelmed with my own typewriter/printer. As a printer, it's as slow as molasses flowing uphill; as a typewriter, the daisywheel completely obscures the typing line so I can't see what I've written until I do a linefeed. Be sure your choice avoids these problems.

As for interfacing, such units usually provide a Centronics parallel port. A Cardco Card/?-b is an inexpensive way to connect your VIC to a parallel port.

**Q: I have a 64 and would like to use my Olivetti ET 221 electronic typewriter as a printer. Is this possible?**

**Tripp Fezler**
**Slidell, LA**

**A:** Yes. Our Lincoln College extension campus at Logan Correctional Center has one connected to a PET. Ac-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cording to the literature with it, four interfaces are offered: PET (IEEE-488), SER (RS-232), Apple (Centronics parallel?) and TRS-80. Via a suitable interface, the 64 is compatible with any of the first three.

If the Apple version is true Centronics parallel, then that will be simplest, as serial bus to parallel interfaces for the 64 are quite common. Most dealers stock at least one. You will end up with two interfaces; one from Howard Industries of Anaheim, CA, suppliers of the ET 221, and the other from your Commodore dealer. The prison programmers report the ET 221 is slow, but works well.

**Q: How can I build an auto-load disk program for the 1541?**

**Richard Nelson**
**Roy, UT**

**A:** Only by permanently modifying your 64's internal ROM programming. If you are seriously interested in doing this, write again and I will forward your letter to a person who has done this. However, his charge will be in excess of $50, and the change will be permanent.

**Q: Will the Texas Instruments data cassette interface with my new C-64?**

**Karen Blinderman**
**W. Springfield, MA**

**A:** No, sorry, unless you are able to use it as an ordinary cassette recorder, too. Then you need an interface like the one from Tymac (below) that will connect it to the 64. Unfortunately, the interface may cost almost as much as Commodore's own Datassette.

**Q: Is it true that the 1525 printer has some problems? Would you please recommend a printer that does not need an interface and costs less than $250?**

**Paul Ricotta**
**Dunkirk, NY**

**A:** The 1525 printer is a minimum printer, at minimum cost. It might be adequate for its intended home market, but it's not strong enough for such business uses as multi-part forms and postcards. It also lacks descenders on letters that should extend below the typing line, such as g or y.

The 1525 has just been upgraded to the MPS 801, a faster and more compact printer that sells for about the same price. After brief testing, I like the 801, and prefer it to the 1525, but would still choose another for business use. Unfortunately, all those I could suggest as alternatives require an interface and cost more than you want to spend.

**Q: I wonder if you can come up with a quicker way to copy tapes on the VIC? We have a small computer club and as we get new members, we like to give them a copy of what we have. Is there anything commercially available for this?**

**B. Alexander**
**Cobb, MN**

**A:** The Tymac Universal Tape Interface ($50 from Micro-Ware Distributing) can copy an entire tape of programs at once, regardless of the contents. I haven't found a cassette program it can't handle, and doing a whole tape at once means you don't have to watch it, once started. It has obvious uses as an aid to piracy, but I hope your club will be one of the many Commodore user groups that only exchange public domain programs.

## Software

**Q: We are using the C-64 with the Smith Corona TP-1 printer via a Card/? interface. Wordmaster, from Data 20, will single-space if we first lock the interface, using Cardco's special command for this and a secondary address of 28. But no matter what we do, Script 64 prints double-spaced.**

**We have asked several companies, including Smith Corona, Richvale Telecommunications and Cardco about this, but none have been able to supply a solution.**

**Tony Rogers**
**Hiwasse, AR**

**A:** Your trouble is in the Smith Corona, but will have to be solved another way, as the TP-1 has an automatic line-feed after carriage return that can't be defeated.

First try the same command you previously used to lock the interface, but with a secondary address of 25. If this fails, look carefully through RTC's manual for Script 64, to see if there's a format control for line-feeds or if you can set it for a smaller line spacing. (Word Pro, for instance, includes format controls for both.) If this too fails, try the new Card/?-B interface; it has a hardware switch to control line-feeds and keep programs from unlocking them, and Cardco does have an upgrade policy, which limits the cost to you.

**Q: I have a C-64 and Easy Script. I bought a Gemini 10X printer, and connected it via a Connection interface, but have been unable to make it work. When I select the MX-80 option in Easy Script, I get only graphics. Would you please advise me?**

**Omar Barriga**
**Columbus, OH**

**A:** Your problem is in the settings of The Connection's switches. It has an ASCII code corrector switch, to make upper- and lowercase come out correctly on program listings. Easy Script also includes a correction for the same problem when you choose the MX-80 printer option. The two fight each other, and you end up with graphics. Turning off the ASCII correction option in The Connection will solve the problem.

Once again, test printers, interfaces and word processors together before buying—not all combinations work.

**Q: When will Commodore market programs that contain professional scoring for music (clef signs, key signatures, meter, etc.)?**

**Gregory Bennett**
**New Orleans, LA**

**A:** For information about Commodore's musical plans, talk to Paul Higginbottom. He reportedly answers some questions on the Commodore Information Network on CompuServe, which requires a modem.

Meanwhile, Electronic Art's Music Construction Set includes most if not all of what you asked for, and has become a very fast seller on several brands of micro, including the 64. Other good music programs are also beginning to appear. (Commodore music programs are featured and reviewed in *RUN*'s April issue.)

**Q: Do you know where I could get a good BBS program for the Commodore 64 with 1541 drive? [A popular question. Ed.]**

**Dave Westphalen**
**Union City, NJ**

**A:** Until very recently, no. There

*(continued on p. 142)*



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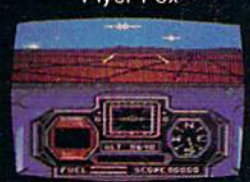
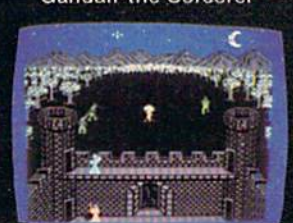


Gandalf the Sorcerer



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*MAGIC is tricks, MAGIC is fun.*
*MAGIC is doing what cannot be done.*

# Magic

**Compiled by Louis F. Sander**

*MAGIC is a monthly column of hints, tricks and odds and ends from the worlds of software, hardware and applications.*

*Every month, MAGIC brings you brief and useful computer tricks from around the world—tricks that others have found to make computing easier, more enjoyable or more exciting.*

*MAGIC features simple hardware ideas, one-line programs, useful subroutines, little-known computer facts and similar items of interest. We look for new or recycled material that is of current value to Commodore computerists and that can be implemented with a minimum of time, effort, or theoretical knowledge.*

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RUN *will pay up to $50 for each unpublished trick we print.*

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Most of this month's tricks are for entering programs or using peripherals. There's also a group that can make you the Merlin of the REM statement, and a few slick one-liners. Altogether, a *most* interesting group.

The final results are in from *RUN*'s premiere issue—MAGIC inspired 330 pieces of correspondence, containing a hundred publishable tricks! And subsequent issues have had even better response. We're trying to print as many of your tricks as possible, within the limits of time and space.

Trick selection is based on usefulness, originality and length (the shorter the better), and we typically pay $5–$10 per trick. The really *super* ones get $20 and up. If your own ambitions include word sorcery, send an SASE for our Trick Writer's Guide.

**$43** BURROW, MK II—C-64 owners who enjoyed BURROW, our very first trick, will like this one. Put a joystick in control port 2, then run the program. Don't use the button. Do press the color keys.

```
1 GETK$:PRINT"[space][crsr lf]"K$MID$("[crsr rt][crsr dn][crsr up]
[2 crsr rt][3 rvs on][crsr lf][crsr dn][crsr up][2 crsr lf][4 rvs on][crsr dn]
[crsr up][3 rvs on]",2*PEEK(56320)-233,2)"*[crsr lf]";:GOTO1
```

**Carl Onsgard**
**Green Bay, WI**

**$44** Amusing your friends—Non-computerists who come to see my VIC always expect me to program to their specifications with just a few taps of the keys. So I always look for programs that are simple to type, yet impressive to use, to satisfy my visitors until their interest is genuinely aroused.

Here's a two-line program that turns my VIC into a rudimentary organ. It gets people's attention, so I can take them step-by-step into more time-consuming programming techniques. After I arouse their initial interest with this little trick, visitors never complain about the time it takes to write a program:

```
1 POKE 36878,15 : A=PEEK(197) : IF A=64 THEN 1
2 POKE 36876,A+170 : GOTO 1
```

To use the organ, just press any key. Stop/Restore turns off the sound when you no longer want to hear it.

**Tony Giordano**
**Brooklyn, NY**

**$45** Typing tip—It's common to find several identical lines within a program. There's an easy shortcut to typing them in. Say you're entering a program in which lines 30 and 70 are the same. Once you've typed in line 30, move the cursor over to the 3 in line number 30. Now simply change the 3 to a 7 and press the return key. You've just entered line 70 without destroying 30. Type LIST and see.

This technique can also be used to simplify the entering of lines that are similar but not identical. Instead of just changing the line number, change whatever makes the lines different, then press the return key.

**Randy Thompson**
**Eugene, OR**

**$46** Escaping from Quote mode—Trick $04 gave some suggestions for breaking out of the Quote mode, which you enter after using the insert key. (In the Quote mode, the cursor control keys don't work as you'd often like them to.)

Another way out is to use your space bar to fill the inserted holes with space characters. Then you can type, delete and move your cursor to your heart's content.

**Roberta London**
**Houghton, MI**

**$47** RVS hint—Whenever you press RVS on and want to shut it off, you can press Return instead of pressing RVS off.

**Erik McMenamin**
**New Haven, CT**

**$48** Printing quotes—The trick for putting quotation marks around a word is simple once you look at it:

```
10 PRINT CHR$(34) "BARTLETT" CHR$(34)
```

**John Ouverson**
**Madison, SD**

**$49** Data statements—When entering a zero in a Data statement, you can leave its place blank, and save a little memory and screen space. For example:

```
10 DATA 5,17,0,32
```

would look like

```
10 DATA 5,17,,32
```

When the computer reads the second line, it will put a zero where there is nothing between the commas.

**Mathew Stephen**
**Chadron, NE**

**$4A** Line numbering hint—If you have ever accidentally erased line 2 of a program you are typing, because you fumble when you are typing a quotation mark or W, here's a simple solution: stop using 2 as a line number!

**David E. Amos**
**Folsom, WV**

**$4B** Naming programs—Here are some hints for naming your programs in useful and/or interesting ways.

When developing and saving a program, it's frequently useful to make the date and time when you saved it a part of the program's name. Using the military style 05291252 takes only eight characters to say 12:52 PM, May 29. Since program names can be up to 16 characters, you have eight left for identifying the program itself.

Along the same lines, you can automate things a bit by using

```
SAVE"PROGNAME"+TI$
```

which will append the value of TI$ to your name. Here you have to be careful that the name+TI$ is 16 characters or fewer, and that resets of TI$ don't confuse you. TI$ is reset by turning on the computer, by using a reset button and by setting TI.

When saving to tape, you can include cursor controls, RVS on and off, color keys and so on as part of your program's name. The effect can be exciting, but whenever you're loading the program by name, you must include the special symbols.

When saving a machine language program, make its SYS

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call a part of its name. That way, when you see MONITOR 828 on a directory or elsewhere, you'll know in a flash that it's an ML program, and that it's called with a SYS828.

**L.F.S.**

**$4C** Magic names—When you save a program to disk or tape, save the name of the program with a CHR$ code:

```
SAVE CHR$(0)+"programname",8
```

Now the program can only be loaded with the CHR$ code. Note the unusual way the program's name is saved in the disk directory.

**Bart van Baren**
**Wageningen, The Netherlands**

**$4D** Naming programs—You can make your program lock the computer into lowercase mode by saving it on tape as follows:

```
A$=CHR$(14)+CHR$(8)+"program name" : SAVE A$
```

Replacing the 14 with a 142 will lock the computer into the Graphics mode. Deleting the CHR$(8) will put the computer into either mode, but the user will be able to switch modes by using the shift and Commodore keys.

**E.L. Hayno**
**Pensacola, FL**

**$4E** Cassette saves—Do you want to add a little color to the name of your program? When you save it, make one or more color keys part of the program's name. For example:

```
SAVE "[rvs][grn]N[red]A[pur]M[blu]E"
```

Each color key counts as one of the name's 16 maximum characters.

**Joon S. Paik**
**New York, NY**

**$4F** Tape save tip—To save time when making more than one copy of a program, try this: Clear the screen, then execute the Save and Verify commands as usual, with the Verify command on the line immediately below the word READY after saving.

For successive copies, place the cursor over the initial Save command, then press CTRL and a color that is different from the one printed on the screen. When you press the return key, the PRESS RECORD... prompt will change to the new color. When the save is complete, READY will change to the new color, and the cursor will appear on the Verify command, again in the new color. Now rewind and press Return; your program will verify with no further typing.

An occasional glance, even from across the room, will tell you whether your computer is saving, verifying, or if it needs your attention. The same technique can be used for loading and saving a series of programs on the same tape.

**Marie E. Coon**
**Bothell, WA**

**$50** Cassette loading—Most of us know that to load machine language from cassette, we must use the LOAD"name",1,1 format, with the name optional. The second "1" tells the computer to load the program into the address range from which it was originally saved. But lots of us *don't* know that there's a case where the second 1 can be omitted. Tapes made using the form SAVE"name",1,1 will *always* load back into their original addresses, regardless of the Load command that is used.

**William King**
**Detroit, MI**

**$51** Cassette directory—To get a list of all the programs on a tape, enter LOAD"X*X*X" (or some similar bizarre name). As long as the string is not the name of anything on your tape, the computer will search for it forever, printing out the name of each program it finds on the way.

**David Lonard**
**Edinburg, TX**

**$52** Write protection—The write-protect tabs used on disks make ideal write-enable tabs for cassettes! After you've broken the tab out of a cassette, you must tape over the hole before recording on it again. The disk tabs are just the right size for the job, and a sheet of them comes with every box of disks. Ask a disk-owning friend to let you have some.

**L.F.S.**

**$53** Disk directory—It's very useful to tape a printed copy of the directory to the disk's protective envelope. The following simple direct-mode sequence will print it for you.

```
LOAD"$",8:OPEN4,4:CMD4:LIST
```

When the printing is done, enter this to clear the printer:

```
PRINT#4:CLOSE4
```

Remember, ?# is *not* an acceptable abbreviation for PRINT#—if you use abbreviations, the proper one is P shift R.

**Travis Stansbury**
**Oakridge, OR**

**$54** Disk loading tip—If you have a Datassette on your VIC or C-64, you probably know you can type shifted Run/Stop to load and run the next program on the tape. Disk users, believe it or not, can take advantage of this, too. Type (don't hit Return yet):

```
LOAD"program name",8:
```

Now press shifted Run/Stop, and the computer will load your program and automatically run it!

**Marcus Featherston**
**Fairdealing, MO**

**$55** Closing files—Leaving open files can be disastrous, and it often happens when your program crashes unexpectedly. You're never sure *which* files are open, and going through a list of Close statements can be the ultimate in tedium. SYS65511 closes all open files automatically and easily.

**Kenneth H. Stroebel**
**Murrysville, PA**

**$56** Disk drive crash test—The 1541 disk drive has a habit of occasionally locking up in the middle of an operation. When you are loading or saving a long program, you often don't know if the operation is still going on, or if your

*(continued on p. 146)*



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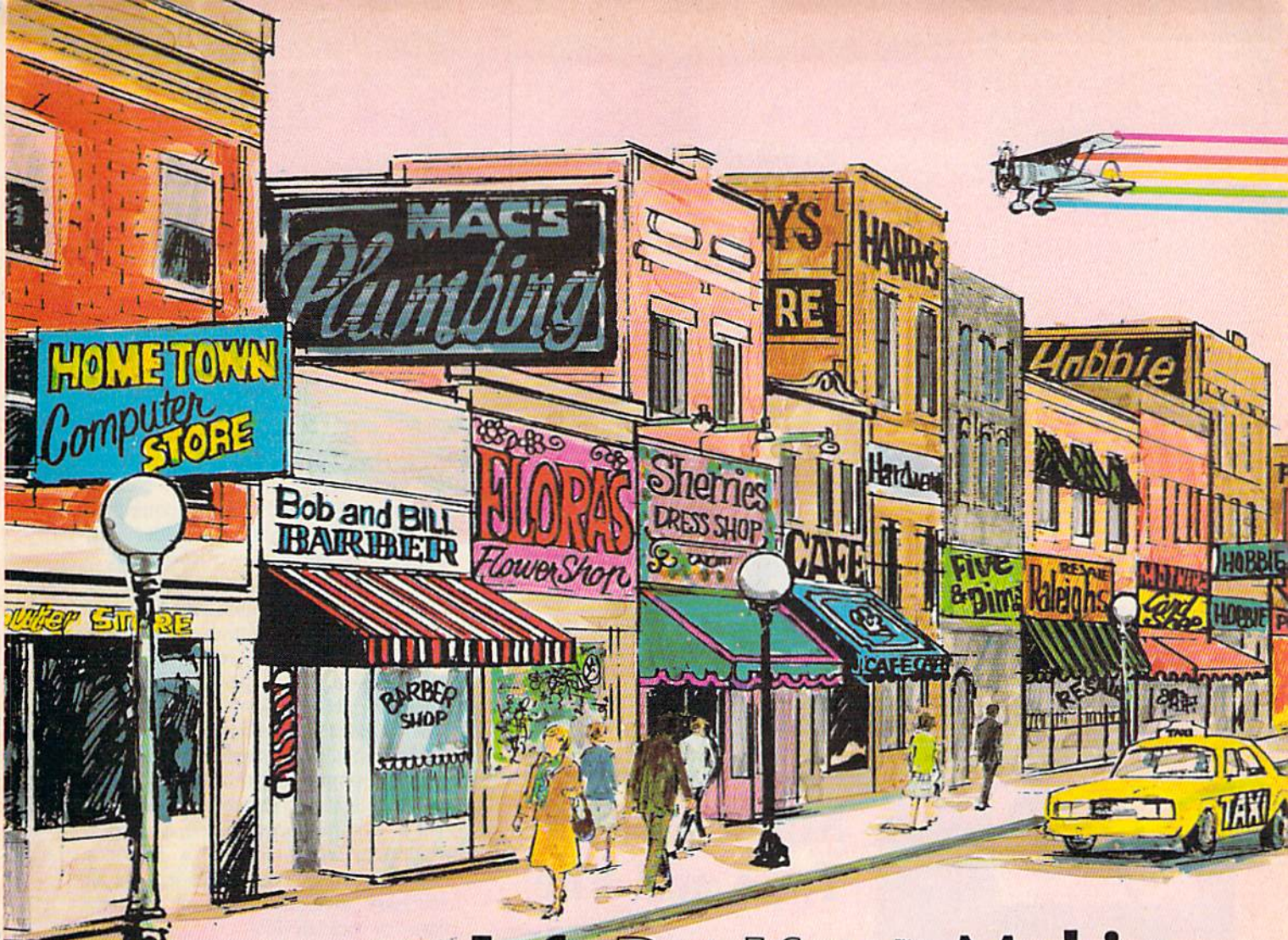


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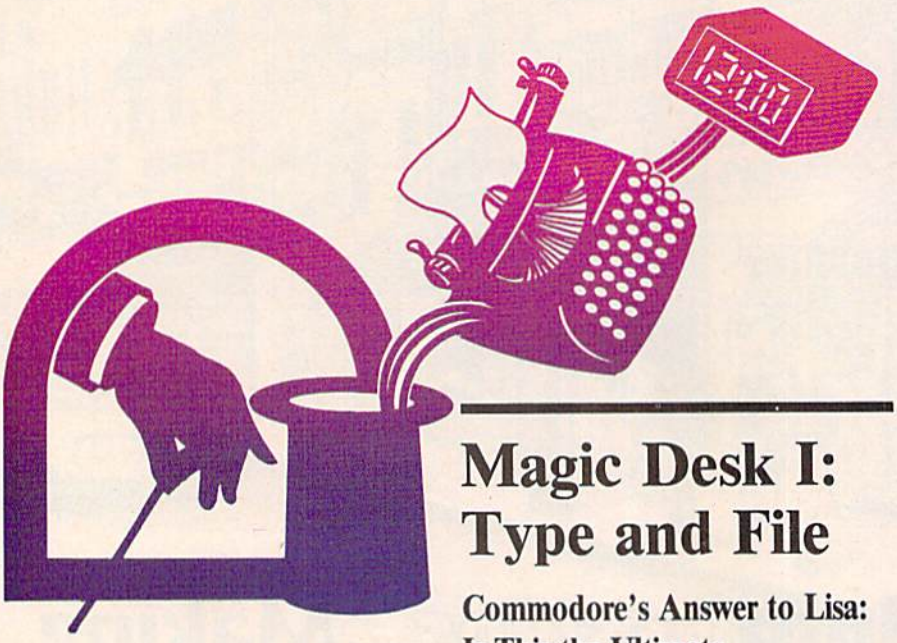
# Software Gallery

Compiled by Shawn Laflamme



## Magic Desk I: Type and File

### Commodore's Answer to Lisa: Is This the Ultimate In Friendly Software?

B

When the Apple Computer Company released its expensive Lisa, with "icons" representing the various functions that it could perform (e.g., file cabinet, scratch pad, wastebasket), few of us would have predicted the number of Lisa look-alikes appearing on much more inexpensive machines. Commodore's new entry into the Lisa look-alike contest, Magic Desk I: Type and File (Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380. $71.95), might be a good piece of software for technophobes.

In fact, in its typing mode it is such a good simulation of a typewriter that it includes both the good and bad features of that machine. Whereas most word processing packages for home computers manage to overcome at least some of the typewriter's drawbacks, Magic Desk I offers you little in the way of improvement over an electric typewriter. For the beginning computer user, however, it has some redeeming features that are worthy of comment.

Magic Desk I is a cartridge to be inserted into the Commodore 64's cartridge slot. Documentation, which consists of a six-sided reference card, instructs you in a step-by-step manner regarding set-up. For full usage of Magic Desk I's functions, you need the Commodore 64, a single disk drive, a printer (Commodore or one with an interface to adapt to printer commands as sent to Commodore printers), a joystick or desktop controller and a TV or a monitor. Set-up instructions include all necessary information about connections for these devices.

A novice should be able to use Magic Desk I and peripherals by consulting the reference card alone, as the program even contains the facility for initializing one's first disk. The reference card does not tell you that some of Magic Desk I's capabilities may be utilized without all of the peripherals. (Specifically, you may use Magic Desk's typewriter function without a printer or disk drive connected, if you wish.)

The screen display shows an office desk, complete with a digital clock, a typewriter, a wastebasket and a nearby file cabinet. Several other objects appear on the desk (a calculator, a rolodex file, a checkbook or wallet), but these are not functional in Magic Desk I. (Shades of things to come, perhaps?)

You select the function to be performed by moving a representation of a pointing finger with your joystick to the object desired (to the clock, for example, if you wish to set the clock; to the typewriter to compose a document). I have an Atari joystick, and I found it very difficult, at first, to properly position the pointing finger at the place necessary to make the program respond.

### Report Card

**A—Superb!**
An exceptional program that outshines all others.

**B—Very Good.**
One of the better programs available in its category. A worthy addition to your software library.

**C—Good.**
Lives up to its billing. No hassles, headaches or disappointments here.

**D—Mediocre.**
There are some problems with this program. There are better on the market.

**E—Poor.**
Substandard, with many problems. Should be deep-sixed!



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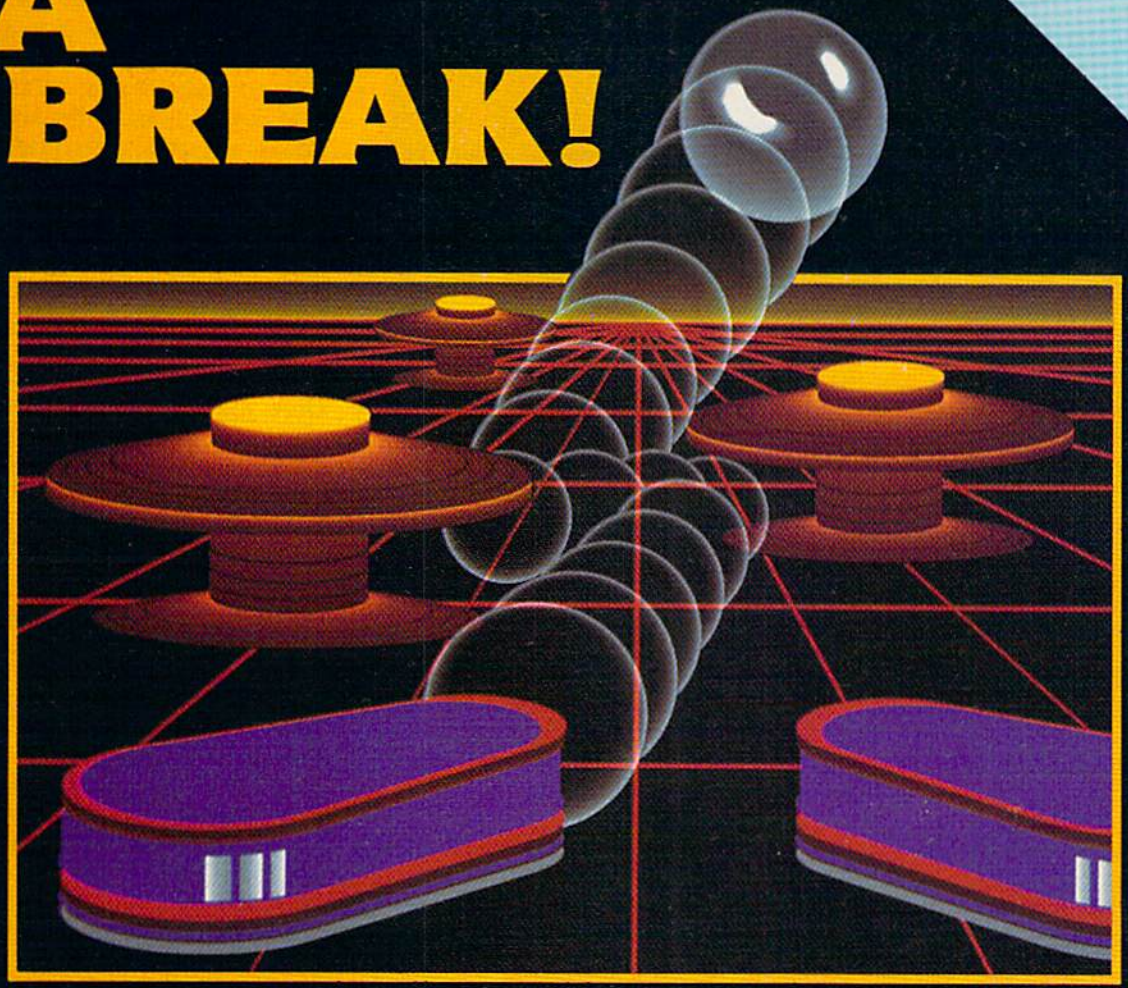
# TAKE A BREAK!

For Commodore 64



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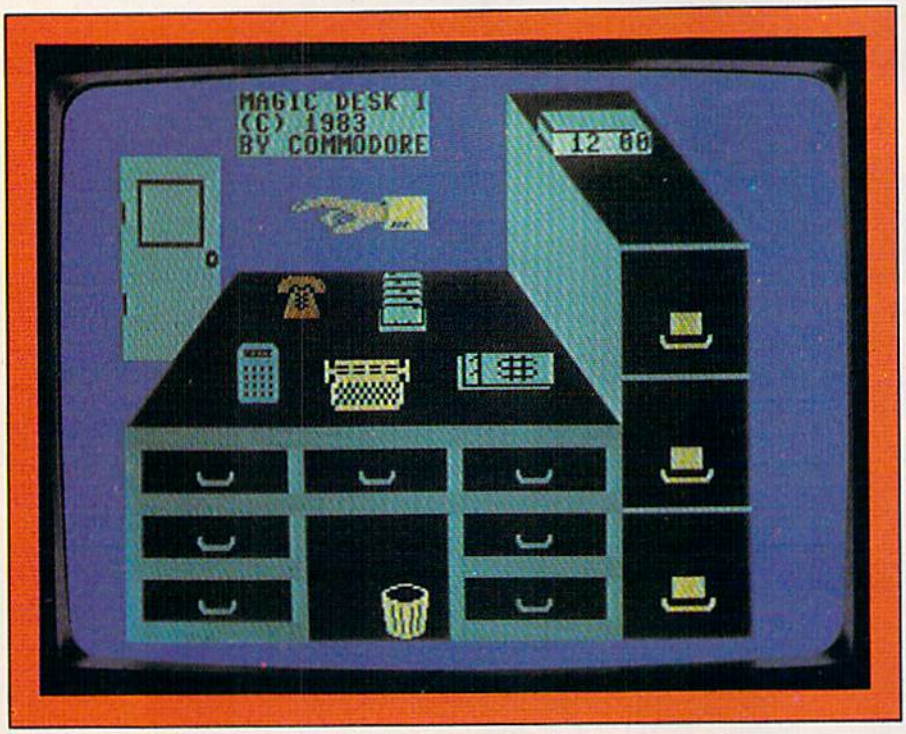
*Move the pointing finger to select the function to be performed.*




Trial and error and practice improved my ability to make the pointing finger stop where I wanted it.

In order to give you the feel of using Magic Desk I, I'll describe a typical session. After turning on the peripherals and the computer, the desk appears. You can set the clock, if desired, by pointing to it, pressing the fire button (which places a highlighted box around the clock), and entering the time from the keyboard. To leave the clock, you must press the Fire button again. The highlighted box disappears and the pointing finger is free to move again. This procedure of pointing at the symbol desired, pressing the fire button to begin, and pressing the fire button again to exit is a standard set of procedures with Magic Desk I.

**The Typewriter**

To type, the pointing finger is aimed at the typewriter, the fire button is pushed, and almost instantly one is greeted by a screen display showing a piece of white paper emerging from the top of what looks like a typewriter platen, complete with margin stops and a paper scale. Below the page image are several symbols: a printer, the typewriter (highlighted), the wastebasket and margin settings. When you begin, the margins are automatically set at 10 and 70 and the typewriter is ready to type on the top line.

If you wish to start down the page a bit, the return key will advance the paper one line. The paper can also be moved by the cursor keys or the joystick. Any key pressed will appear on the "paper" as the key is struck, and a realistic "tick" noise is sounded after each keystroke. The first surprise, for one accustomed to word processors, is that, as you type, the carriage actually appears to move one space to the left. Also, five spaces before the right margin stop, a bell rings, just like a real typewriter! Tabs may be set and removed using some of the special function keys, and one key (F1) is used for a margin release key.

When reaching the end of the line, you must hit the return key (no word wrap) and the screen display whizzes by, simulating the actual carriage return on a typewriter. As you may note, this is a very accurate simulation of a typewriter—including features such as the carriage return, which I was glad to be rid of when I graduated from a typewriter to a word processor. For some individuals, there may be advantages—there would be little or no adjustment necessary for one accustomed to typing.

On the other hand, for an individual accustomed to the features of more powerful word processors, there are many trade-offs: once typed there is no way to change the format, such as changing margins or switching from single- to double-spacing after the material is entered; mistakes can only be corrected by returning to the spot where the mistake was made and typing over it; no insertion feature; no find and replace feature; and no capability to move lines or paragraphs. In sum, the typewriter portion of Magic Desk I gives you the features of a fairly good electric typewriter—no more, no less.

The joystick allows some interesting viewing of the printed page, however. Once you have typed something, you may move around the page with the cursor keys or with the joystick. This is a nice feature which I found useful for quick review of page layout and proofreading.

You're allowed to enter approximately 60 lines of text before coming to the bottom of the "page." This is not mentioned anywhere on the reference card, but the typing function simply locks up at this point, and you must either print the material, save it or toss it in the wastebasket before going further.

In order to print, you must press the fire button once to exit typing, move the pointing finger to the printer symbol, press the fire button again and the printer will be highlighted. Then you must check to see if the printer is on, press the fire button, and the printing will begin immediately. When it has finished, control will return to the screen for your next step.

During any of these procedures, the reference card tells you that there are Help screens available. These are accessed by pressing the Commodore key while in any function. I found the Help screens little or no help. Material included was sketchy and contained information identical to that on the reference card.

**The File Cabinet**

Once you've printed a piece of material, you can toss it away or save it in a file. To save a page, you point the finger at the desk to return to the opening screen. Once at the desk, you use the finger to select a file drawer. When you've selected the file drawer, the screen image changes to a representation of the disk drive with a message indicating that file handling is taking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place and that you must wait.

If you haven't initialized the disk, messages will appear informing you that disk initialization has to be done. Magic Desk I handles initialization smoothly, asking you to respond only once (to be sure that the disk is supposed to be initialized).

Once the disk is initialized, you select a file drawer, and the next image is a bank of ten file folders. You can wade through the folders using the joystick and select any one of the ten. Once a folder is selected, you can file your page on any of ten spaces in the selected folder. Folders may be labeled by typing from the keyboard, and pages may be labeled also. Once a page is labeled, you must move the finger to a symbol of a disk and press the fire button. This records the text file to disk.

A nice feature of the filing portion of the program is the capability to view any filed page, while remaining in the file cabinet "area." This could be particularly useful if you have forgotten what is filed in a given folder or on a given page.

From the subtitle of the package, I had assumed, incorrectly, that Magic Desk I: Type and File was an integrated word processing/data management cartridge. The filing portion of the program simply allows you to save text files to disk, without any of the sorting or retrieval functions of typical data management systems.

Again, as with the typing portion of Magic Desk I, this simulation of filing in a file cabinet might be unthreatening to a person accustomed to file cabinets, folders and pages; however, to a person accustomed to the fairly simple procedures of naming text files and requesting that they be saved, this procedure seems cumbersome. Magic Desk I's philosophy seems to be that of eliminating any procedures common to the microcomputer and supplanting them with procedures already known by individuals in the world of work.

**The Wastebasket**

Magic Desk I's wastebasket is used to erase text already entered. To delete a page, you must first access it (either by having just typed it or by retrieving it from a file), and then move the finger over the basket. You then press the fire button once the paper is hovering over the basket. The program gives you a second chance to reconsider; the page will not drop in until you press the fire button again. A noise that resembles the dropping of a metal object in a can sounds as the paper drops into oblivion!

**Summary**

Magic Desk I: Type and File will convert your Commodore 64 into a fairly good electric typewriter with a memory. For an individual who wishes to sit right down at the computer and type a letter or memo, print it or save it without the trouble of reading the disk drive manual or other long pieces of documentation, the Magic Desk cartridge might be a good buy. The Commodore 64 as a typewriter has a good "feel."

Magic Desk I, however, does not have many of the features that individuals have come to expect as part of a word processing program. You'll have to weigh these limitations against ease of use if you're considering the addition of Magic Desk I to your software library.

**M.C. Ware**
**Homer, NY**

*Magic Desk I converts your C-64 into a typewriter with memory.*

# Drol

## An Evil Witch Doctor Is Your Nemesis in This Zany World Of Fantasy and Illusion

I've had enough of this world—it's driving me crazy. I'll just slide this C-64 disk into the tiny door of my 1541 disk drive and see where it takes me....

Hey! Where am I? What do you mean I'm here to perform rescue missions? I was looking for a...aargh! A flying turkey's heading straight for me! Oh no, what have I gotten myself into this time?

Into Drol's dream world, my dear, which might very well be *your* nightmare.

The multi-leveled ruins of a lost civilization are Drol's dream world. A girl and her pet lizard and a boy and his pet crocodile wander, aimlessly and obliviously, through the scrolling corridors; their mother sits, bound, at the bottom of the ruins.

You're the only one who can bring them back to reality and save them from the evil witch doctor—in order to move from one level of play to the next, you must perform a rescue mission.

You must rescue the girl and her pet lizard on the first level, the boy and his pet crocodile on the second level and the mother on the third level. Although there are more than three levels of play, each more challenging than the preceding one, you must repeat these rescue missions.

But is that the only reason you're in Drol's dream world? Do you just want to rescue this cute little family and get out, or do you want to rack up a high score by shooting flying turkeys into roasters, destroying hopping scorpions, outsmarting a clever witch doctor and dodging honking vacuum cleaners, to name a few of your tasks?

After all, not only do you have five lives (and can gain more), but you're wearing a trance-resistant, anti-gravity suit, and you're armed with an unlimited supply of reality pellets, with which you can, if you're fast enough, disintegrate whatever's zinging, flapping or hopping towards you. And everything you shoot is worth a certain amount of points, so why not play a little while you work?

You can move back and forth, on ground and above ground and from one level to the next.

The wide-screen radarscope at the top of the screen lets you see yourself in relation to everything and everyone else in the ruins. Scanning the scope and then watching the screen requires tremendous eye-hand coordination and gives you quite a workout.

For instance, you are on the third level of the ruins. Checking the radarscope, you see that the flying turkey and the girl are moving on the level below you, and that a group of scorpions are coming towards you from the left side of the screen.

Quickly, you move toward the scorpions and disintegrate them with your reality pellets. You then descend a level and try to shoot the flying turkey (which you must shoot at continuously and

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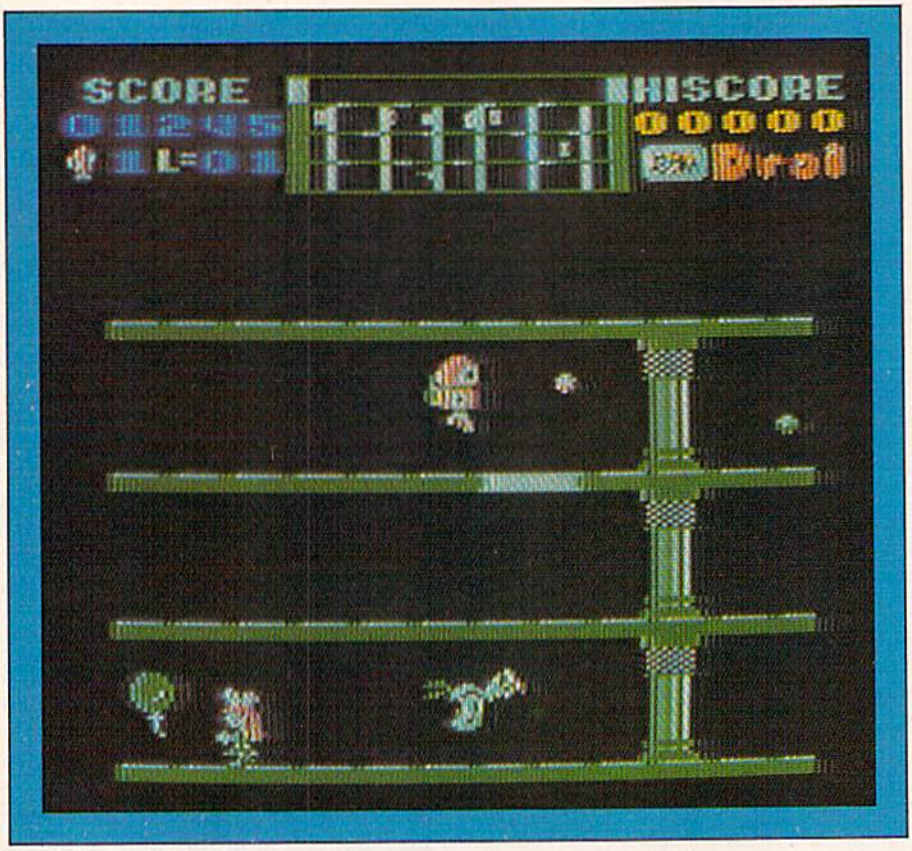
*The flying turkey turns into a roaster when you hit it—an amusing transformation!*




from above ground).

The flying turkey turns into a roaster when you hit it (an amusing transformation) and you must then eat the roaster (simply run into it) to gain 500 points.

You might become so preoccupied with fighting and gaining points that you forget about the little girl and accidentally bump into (save) her. If, when this happens, you've already saved the lizard, you may consider your move to the second level of play as untimely.

Perhaps you wanted to first gain 4000 points and contend with the small, green, honking vacuum cleaners over which you must leap, or with fighting the scorpions, which at this point begin shooting at you. (The more points you accumulate, the more difficult it is to survive.) If the going gets too tough, you'll have to try and make a quick rescue so you can move to the next level of play. (Hey, who's saving who here?)

Each level of play presents an increasingly challenging scenario—monsters and a witch doctor on the second level; swords, knives and serpents on the third level. And if you don't zap them, they'll zap you.

I didn't get beyond the third level (I couldn't save the mother), but my friend, who's been there (and back), shared his experience with me. When you save the mother, you're presented with a victory cartoon. But that's not the end of the game, so don't expect any relief. You have to perform your initial rescue again, only now it's almost impossible to succeed.

My friend quickly lost his last life before he could gain further knowledge, so if you want to know more, you'll have to fight for yourself.

The game's graphics are humorous and detailed. A propeller is attached to the little boy's beanie; the little girl carries a balloon (worth 300 points if you shoot it); the wizard wears a crazed expression as he waves his arms back and forth; the creatures are colorful.

As for the game's sound, the flapping of the turkey's wings and the honking of the vacuum cleaners are especially good.

The game features a permanent scoreboard, which records on disk the top five scores, and a pause feature, which allows you to stop the game's action and catch your breath.

The game's only negative feature involves the length of time it takes to load between play levels (about 30 seconds). According to the game's brief documentation, this is due to the large amount of graphics data required. Also, the 1541 isn't the fastest disk drive around. You might find this pause to be a welcome rest, but I'd rather decide myself when I need a rest by pressing the run/stop key.

Compared to other games I've seen, Drol is outstanding. It is also, admittedly, a rather violent game, but, like popular cartoons, the violence lacks a certain seriousness. Obliteration is temporary; your attackers always return.

For those of you with a goodly supply of energy and alertness, you should find Drol to be fun, funny and exciting. And if we must play, it's best to play something playful.

Hats off to Aik Beng, the game's creator, and to Broderbund Software, Inc. (17 Paul Drive, San Raphael, CA 94903. $34.95) for publishing a game worthy of publication.

**Marilyn Annucci**
***RUN* staff**

# Disk Directory Manager

## Here's a Handy Utility For the Frustrated Disk Drive Owner

After a few months of use, most disk drive owners have accumulated hundreds of files on numerous disks, and often experience great difficulty in locating any particular file. Catalog programs that read and sort disk directories generally require two disk drives. Disk Directory Manager (Bytes and Bits, 524 E. Canterbury Lane, Phoenix, AZ 85022. $19.95) is an automatic catalog program for the Commodore 64 and the VIC-20 that requires only a single 1541 or 1540 drive. This program goes a considerable way toward resolving a source of frustration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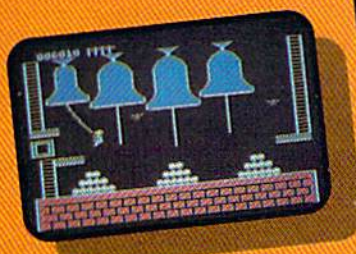
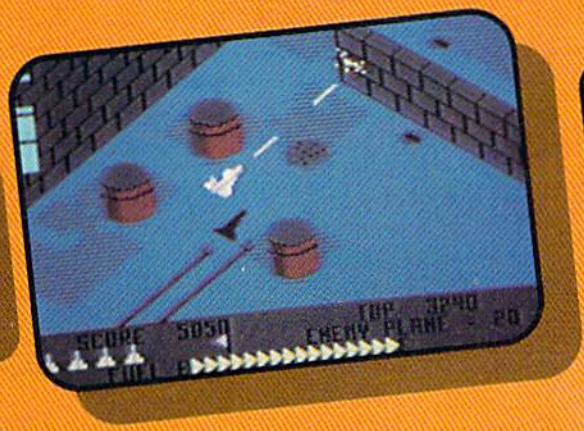
# ZAXXON FOR THE C-64!





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Commodore 64 disk & cassette

### ZAXXON

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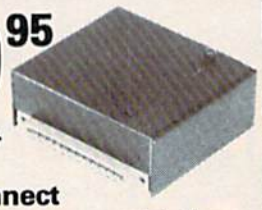

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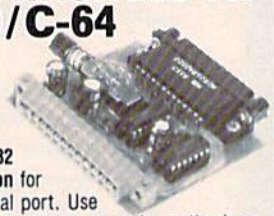

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for most disk drive owners.

The Disk Directory Manager consists of two programs with a total length of only 4K. The programs are written entirely in machine language, and are stored in upper memory. The entire area of RAM accessible for Basic programs is available for storing the master directory. The number of characters stored per record is 24; this includes 16 for the filename, 3 for the file type (PRG, SEQ, REL, or USR), 3 for the file size in blocks, and 2 for the disk ID.

Thus, a total of 1556 records can be stored and sorted at once on the C-64. You can catalog up to 1047 records on a VIC-20. (With a VIC, you'll need at least 16K of memory expansion to use this program.) A maximum of 1000 records or so is no limitation in practice, since you may want to have different catalogs for word processing files, educational programs, games and so on.

The instructions consist of two lengthy sheets that are quite adequate for this easy-to-use, menu-driven program. Only two keystrokes are required to read each disk directory into the computer. Sorting into the master directory is done as soon as each disk directory is loaded. The sorting procedure is extraordinarily fast, taking a second or less. Thus, you can easily process five disks in a minute. The total number of records in the master directory at any point is displayed under the menu, and a bar graph shows the percentage of available memory filled.

You can obtain a printout of the master directory on any Commodore printer or parallel printer daisy-chained off the disk drive. The printout format is easy to read at a glance, consisting of four columns: Disk ID, Filename, Type of File and Number of Blocks (file length). A new page with headings starts automatically after 55 records. All records are listed in alphabetical order by filename. The printout makes it a snap to determine where (or whether) you have backup copies of programs or data files, or whether you have too many copies of any particular file.

A start-over command on the menu is convenient if you want to begin a new catalog for a different set of disks, or catalog all the files on each disk in alphabetical order. Because of the almost instantaneous sorting, a library of dozens of disks can be read, sorted and printed in less than half an hour.

I found the Disk Directory Manager to be completely bug-free. However, it does have some shortcomings. Perhaps the most serious drawback is that it has no display on the printout or the screen of the number of blocks free on each disk. This feature could have been added with the additional information using less than 1K of memory, even for several dozen disks in one catalog.

Another drawback is that the program does not allow saving the master directory to disk so that it can be loaded and easily updated when the contents of only a few disks are changed. Also, there is no provision to obtain separate listings of programs (PRG) or data files.

Despite the limitations discussed above, the Disk Directory Manager is a fast, easy-to-use utility that will undoubtedly prove invaluable to any 1541 or 1540 owner with hundreds of disk files. In view of its modest price and the requirement for only a single disk drive, I highly recommend it.

**D.L. Jassby**
**Princeton, NJ**

# Personal Finance Forecaster

## If You're Not Walking On Easy Street, Let This Program Take You a Step Closer

Many computer enthusiasts are just discovering that their machines can be very useful beyond the realm of games. When they arrive at the knowledge that these marvelous micros can be used for home financial applications, software such as the Personal Finance Forecaster (Xana Data Systems, 3427 12th St., N.E., Calgary, Alberta, Canada T2E 6S6. $99.95) will be waiting for them.

The program package for the Commodore 64 includes a user's manual, the master disk, a working copy, and a Xana Security Key (used to protect your data).

The 120-page manual starts off with the basics: a summary of budget items, keystroke commands, a summary of letter codes, abbreviation for display



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and the program flowchart. Most likely you'll come back to these pages after consulting the next section, entitled Preliminary Operations.

The general information section gives you an idea of the program's potential. It states that the purpose of the program is to allow for a personalizing of your budget and finances in a flexible manner. It was designed to allow you to learn about your financial situation through the preparation, revision and reviewing of your budget projections.

After placing the security key in the Port 2 slot, you must connect the printer, put the working copy disk in your drive and power up. Then, you're ready to go.

Entering data is a smooth operation. The program is very resistant to typographical errors.

It is assumed that you have read the manual, as the program gives no on-screen feedback about errors.

All feedback on operations is in the manual. Upon reading and discovering the program's idiosyncrasies, I found that running the program eventually became easier. A lot of trial and error, reading and practice may be necessary to help you understand the program's style. Also, the figures in the manual are very helpful.

*Forecaster lets you personalize your budget and finances in a flexible manner.*

The manual recommends that you accumulate your budget items. These can be arranged on a sheet, which can be printed out from the disk. The chapter that deals with this is only one page long. A more detailed treatment would be preferable, and a short primer for those unaccustomed to accounting jargon would be a useful aid. Novices may have to read certain parts several times to understand the contents. However, a little perseverance pays off.

The program allows for budget projections with more than one salary; it can also accommodate changes in income over a period of time. Information normally needed in forecasting and budgeting is taken into consideration: interest, investments, loans, assets, bank accounts, household expenses, additional financial data and miscellaneous information (travel, gifts, etc.). Entering data is easy. The main drawback in this part of the program is that you cannot easily skip over the parts where you do not want to enter data. Revision of each section is allowed, but you must go through the whole section to correct a single part of it.

Finally, the program requests information about the inflation rate. The data can then be printed out and displayed and/or stored. Best of all, the data can be quickly plotted and graphed in a brilliantly colored chart. Each color represents a different part of the data. These line and bar charts give you a good visual idea of your financial status.

Data, in the form of different colors, can be combined or split up to produce a display of your financial status for each month. This showed great flexibili-

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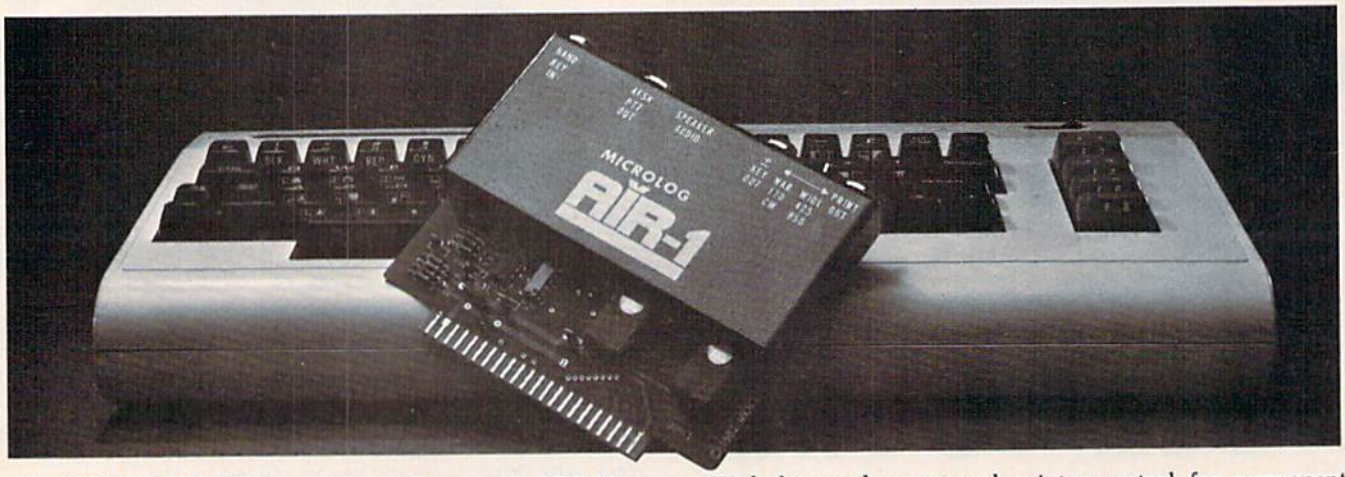


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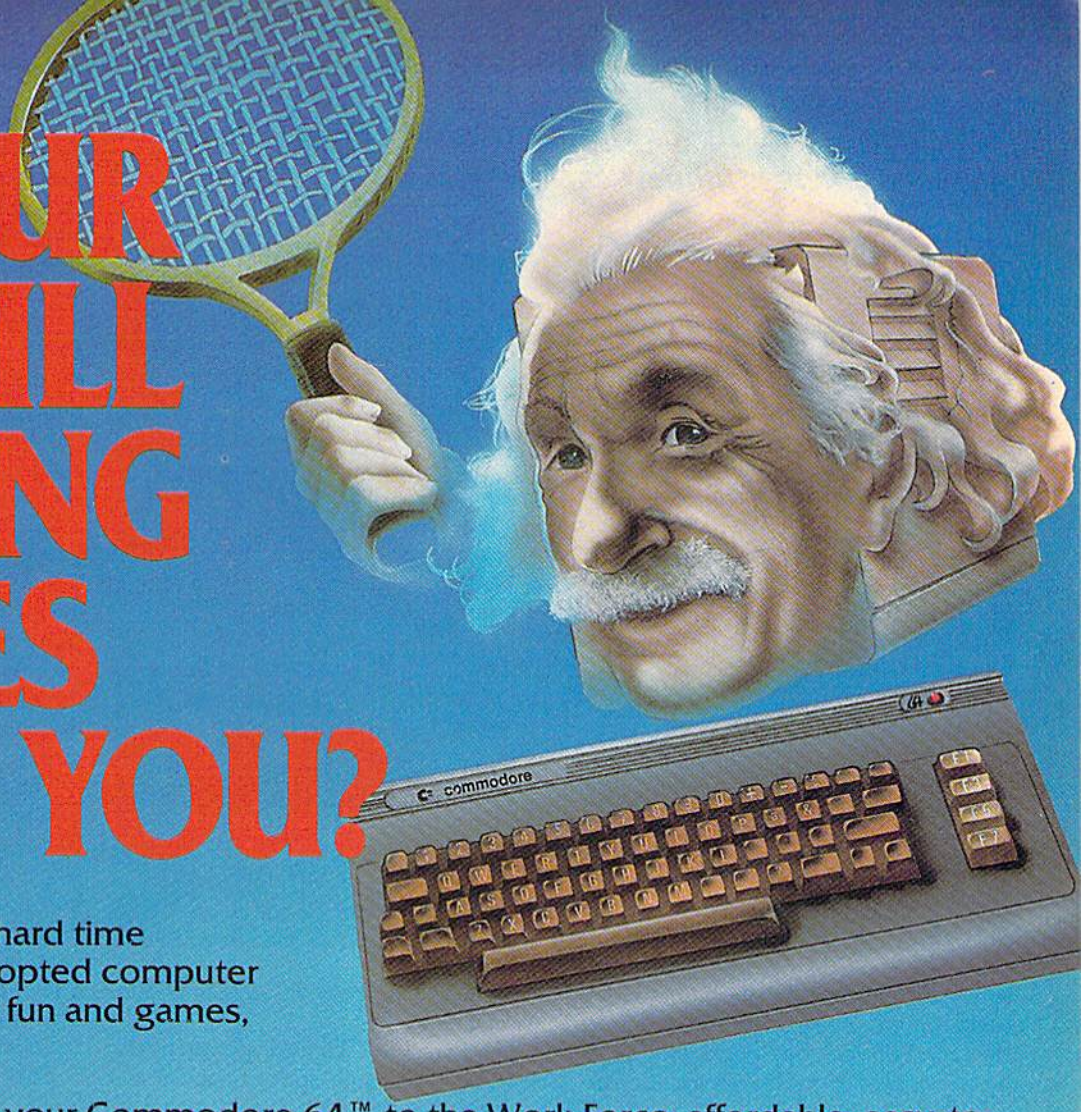


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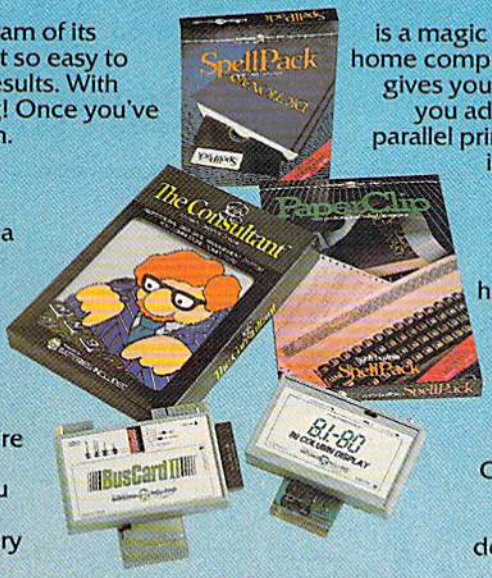


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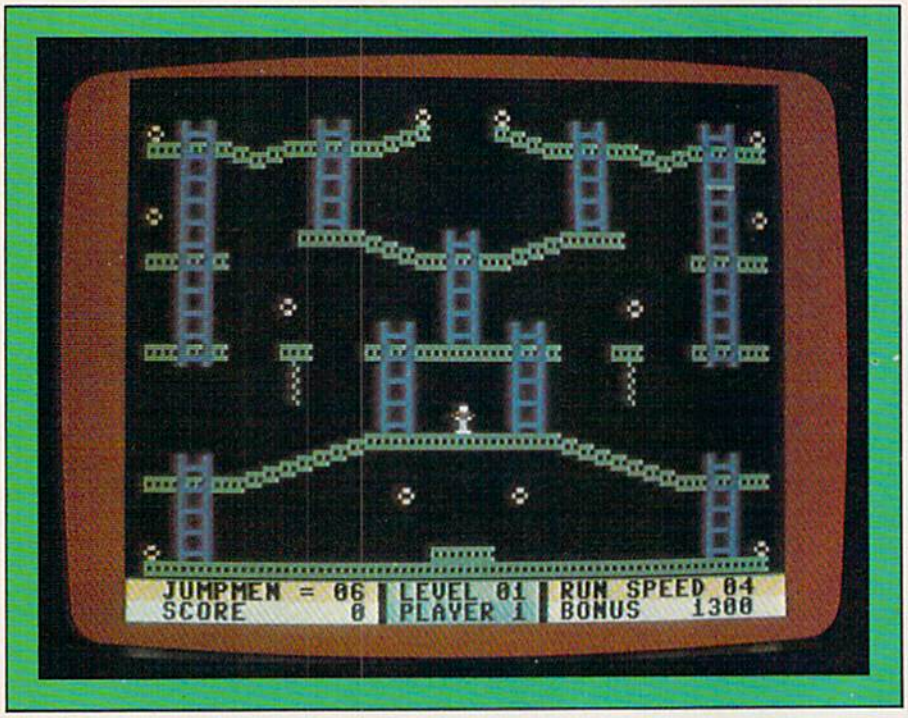
*Jumpman offers 30 games for the price of one! Each screen is a delightful new challenge.*




ty on the part of the program. However, it took a few minutes for me to figure out the arduous sequence of commands needed to produce a display similar to that in the manual.

A forecast of the changes in your cash balance, over a series of months, can also be generated. This can be used as a simulation, for the purpose of studying future possibilities of budgeting and finance.

Not being an accountant, I was eager to see what I could do with this program. It took me about 40 minutes to read through and progress to the end of data entry. About 20 minutes later, I was able to graph the data on the screen and print out the data.

The on-screen graphic displays are the best feature of the program. On seeing the graphs, you begin to truly appreciate one of the most impressive capabilities of your computer: the ability to calculate, project and display numbers visually.

Most adults, and possibly older children, could master this program in time. The manual is lacking in some respects. Charts, with lists of commands, would have been very helpful in learning the program's operations. An index would have been a nice touch, too.

The program is user-friendly to a great extent. You just have to persevere through the accounting jargon in the manual.

The Personal Finance Forecaster was designed to be a complete financial assistance program. However, it may not be flexible enough to meet all of your needs. If so, you may prefer a sophisticated spreadsheet program that can be tailored to meet your personal needs.

However, for the price, the Personal Finance Forecaster may be just what you are looking for.

**Eric Flescher**
**Lawrence, KS**

# Jumpman

## Thirty Different Screens Packed with Arcade Action... Jumpin' Jupiter!

How good is Jumpman? A friend of mine says he is going to buy a Commodore 64 just so he can play it. That may be a bit extreme, but if you already own your computer, this is a recommended purchase!

Jumpman is a machine language, arcade-style game that falls into the running-jumping-climbing category, along with games such as Donkey Kong and Miner 2049er. But with its 30 different screens, it outshines all the others.

However, an abundance of screens is no guarantee of high quality. The 30 screens could be uninspired variations of one theme, and the mechanics of play could be downright dull. Not so in this case. Each screen is a delightful new challenge. In effect, you have 30 different arcade games for the price of one!

In your role as Jupiter Jumpman, you have seven lives when the game starts. You'll need them. Your task is to defuse the various bombs found in all thirty levels. This is done by running over them or jumping up and catching them. In addition to running and jumping, you can also climb, and in certain screens, shoot bullets or throw spears.

The game is set against a background of steel girders, ladders and ropes. Parts of the girders can disappear or appear while you are playing. And against this background, a variety of hazards appear: bullets, robots, dragons, vampire bats, bombs and flying saucers to name a few. Each of the 30 screens has a distinct theme utilizing one or more of these hazards.

The 30 screens are divided into three levels. Screens 1–8 comprise the beginner level, 9–18 is the intermediate level, and 19–30 is the advanced level. When you begin Jumpman, you must choose a level: beginner, intermediate, advanced, grand loop or randomizer. The grand loop starts at screen 1 and continues until you lose all seven lives. The randomizer chooses the order of the screens at random.

All of this is rendered in colorful, detailed graphics accompanied by superb sound effects and music, from the classy opening cartoon to the cute way in which Jumpman bounces as he falls, landing in a sitting position with stars spinning around his head. The Jumpman figure is very responsive to joystick control, and you are given a choice of playing speeds, from a blindingly fast 1 to a slow 9. This will accommodate any player from the youngest child to the most advanced arcade ace.

This choice of speed is important for a second reason—bonus scoring. As you run and climb around the screen collecting bombs, a bonus timer is counting down. If you complete the screen before it reaches zero, you receive the bonus points. By choosing a

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faster speed, you can get a higher bonus.

One to four players are permitted. The vanity board has room for the top 20 high scores, as well as the top 20 high bonus scores. These scores are saved to the disk, so they are current each time you load the game.

I have a wide assortment of games to play on my Commodore 64. Yet, while some games sit unplayed week after week, I keep coming back to Jumpman. This game offers variety and a challenge, and at the same time it lets me feel temporary success. There is always one more screen to conquer, one more strategy to try. And that's why I keep coming back for more.

The instructions that come with Jumpman are quite complete in helping you to get comfortable with the mechanics of the game. They even give you a few hints on how to get higher scores. But there is a lot that they don't tell you. These are things you have to find out for yourself through trial and error. And how frustrating it can be to finally reach screen 14 only to be killed because you don't know your options! (It may take another two hours of play to reach screen 14 again.)

Here are a few clues for those of you who already have Jumpman, and for those who may get it soon. On screen 5 (Vampire), you should keep moving so that the bat's radar can't zero in on you. In screen 12 (Robots II), there are "dead" spots where you are safe from the robots. Pressing the fire button in screen 14 (Dragonslayer) throws a spear, unless you are standing on a hill, where pressing the fire button will cause you to jump. You can shoot down flying saucers in screen 6 (Invasion) for an extra 25 points apiece.

Jumpman is state-of-the-art. And in the constantly changing world of microcomputer games, that's saying something. If you were only going to buy one game, this would be an excellent choice. However, you should be aware that there is a new sequel available entitled Jumpman Junior. And if it's anything like the original, you'll have a tough decision to make! *(Epyx, 1043 Kiel Court, Sunnyvale, CA 94086. $39.95.)*

**John Olsen**
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# For Gamesters Only

**By Tom Benford**

Well—hello again! Spring has sprung and all of Nature's creatures are finally shaking off the mantle of winter. Lifeforms, like flies, centipedes, snakes, rodents, frogs, arachnids—in short, all of those interestingly vile little creatures that no one really misses—are awakening to do their bit to contribute to the food chain. And, as coincidence would have it, those are some of the main characters in the games we're going to take a look at this month.

Also, each month, I'd like to answer a question of general interest, and I'd like you folks to provide the questions. You can ask just about anything that's related to a VIC or C-64 or any peripherals, but it should be something that will benefit everyone. So let's hear from you, and you might see your name in print right on these very pages! Send your questions, comments, hints or tips to:

Tom Benford/*RUN*
PO Box 125
Osborneville, NJ 08723

This month's question is from my nephew, Timmy Benford, who has a VIC. He asked me why some games that required a 3K expander wouldn't work properly with an 8K expander. It's a good question, and the answer is fairly simple.

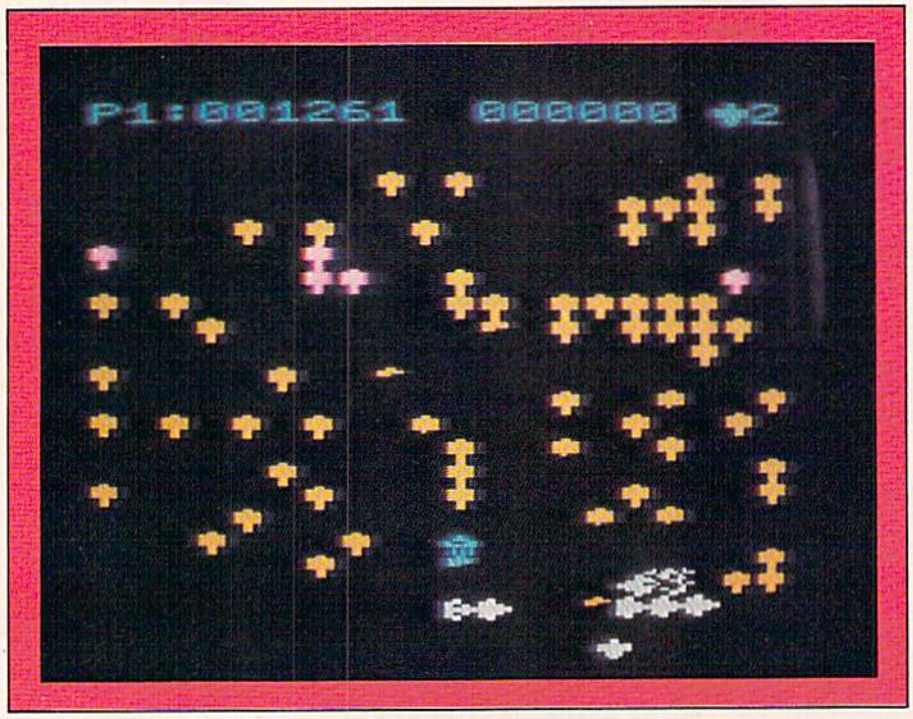
Open your *VIC-20 Programmer's Reference Guide* to pp. 124–125 (what do you mean you don't have one?). You'll see that memory locations 1024 to 4095 are normally vacant; this space is reserved for a 3K expander, either the standard module or the Super Expander.

Locations 4096 to 8184 are already assigned. There's a gap from 8185 to 32768 for up to 24K of RAM expansion. So, if you have an 8K or 16K expander cartridge inserted, there's still that hole from 1024 to 4095 where the bottom 3K is not accommodated.

The reason for this is revealed on page 124, which states that location 4096 becomes the beginning of screen memory where at least an 8K expansion has been used, and the screen RAM following it would become user memory space, continuing up to the top of the expansion memory. This means that user memory would start at location 7680, and anything below it (i.e., locations 1024 to 4095) would be ignored.

So, if your game needs to Poke something into, let's say, location 1125, it isn't going to work with an 8K expander in place, because the VIC will think that its memory begins at 7680. Even if you use a slot-expander and have both a 3K and 8K cartridge switched on, the 3K is going to be ignored for the same reason.

The PRG further eleborates on it, but that's the general idea. I hope that clears up your memory problems.




*Centipede's bugs'll get you if you don't watch out!*

## Centipede

*(VIC-20 cartridge from Atari, Inc., 1399 Moffett Park Drive, Sunnyvale, CA 94086. $44.95.)*

I guess just about everyone has played Centipede in a video arcade at one time or another, and now, thanks to Atari, Inc., which has finally released its horde of arcade goodies for general licensing, you can enjoy this arcade classic at home on your VIC!

The playscreen holds true to the original coin-operated version and the playaction is just as hairy. You use your joystick to control the bug-blaster gun, and press the space bar to pause the game. Centipede can accommodate either one or two players, and high score per gam-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ing session is displayed at the top of the screen.

For those of you who've never seen Centipede, I'll brief you on the scenario. Your man is at the bottom of the playscreen, which is really an enchanted mushroom patch. You'll have to fend off such nemeses as attacking centipedes, spiders, fleas and scorpions. You fire your bug-blaster ray with your joystick's firebutton, and your objective is to blast all of these invading insects while destroying the centipede that's quickly descending through the mushrooms toward you.

You gain the highest points when you destroy a scorpion, which will scurry across the screen from time to time (this "bugger" is worth 1,000 points). Every time you blast the head of the centipede, you'll get 100 points—plus a new head on the centipede. Frenzied fleas also drop down from time to time, and they're worth 200 points each. Jumping spiders are worth 300 points at long range, 600 at medium range and a whopping 900 at close range. But watch them—they're deadly and you only have three exterminators before the game's over.

You'll also receive 10 points for each body segment of the centipede you destroy, 1 point for each mushroom you totally obliterate and 5 points for each partially destroyed mushroom.

This is a good game for the whole family, since the two-player option allows head-to-head competition, and the objective of the game is simple: get them before they get you.

It has a fairly high continued-interest level, and the element of challenge increases with each successive level. Though it's not a new game to the arcade set, it's new to us VIC owners, and it's one of those classics you'll want as a permanent edition to your gaming library.

**Strategy Tip**

Constant movement won't help you much, since you want to destroy the centipede in short order, but in order to avoid the spider and other attacking beasties, you'll have to move around a bit. The best plan is to take the offensive role and shoot first.

You'll find that the edges of the screen are often good areas for spraying shots upward and making short work of the centipede. But be careful, the spider may make his entrance on your head!

## Worms?

*(C-64 disk from Electronic Arts, 2775 Campus Drive, San Mateo, CA 94403. $35.)*

This offering from Electronic Arts is so different, I'm not sure exactly where to begin. Worms? can be played by one to four players. There are five different types of worms. The keyboard, rather than a joystick, is used.

Worms? is intellectually stimulating, beautiful to watch and soothing to hear. The entire gaming experience of Worms? is transcendental; the patterns are hypnotic.

David Maynard designed Worms?. He was a physics major who worked on the first office automation project at Stanford Research Institute and wrote programs for the first mouse-based user interface. Worms? is vastly different from any other computer game I've ever seen.

There are five types of worms. The New Worm is untrained; you must train it as you play. The Auto Worm is taught by the computer (while playing) to make smart moves. The Wild Worm has been trained by the computer prior to the start of the game for all possible moves at random. The Same Worm plays the same color as it did in the last game. The "-----" Worm doesn't play.

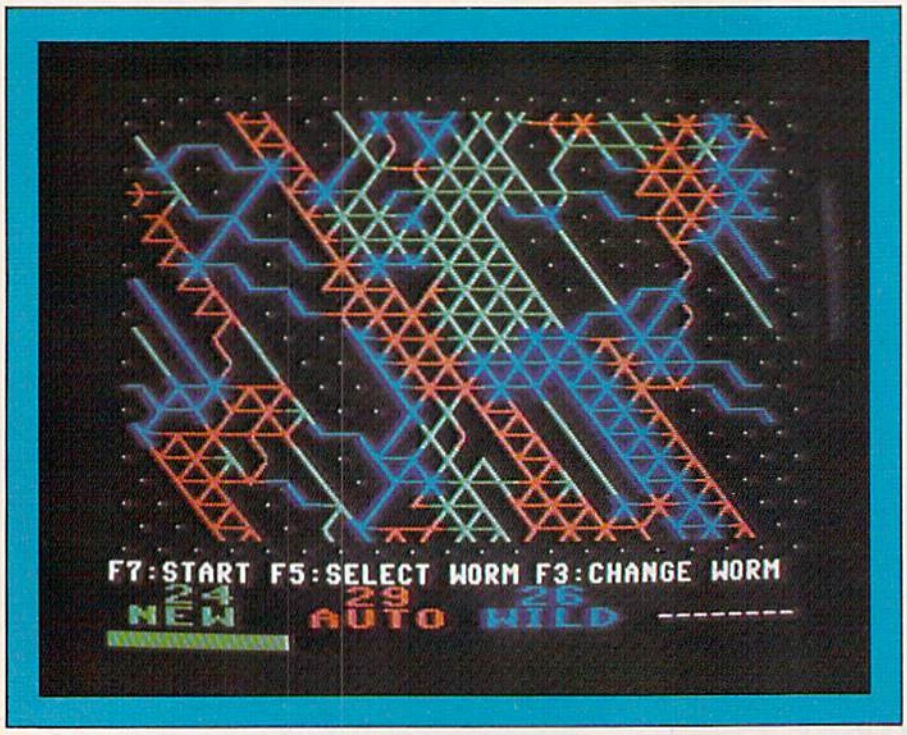
If this all sounds pretty strange right now, don't worry. It probably won't become any more clear until you play the game.

The worms lay trails from dot to dot on the gridded playfield. Each dot is the center of a territory that the worms capture by laying these trails. The worm that lays the sixth (last) trail in a territory gains that territory and receives one point. The winner is the highest point scorer. That's the objective game principle.

The subjective game principles, however, are myriad. One game you can play is called "What Does Worms? Mean To Me?," which is something you'll ask yourself each time you boot the game. I find the geometric patterns that the demo game generates to be soothing and interesting to watch. They stimulate my imagination.

They also make me wonder what goes on inside this guy Maynard's head. Is this really meant to be a game? Is it meant to be a hypnotic aid to relaxation? Is it a brief treatise on CAD (computer aided design)? Is it all of these or is it none of these? And who can answer these questions?

The resolution of the imagery and the colors is excellent. The screen consists of white dots and blue, red, green or violet lines. Through the crossing over of different lines, countless abstract

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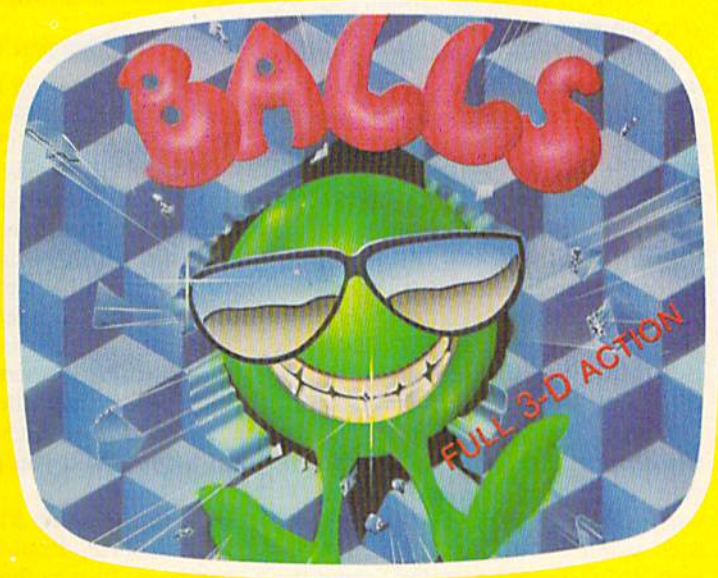

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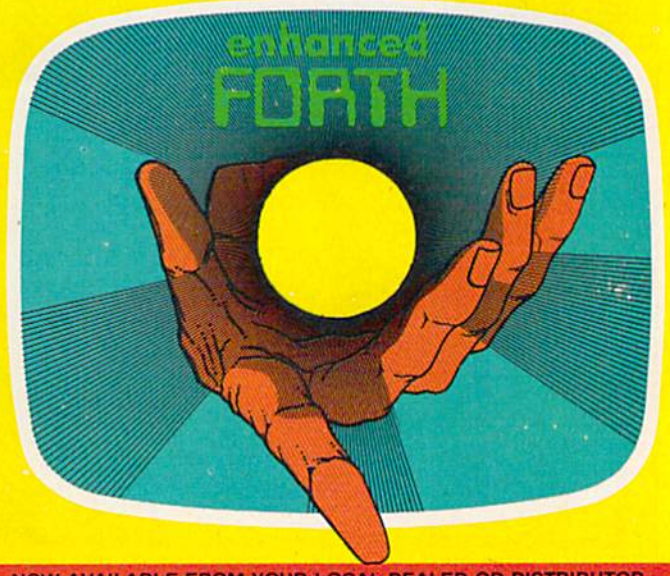


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patterns emerge. Three of the colors may be shut off if you wish to deal with only one worm at a time; you can teach the worm to move in certain ways to generate patterns for you. You can let the worm do its own thing, and simply watch or occasionally prod it along. You can have all of the worms moving simultaneously.

At the risk of sounding "cute," I must say that Worms? is all things to all people. It's not a game, per se, unless you perceive it that way. It's not a creative program, either, unless that's how you see it. Personally, I think it's really an electronic Rorschach test. But that's how I perceive it. You may perceive something entirely different.

If you're looking for a shoot-'em-up, this is not it. Nor is it a maze or an adventure. I feel it will appeal to those who enjoy high-intellect strategy games, such as multi-level chess. It will also appeal to those who enjoy computer graphics, geometry and design. It will not appeal to anyone who is looking for action, violence, hair-trigger reflexes and arcade-type action.

Since there aren't any rules if you don't want them, there aren't any strategy tips. This is the most original piece of recreational software I have ever seen. Please send me your comments.

## Dragon's Den

*(C-64 cartridge from Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380. $24.95.)*

Dragon's Den was designed by Steve Finkel, one of Commodore's game programmers and the same fellow who did such a beautiful translation of the coin-op "Lazarian" for the C-64. Dragon's Den has the same feel and level of excitement as Lazarian; it takes you through multiple screens, a lot of the same music and the same high-challenge level. The game's scenario is that of a quest, and you play it with a joystick.

You're a noble knight astride your winged horse, Pegasus. With lance in hand, you fly over the enchanted mountain releasing pterodactyls, which attack you. Relentlessly, they circle and attack, but you kill them all with your lance. Now you are taken to the second screen, where you are within the mountain itself.

You speed down the corridors on your winged steed, dodging spiders, which drop from the ceiling. You spear bats disturbed by your coming before they attack you, and you jump over low spears and duck high ones, until you arrive in the dragon's den, the third playscreen.

You pump the fire button rhythmically to maintain a high altitude for your knight and winged horse, as you shuttle back and forth spearing the devil bats, which attack you from the ceiling.

Below you is a gigantic egg within which lies the sleeping dragon. For each bat you kill, more of the egg shell falls away, until finally the shell is gone and the dragon awakens. Talk about waking up on the wrong side of the bed! This guy is ugliness personified.

The playfield for the ultimate battle with the dragon is the final screen. It will take four encounters with your spear point for the beast to die. Charge valiantly, sir knight!

You're given three lives for your knight, and you play against a time clock for each of the four playscreens. Should you lose all three lives, the game doesn't restart; it grants you another three lives, but forfeits all your accrued points.

If and when you slay the dragon, you're entitled to entertainment during the half-time show with some really great animation. Then you restart your quest from the pterodactyl stage, but this time you're not reincarnated. When you've expended your remaining lives, the game's over.

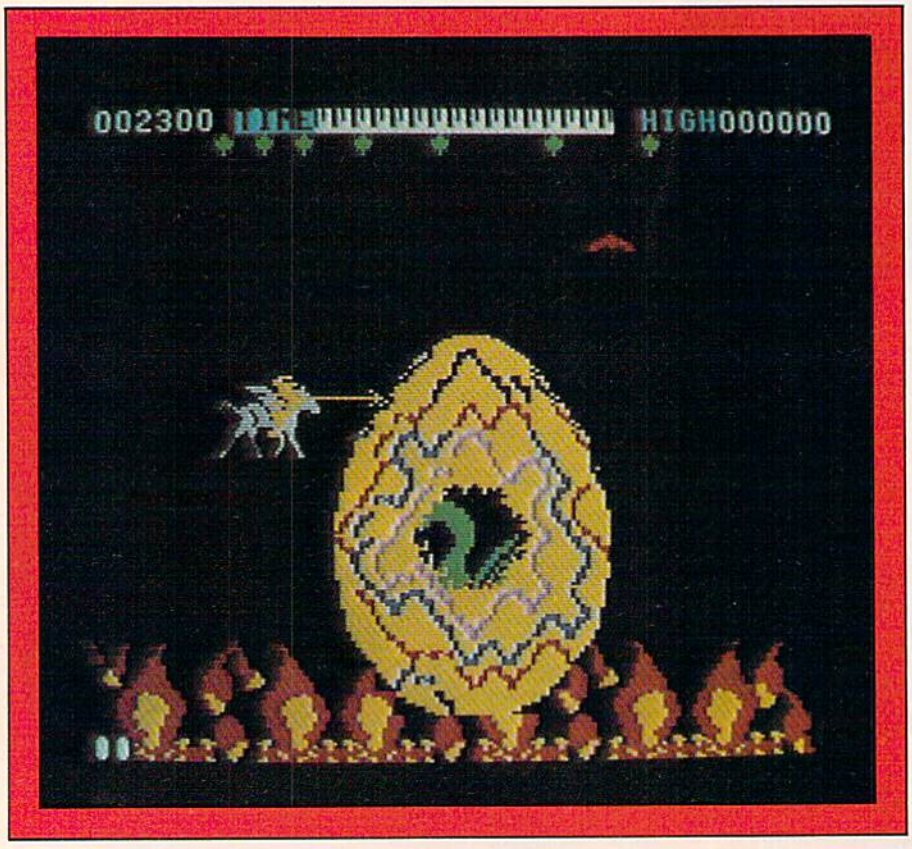
Dragon's Den is an exemplary piece of in-house game design that clearly shows Commodore's in the software business. Animation and graphic resolution are outstanding. The music, too, is very good, and the play-action's exceptionally challenging.

### Strategy Tip

Observe the rhythms at which the spiders and bats drop, and adjust the pace of your knight so that only the point of his spear comes into contact with them; the timing is crucial.

When facing the dragon one-on-one, I've found it's better to stay at the bottom of the screen, touch him with the lance and swiftly retreat. The chances of your being hit by the dragon's flailing tail are greater when you're on the upper half of the screen.

This is a rough game, so be patient—it'll take lots of practice to become a consistent winner.




*The point of Dragon's Den is to slay the monster with your spear.*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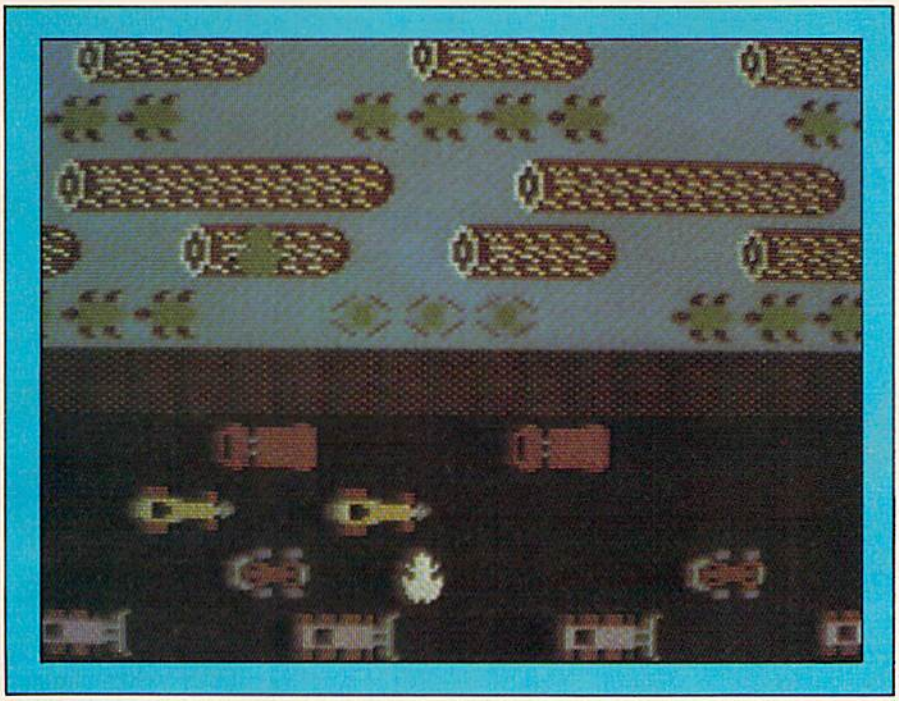

*This game from Sierra On-Line Systems will keep you hopping.*

## Frogger

*(C-64 disk from sierra On-Line Systems, 36575 Mudge Ranch Road, Coarsegold, CA 93614. $34.95.)*

Frogger, that perennial arcade hit, is available for your C-64. Just as in the coin-operated version, Frogger is loads of fun, and this official version from Sierra On-Line is about as close to the real thing as you can come on your 64.

The object of the game is simple. You have to get your frog across the busy highway, up over the wall, then across the river and over logs and leaves to safety on the opposite shore.

In the water, you'll face such obstacles as crocodiles and turtles. There's always the chance you might leap at the wrong time and get swept away by the current, or you could go over the waterfall, which is also fatal.

You gain bonus points if you land the frog on bonus mud holes on the far side of the river. As you move on to succeeding phases of the game, the pace picks up and the obstacles become harder to overcome; turtles dive at shorter intervals and cars move faster, not to mention the multitude of snakes on both the wall and the logs in the water. Once your score exceeds 10,000 points, the action really gets intense, so you'll need sharp reflexes and steady nerves.

The game can be played either through the keyboard or a joystick, and you have your choice of slow or fast speeds. Everything about Frogger is first-rate, including the catchy musical score. By the way, the music can be toggled on or off with the f7/f8 key, and the game can also be paused during play.

Frogger is a terrific game, whether you play alone or with family or friends. It's simple enough in concept and control for even the youngest player, while it's sufficiently entertaining and challenging for the more serious gamesters in the household. Frogger's a welcome addition to your C-64 game collection.

### Strategy Tip

The cars and trucks move at predetermined speeds, and in certain patterns. Watch the patterns and zig-zag your frog across the roadway.

When jumping on the logs, try to get on the log with the green leaf, as this is a bonus symbol. Avoid the crocodiles—you can jump on their backs while their mouths are closed, but if they open them, your frog dies.

Also remember that you're playing against the clock, so try to plan ahead to keep hesitation at a minimum—you'll get more bonus points this way. R

*Address author correspondence to Tom Benford, PO Box 125, Osborneville, NJ 08723.*

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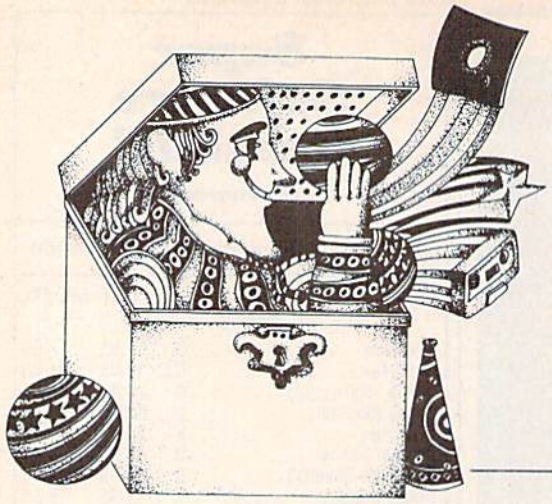

# Video Casino

By David D. Busch

*Experience the excitement of a bidding war to acquire valuable paintings in this art auction simulation. You could end up with a genuine Rembrandt.*

Simulations, a popular outlet for computer gamers, provide a broad canvas on which to paint logic puzzles, math challenges or other games. You can build nearly any sort of skill or pure chance contest around a simulation.

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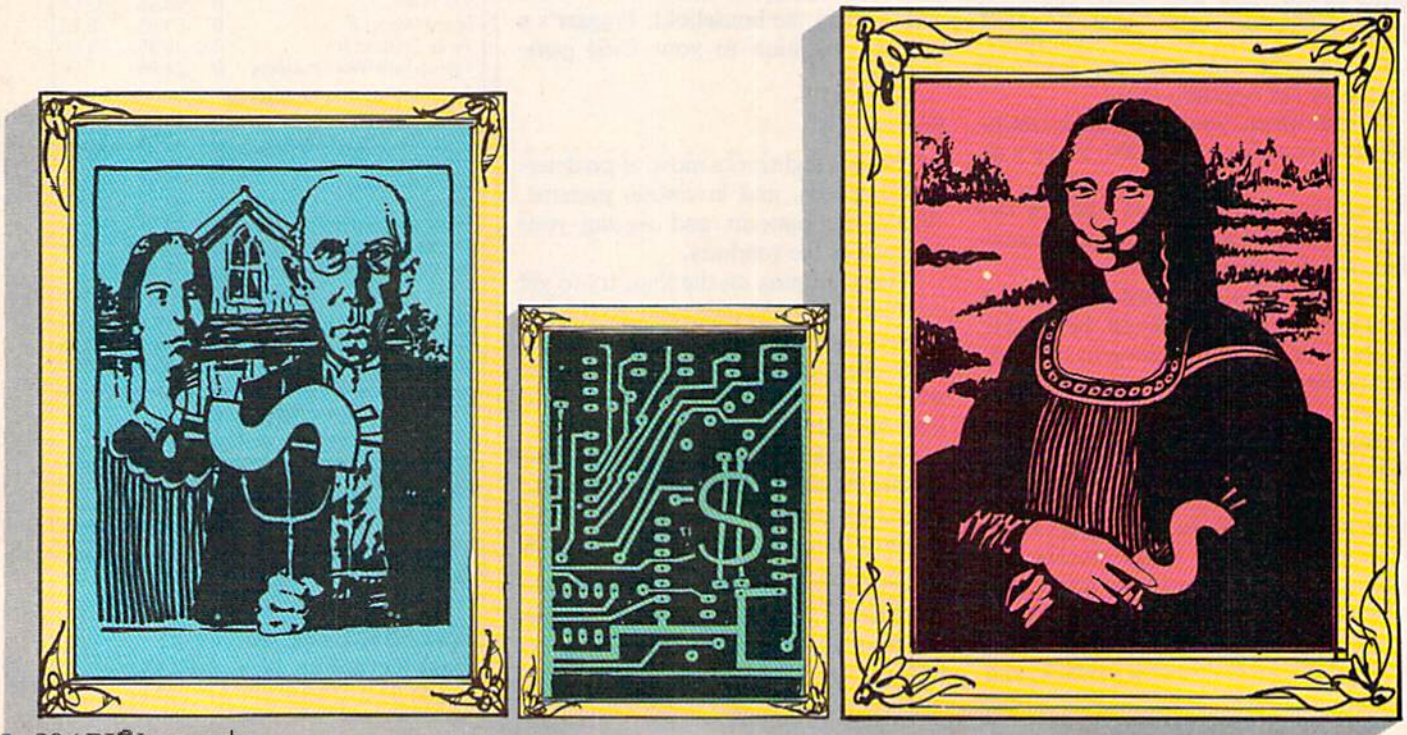
*Address author correspondence to David D. Busch, 5217-C Cline Road, Kent, OH 44240.*

A simulation is usually a computerized model of a situation, with the player or players acting out the role of one or more participants in whatever is being simulated. Typical scenarios include operating a lemonade stand, traveling westward in a wagon train, or, as in this game, buying and selling artwork at an auction.

In all games of this type, you must make certain decisions throughout the game that have some bearing on the outcome. Often, such games are better played when knowledge of that actual situation is available.

For example, complex simulations have been built around so-called "Hammurabi" scenarios, where you are the absolute ruler of a given country and must decide how much land to plant, food to provide for the people and actual crops to raise. Depending on the wisdom of your allocations, the consequences can be increased wealth or bankruptcy. In addition to the player's own actions, random factors are used to determine harvest, births, deaths and so forth.

Adventure-style games also are a kind of simulation. These attempt to mimic a trip through a haunted castle, nuclear power plant or other interesting site. Most have very little, if any, randomness; the object is for you to figure





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out the fixed series of events that leads to the adventure's solution.

Masterpiece is an example of a third type of simulation, in which chance totally controls the outcome. You must use your intuition, ESP or luck to guess which combination of prices and bids will produce the most favorable results.

The game pits you against unseen opponents in a war to buy and sell paintings for the best possible price. The object is to end the game with as much of, or more than, your original $5000 stake as possible.

You are offered five paintings, one at a time, which you can buy with your $5000. You are allowed one bid for each. The computer opponent selects a random bid, which may be higher or lower than your bid. If you have the high bid, you gain possession of the painting. Otherwise, it's lost forever.

Obviously, a good strategy is for you to try to make the winning bid as small as possible, leaving a maximum amount for later purchases. However, because it is difficult to predict what the computer will do, this can be very tricky.

After all the paintings have been sold, you are invited to sell those you have successfully purchased. As each is brought to the auction block, you'll be reminded of the amount originally paid for the painting, and the computer will present you with an offer you may accept or reject.

Additional bids may or may not be made. A random number of offers will be made. You'll never know whether to take a bid or hold out in hopes of a higher price. The most recent offer just *may* be the last. In that case, you'll be stuck with the painting, and receive no money against the final tally.

The purchase portion of the C-64 program begins at line 170, where a For...Next loop repeats from 1 to 5. The money remaining (Cash) is displayed, along with the number of the painting for sale and an invitation to bid. You are not allowed to bid more money than you have (line 250).

Next, the opposing bid (OP) is selected by the computer. The computer will choose a number between 1 and 99, multiply that by 10 and add 150. So, the smallest bid will be $160, the largest $1140. It is better if you don't know that. Otherwise, no bid will be larger than $1141. Note that since five paintings are available, it will not be possible to bid $1141 for all five, even if you know the secret.

The number of paintings purchased, NU, is used to limit another For... Next loop, from 1 to NU, during which

*Listing 1. Masterpiece program for the VIC-20.*

```
10 REM ***************
20 REM *{13 SPACEs}*
30 REM * MASTERPIECE *
40 REM *{13 SPACEs}*
50 REM ***************
60 CASH=5000
70 PRINT"{SHFT CLR}{2 CRSR DNs}"
80 PRINTTAB(6)"{CTRL 9}{CTRL 3}MASTERPIECE{CTRL 7}{CTRL
     0}{2 CRSR DNs}"
90 PRINTTAB(2)"YOU MAY BID FOR UP"
100 PRINTTAB(2)"TO FIVE VALUABLE"
110 PRINTTAB(2)"PAINTINGS.{2 SPACEs}START"
120 PRINTTAB(2)"WITH $5000."
130 PRINTTAB(2)"THEN, YOU MAY SELL"
140 PRINTTAB(2)"YOUR COLLECTION"
150 PRINTTAB(2)"FOR AS MUCH AS"
160 PRINTTAB(2)"POSSIBLE."
170 PRINT"{2 CRSR DNs}";TAB(6)"{CTRL 9}{CTRL 6}HIT ANY
     KEY{CTRL 0}{CTRL 7}"
180 GET A$:IF A$="" GOTO 180
190 FOR N=1 TO 5
200 PRINT"{SHFT CLR}{2 CRSR DNs}"
210 PRINTTAB(4)"MONEY LEFT:";CASH
220 PRINTTAB(4)"PAINTING #";N;"IS"
230 PRINTTAB(4)"UP FOR SALE."
240 PRINTTAB(4)"{CRSR DN}{CTRL 9}{CTRL 4}ENTER BID:{CTR
     L 7}";
250 INPUT BID$
260 BID=VAL(BID$)
270 IF BID>CASH GOTO 200
280 OP=INT(RND(1)*100)*10+150
290 PRINTTAB(1)"{2 CRSR DNs}ANOTHER COLLECTOR HAS";
300 PRINT" BID $";OP;" FOR THAT"
310 PRINTTAB(1)"PAINTING.{CRSR DN}"
320 IF BID=>OP GOTO 350
330 PRINTTAB(2)"YOU LOST IT!"
340 GOTO 390
350 PRINTTAB(2)"YOU BOUGHT IT!"
360 NU=NU+1
370 COLLECT(NU)=BID
380 CASH=CASH-BID
390 PRINT"{2 CRSR DNs}";TAB(6)"{CTRL 9}{CTRL 6}HIT ANY
     KEY{CTRL 0}{CTRL 7}"
400 GET A$:IF A$="" GOTO 400
410 NEXT N
420 FOR N=1 TO NU
430 PRINT"{SHFT CLR}{2 CRSR DNs}"
440 PRINTTAB(2)"YOU MAY NOW SELL"
450 PRINTTAB(2)"YOUR PAINTING #";N;"."
460 NB=INT(RND(1)*6)+1
470 FOR N2=1 TO NB
480 BID=INT(RND(1)*200)*10+500
490 PRINTTAB(2)"{2 CRSR DNs}YOU'VE BEEN OFFERED"
500 PRINTTAB(2)"$";BID;" FOR THIS"
510 PRINTTAB(2)"PAINTING.{CRSR DN}"
520 PRINTTAB(2)"YOU PAID $";COLLECT(N);"."
530 PRINTTAB(2)"DO YOU ACCEPT (Y/N)?"
540 GET A$:IF A$="" GOTO 540
550 PRINT"{SHFT CLR}{2 CRSR DNs}"
560 IF A$="Y" GOTO 580
570 GOTO 600
580 CASH=CASH+BID
590 GOTO 690
600 NEXT N2
610 PRINT"{SHFT CLR}{2 CRSR DNs}"
620 PRINTTAB(2)"SORRY, SPORT!"
630 PRINTTAB(2)"THAT WAS THE LAST"
640 PRINTTAB(2)"OFFER! YOU'RE STUCK"
650 PRINTTAB(2)"WITH THAT ONE."
660 PRINT"{2 CRSR DNs}"
670 PRINTTAB(6)"{CTRL 9}{CTRL 6}HIT ANY KEY{CTRL 0}{CTR
     L 7}"
```

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*Listing 1 continued.*

```
680 GET A$:IF A$="" GOTO 680
690 NEXT N
700 PRINT"{SHFT CLR}{2 CRSR DNs}"
710 PRINTTAB(2)"YOU STARTED WITH"
720 PRINTTAB(2)"$5000.{2 SPACEs}YOU FINISH "
730 PRINTTAB(2)"GAME WITH $";CASH;"."
740 PRINT"{2 CRSR DNs}"
750 PRINTTAB(2)"CARE TO PLAY AGAIN?"
760 GET A$:IF A$="" GOTO 760
770 IF A$="Y" THEN RUN
```

*Listing 2. Masterpiece program for the C-64.*

```
10 REM ***************
20 REM *{13 SPACEs}*
30 REM * MASTERPIECE *
40 REM *{13 SPACEs}*
50 REM ***************
60 CASH=5000
70 POKE 53281,15
80 PRINT"{SHFT CLR}{2 CRSR DNs}"
90 PRINTTAB(12)"{CTRL 9}{CTRL 3}MASTERPIECE{CTRL 7}{CTR
   L 0}{3 CRSR DNs}"
100 PRINTTAB(8)"YOU MAY BID FOR UP TO"
110 PRINTTAB(8)"FIVE VALUABLE PAINTINGS."
120 PRINTTAB(8)"START WITH $5000. THEN,"
130 PRINTTAB(8)"YOU MAY SELL YOUR COLLECTION"
140 PRINTTAB(8)"FOR AS MUCH AS POSSIBLE."
150 PRINT"{2 CRSR DNs}";TAB(13)"{CTRL 9}{CTRL 6}HIT ANY
    KEY{CTRL 0}{CTRL 7}"
160 GET A$:IF A$="" GOTO 160
170 FOR N=1 TO 5
180 PRINT"{SHFT CLR}{2 CRSR DNs}"
190 PRINTTAB(8)"MONEY LEFT:";CASH
200 PRINTTAB(8)"{2 CRSR DNs}PAINTING #";N;"IS"
210 PRINTTAB(8)"UP FOR SALE.{CRSR DN}"
220 PRINTTAB(8)"{CRSR DN}{CTRL 9}{CTRL 3}ENTER BID:{CTR
   L 7}";
230 INPUT BID$
240 BID=VAL(BID$)
250 IF BID>CASH GOTO 180
260 OP=INT(RND(1)*100)*10+150
270 PRINTTAB(8)"{2 CRSR DNs}ANOTHER COLLECTOR HAS BID"
280 PRINTTAB(8)"$";OP;" FOR THAT PAINTING.{2 CRSR DNs}"

290 IF BID=>OP GOTO 320
300 PRINTTAB(8)"YOU LOST IT!"
310 GOTO 360
320 PRINTTAB(8)"YOU BOUGHT IT!"
330 NU=NU+1
340 COLLECT(NU)=BID
350 CASH=CASH-BID
360 PRINT"{2 CRSR DNs}";TAB(12)"{CTRL 9}{CTRL 6}HIT ANY
    KEY{CTRL 0}{CTRL 7}"
370 GET A$:IF A$="" GOTO 370
380 NEXT N
390 FOR N=1 TO NU
400 PRINT"{SHFT CLR}{2 CRSR DNs}"
410 PRINTTAB(8)"YOU MAY NOW SELL"
420 PRINTTAB(8)"YOUR PAINTING #";N;"."
430 NB=INT(RND(1)*6)+1
440 FOR N2=1 TO NB
450 BID=INT(RND(1)*200)*10+500
460 PRINTTAB(8)"{2 CRSR DNs}YOU'VE BEEN OFFERED"
470 PRINTTAB(8)"$";BID;" FOR THIS"
480 PRINTTAB(8)"PAINTING.{CRSR DN}"
490 PRINTTAB(8)"YOU PAID $";COLLECT(N);"."
500 PRINTTAB(8)"DO YOU ACCEPT (Y/N)?"
510 GET A$:IF A$="" GOTO 510
520 PRINT"{SHFT CLR}{2 CRSR DNs}"
```

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the art can be sold. The purchase price of each painting in your collection has been previously stored in an array, Collect(n), and is displayed.

A nested loop runs from 1 to the number of bids that will be offered. This figure, NB, is chosen in line 430, and will range from 1 to 7 bids. In some rounds, only a single bid will be offered; in others, as many as seven can be tossed out. Thus, you'll never know whether the current bid is the last one, or whether a more enticing offer is forthcoming.

The amount of the bid itself is determined in line 450, and ranges from $560 to $2490. Again, do not reveal these figures to the players. Ideally, no one should know what the lowest possible bid will be, or the highest. If, after many playings, the values are deduced, you can change them by making a few program modifications.

You may, for example, alter the minimum and maximum amount that your opponent will initially bid for a given painting, or the amount that will be offered when it comes time to sell. You can also increase the number of possible bids from seven to ten, or some other number.

If a bid is accepted, the amount is added to your Cash. If the last bid is declined, an appropriately taunting message is displayed. Once all the paintings have been sold, the results are given, and you're invited to play again.

Masterpiece has some of the fun of an art auction—with none of the expense. As a simulation, it constitutes an easy introduction to an increasingly popular game form. R

*Listing 2 continued.*

```
530 IF A$="Y" GOTO 550
540 GOTO 570
550 CASH=CASH+BID
560 GOTO 660
570 NEXT N2
580 PRINT"{SHFT CLR}{2 CRSR DNs}"
590 PRINTTAB(8)"SORRY, SPORT!"
600 PRINTTAB(8)"THAT WAS THE LAST"
610 PRINTTAB(8)"OFFER! YOU'RE STUCK"
620 PRINTTAB(8)"WITH THAT ONE."
630 PRINT"{2 CRSR DNs}"
640 PRINTTAB(12)"{CTRL 9}{CTRL 6}HIT ANY KEY{CTRL 0}{CT
    RL 7}"
650 GET A$:IF A$="" GOTO 650
660 NEXT N
670 PRINT"{SHFT CLR}{2 CRSR DNs}"
680 PRINTTAB(8)"YOU STARTED WITH"
690 PRINTTAB(8)"$5000.{2 SPACEs}YOU FINISH "
700 PRINTTAB(8)"GAME WITH $";CASH;"."
710 PRINT"{2 CRSR DNs}"
720 PRINTTAB(8)"CARE TO PLAY AGAIN?"
730 GET A$:IF A$="" GOTO 730
740 IF A$="Y" THEN RUN
```


Circle 27 on Reader Service card.

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# The Mail RUN

## Master Your Disks

I purchased your February issue and was quite pleased with it. I was particularly taken with "Disk Master Revisited." As I have a considerable number of disks, I typed it in, it ran, and now I don't have to sort through all of my disks, wondering which program I put where. Many thanks.

**Lawrence F. Harris**
**Santa Ana, CA**

I have received my second issue of *RUN* and am quite pleased. I slightly modified Mr. Baker's program, Disk Master (February 1984) to permit use of either one or two disk drives and to print properly with an Epson or compatible printer.

I will send interested readers a copy of the modified program if they include a self-addressed, stamped envelope with their request.

**Forrest C. Gilmore**
**233 E. Thistle Court**
**New Martinsville, WV 26155**

## More on Writer's Assistant

The strengths of the Writer's Assistant program (see *RUN*, January 1984, p. 68) do not lie in this program alone. The Writer's Assistant is part of a series of software programs, many of which can interchange data.

Writer's Assistant can merge with a spreadsheet created from the Spreadsheet Assistant (it will also merge with the Filing Assistant and the Mail List Assistant). There is also a glossary function in the Writer's Assistant that allows you to define 99 phrases (40 characters in maximum length) that can be retrieved while you are editing by pressing just three keys, and there was no mention of this in the review.

Also, in your list of features, you have a "no" next to "delete by line, sentence, paragraph and screen." However, using our delete function, press CTRL-D on the first character where you want to start deleting, then to stop deleting, move the cursor to that character and press CTRL-D. This allows you to perform any of these functions quite easily.

**Steve Lynott, Vice President**
**Rainbow Computer Corporation**

*The reason "no" was entered next to delete by line, sentence, paragraph and screen was because the Writer's Assistant's delete function is really a delete by range—specific commands for each of the above commands do not exist. A range must always be used!*

**Robert Baker**
***RUN* Reviewer**

## *RUN*ning the Course

I think your magazine is great. I have learned more from my first issue than I learned from a whole semester of computer courses.

**Mary Vanderhaar**
**Middletown, NY**

*Thank you, Mary. We only hope your teachers aren't reading this.*

**Editors**

## Reviews Reviewed

I find your product reviews, especially on software and books, to be better than the other computer magazines that I read. I especially like the content and format of Software Gallery and Book Gallery.

However, please don't be afraid to publish reviews on products of inferior quality; warning your readers of bad products is as important as bringing noteworthy products to their attention.

**Mark Steven Jacobs**
**Glen Burnie, MD**

## An Excellent Medium?

I received your premiere issue, read it immediately and found it the best computer publication that I've read to date. *RUN* will eventually bring satisfactory software to the end user. Perhaps through your magazine, we can also get better documentation from dealers, suppliers of software and Commodore itself.

**Robert I. Niles, MD**
**Hollywood, FL**

## That's MAGIC!

I enjoy your column, MAGIC; it's very good. One trick I learned was worth the annual subscription alone. Keep it up.

**Ed Moore**
**Portland, ME**

## Totally Useful

My thanks to Mr. Stanfield for his program, Color Setter (February 1984, p. 40). I found it extremely useful in finding eye-appealing combinations.

To make the program into a total utility, you only need to add the following line.

```
9475 PRINT"53280,";PEEK(53280);"53281,";
PEEK(53281);"646,";PEEK(646)
```

When the program ends, you'll have the various Pokes to include in your own programs to adjust color.

**Al Buettner**
**Las Vegas, NV**

## *RUN* Overseas

I have bought and read your new magazine. My compliments to you. For us in the Netherlands, your magazine is very beneficial.

Greetings from a little housewife in the middle of the Netherlands to all you *RUN* readers in the USA.

**Mary-Hoytink-Lemmers**
**Netherlands**

*We're glad you enjoy* RUN, *and greetings to all you* RUN *readers in the Netherlands.*

**Editors**



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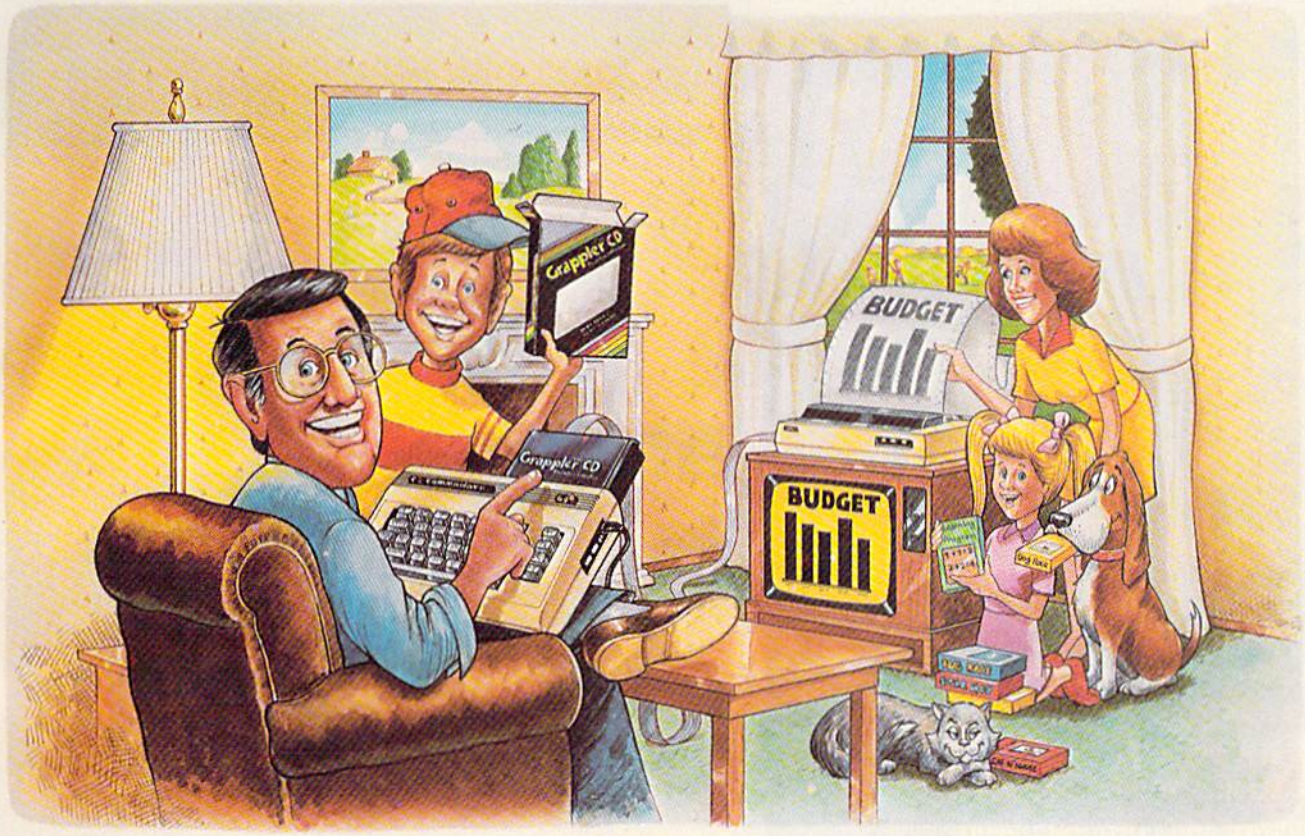


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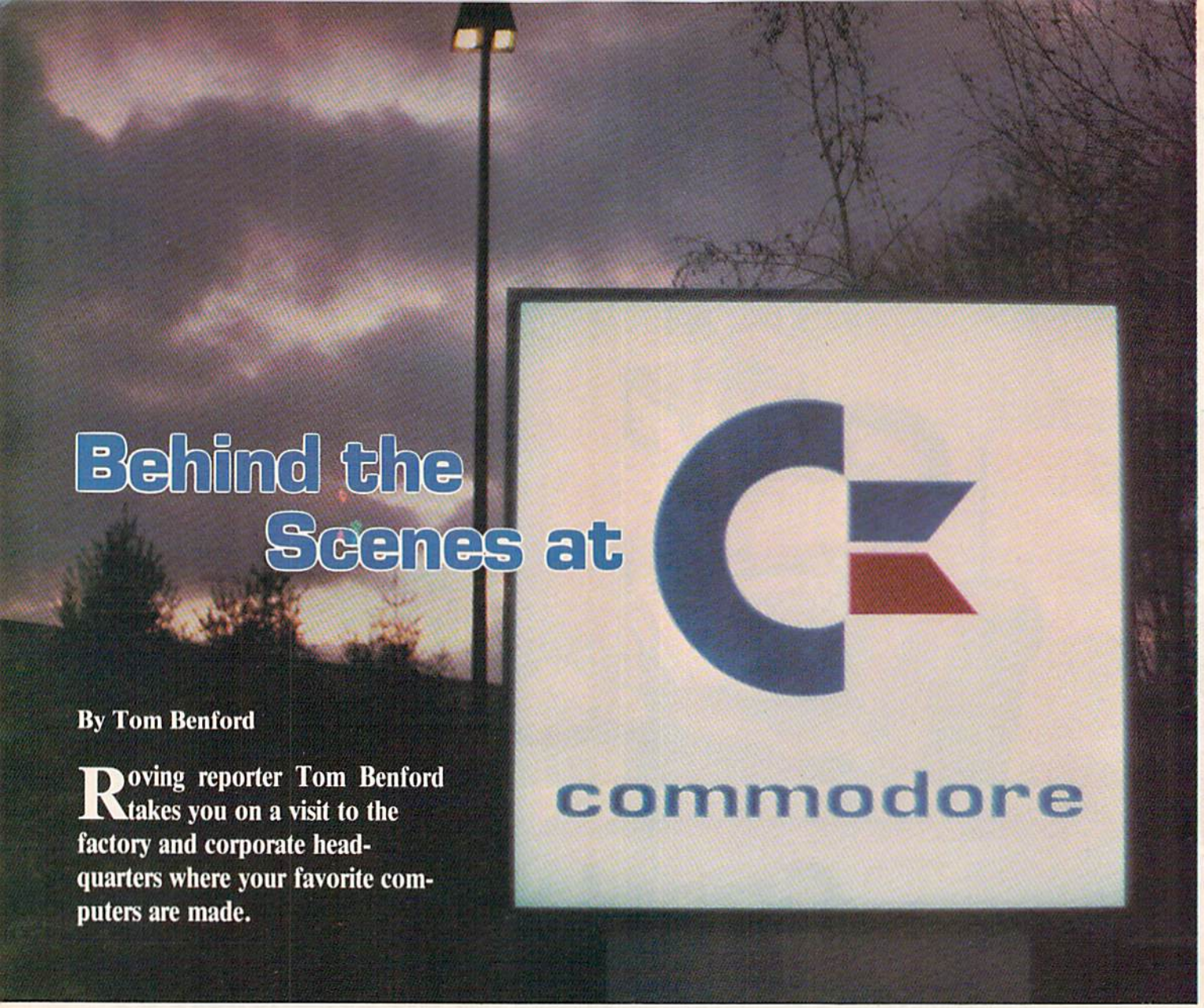


# Behind the Scenes at Commodore

By Tom Benford

**Roving reporter Tom Benford takes you on a visit to the factory and corporate headquarters where your favorite computers are made.**

What could be better for *RUN* readers than a visit to the factory and corporate headquarters where your favorite computers come from? After phoning John Mathias, director of recreational software at Commodore (and also an old friend), arrangements were made, and my wife Liz (and her trusty Nikon) and I were on our way.

It was a seasonably cold day in mid-December when we drove the 120 miles from our New Jersey home to the Commodore plant, which covers 11 acres, in West Chester, PA. Mathias greeted us at the security desk, and the day's itinerary was mapped out. *RUN*'s founder/publisher Wayne Green was also due to arrive shortly at the corporate offices; that was the first of many pleasant surprises ahead of us that day.

We met and interviewed countless interesting folks at Commodore, collected a wealth of information on the company's products and plans for the future, and even scored a scoop: we were given exclusive information on the new Commodore 264—a month before its formal debut at the January Consumer Electronics Show in Las Vegas!

The folks at Commodore were bursting with excitement over the 264 and many other new products. Let's cover them one at a time.

The 264 is the most exciting of the lot, with 60K of RAM available for Basic programming, built-in software, 128-color capability, extended Basic commands and a projected price tag in the $300–$400 range. (For more on the 264, see p. 93, March *RUN*.)

The SX-64 was another treat. Commodore calls it "the affordable portable." We were lucky enough to get one on a loaner basis for review purposes, and I fell in love with it immediately (see sidebar, p. 48).

Under the direction of Sig Hartman, the people in Commodore's software division have been hard at work coming up with a stable of solid new products.

### Magic Desk

The Magic Desk Series, for example, is a new idea in applications software. It's designed primarily for in-home users rather than for commercial applications, and it comes on cartridge for the Commodore 64 or SX-64 computers.

Magic Desk I is an integrated piece of software that features word processing, a real-time clock, filing on disk and line-printer capabilities. Its best feature is that everything is pictorial and menu-driven with international symbols; the opening screen depicts an office environment complete with desk, filing cab-


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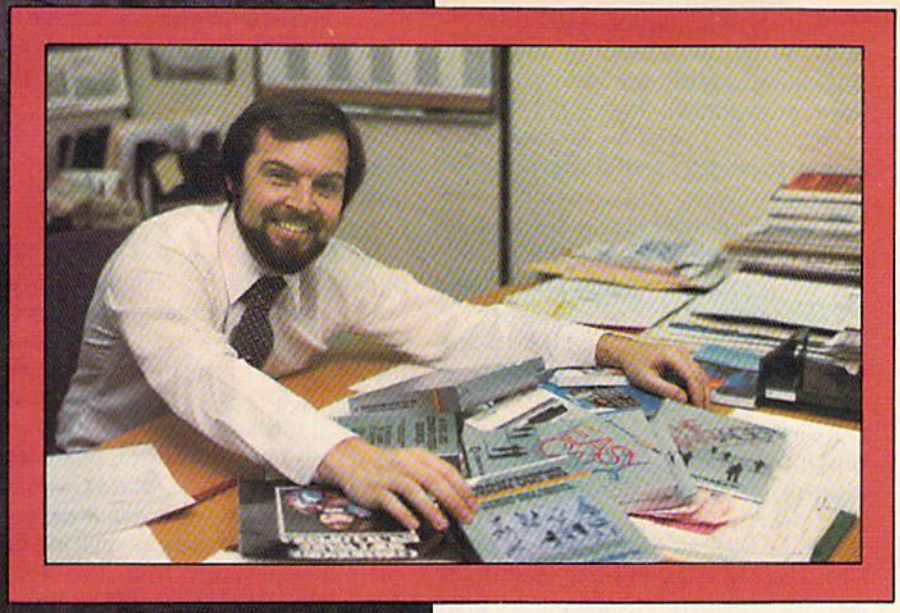

*Mike Tomczyk, director of market development and publications, with some of the exciting new Commodore software products he had a hand in.*

(Photos by Liz Benford)

inets, digital clock, typewriter, wastebasket and other familiar office furnishings. You use a joystick to select the device you want.

For example, to use the typewriter, move the hand down to the typewriter with your joystick, hit the fire button, and presto—the screen changes to a typewriter display. You then may set your margins, adjust the paper and type away to your heart's content.

After you're finished, you can file your document in the filing cabinet or send it to the line printer. If you choose to file it, you simply move the hand to the file cabinet and point to the drawer. Once again, the screen changes to several file folders, upon which you can type the name of the file for future reference. Then you move the hand to the document, which is filed away on disk.

On yes—if you haven't turned on your disk drive or you don't have a disk in the drive, some noticeable sound effects and a screen message alert you to the problem.

After filing, you may decide to print your document. Or perhaps you're just doing a short memo or note and you don't want to file it, but you do wish to print it. That, too, is a simple matter; just move the hand down to the printer symbol and hit the fire button. That's all there is to it; the printer instantly comes to life, and your document is printed out on real paper.

Suppose you change your mind and decide to scrap the document. Just move the hand to the trash basket and hit the fire button. The screen changes to show you the document poised over the wastebasket, giving you a visual prompt to make sure that this is what you want to do. By hitting the fire button a second time, you'll activate an amusing sound effect that sounds like a bomb dropping. The document has been trashed.

Another outstanding feature of Magic Desk is the help key, which fully defines the functions and gives procedural advice to the user.

The pictorial metaphors, or icons, make this product easy to use for even the younger set. My son has always avoided computers except to play games on, but he likes using Magic Desk so much that he now uses it for school reports.

Magic Desk II will have speech capability, as well as some added functions—a working calculator and general ledger are planned. Farther on down the line there are plans to add index/database and communications capabilities to the Magic Desk Series.

**Game Time**

And now about games...in addition to Wizard of Wor, I received advance copies of Gorf and an educational game for preschoolers, the ABC-Alphabet game. Both of these cartridges have talking capabilities.

Other interesting and challenging games released by Commodore are International Soccer, which is an absolute knockout, Dragon's Den, Blueprint, the Visible Solar System and a few that were referred to by their code names only.

Commodore is making a massive commitment to software development and marketing, both in the recreational and applications fields. Based on what I saw at the plant, they'll be setting new standards for the industry.

Commodore also has acquired the distribution rights to six of the games in the Infocom series, including Deadline and Suspended. Watch my monthly gaming column for reviews of these products.

**Shhhh...**

Several products/projects that were being worked on during our visit were hush-hush, but I *can* tell you that Commodore is planning to release a low-cost letter-quality printer in the near future. A musical keyboard and an electronic drum set are on their way also. How soon? Unfortunately, Commodore won't

*Address author correspondence to Tom Benford, 520 Havens Cove Road, Bricktown, NJ 08723.*



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say; based on what we saw, though, they'll be worth the wait.

**Return Trip**

As the saying goes, "Time flies when you're having fun." There was so much to see and so many interesting people to talk to that we needed to schedule a return trip in order to tour the production lines.

Exactly one week later, we returned to West Chester. Our tour guide was Frank Szczepanski, an amiable fellow who gave us the red-carpet treatment. Talk about a kid in a candy store—when I saw those racks filled with C-64s, VIC-20s and PETs, I really felt giddy!

There were literally thousands upon thousands of completed computers, some on the burn-in racks, some on pallets waiting to be packed, and others already boxed and ready for shipment. And multitudes of each were in various stages of assembly.

The whole operation is mind-boggling; it reminded me of a symphony orchestra, wherein each assembly line "musician" is completing his task in perfect synchronization with the others. The end result is a turnout of more than 500 units per hour.

Before we go on to the interviews, I must make one point: During both of our visits, the thing that impressed us most was the enthusiasm of the people working at Commodore—from the top company executives to the assembly-line workers.

I really wish all of our readers could have been with us to meet these folks and to experience Commodore first-hand. But since that wasn't possible, we brought some of the people back with us for you to meet. Here's what they had to say...

**John Mathias**
**Director of Recreational Software**

**Q.** How do you feel about video games in general for children? Do you feel they're educational in any respect?

**A.** Absolutely. I feel a good game is fun and I can't imagine the world without fun. It's been said that video games give us a medium to express our fantasies under our own control; that's really true. I feel the trend started with the "shoot-'em-ups"—fast hand/eye coordination and that was it—but it's definitely moving away from that to the more intellectual-type games, for in-

*One of the stages of assembly of a PET computer. Sorry, photographs of the assembly of VICs and 64s weren't allowed.*

*Pallets of completed and checked C-64s en route to conveyor for packaging.*


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stance, the Infocom Series.

**Q.** Which direction will gaming on home computers take in the future? Will the computer be generating more random patterns for games, or will it continue to follow a preprogrammed series of events?

**A.** One thing about randomness is that you have to be careful where you place it within the game; [if it's put] in the wrong spot, you can wind up with no game at all. But I do see the trend going that way; it has, ever since I've been in the game business.

**Q.** So games will continue to grow in complexity?

**A.** Definitely. You've seen our International Soccer game. Memory is getting cheaper all the time, so you'll be seeing more and more three-dimensional graphics as well as excellent sound effects. I will have 32K recreational products in the stores by the end of 1984.

**Q.** What other new recreational products does Commodore plan to introduce in the near future?

**A.** Football is in the works—we plan to release it in September—and basketball should be released in May; both of these sports games will be judged against soccer for excellence. We're also working on a chess program for the C-64 that will offer a tutorial; it'll not only play you; it'll teach as well.

**Q.** Do you have any advice for young people who are looking to go into the game design field?

**A.** They first have to understand what a real game is. Most of the failures are designed right at the keyboard on the kitchen table. You really have to know what the elements of a good game are and understand the medium you're working with, whether it's paper or a Commodore computer. I usually write in assembly language, but that's not to say that a good game can't be written in a high-level language like Basic.

**Q.** Do you feel it's important for a game designer to have an intimate working knowledge of computers, or can he come up with a terrific idea and bring it to a hacker to have the coding worked out?

**A.** Oh, sure—that's what's happening today. The designer doesn't have to know anything at all about computers, but I certainly think he should know about colors, have some concept of memory, know whether the system supports sprites or player missiles, and so forth. I look at every game submitted; if I don't look at it personally, then someone on my staff will look at it. We look at each and every one—you never know when the next Pac-Man might come


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A high speed disk is now available for your Commodore 64. **QUIKDISK** is here! The **QUIKDISK** system consists of a small disk controller module, a cable assembly, and a standard disk drive. The **QUIKDISK** controller module plugs into the cartridge slot of the computer and a flat cable connects to the drive.

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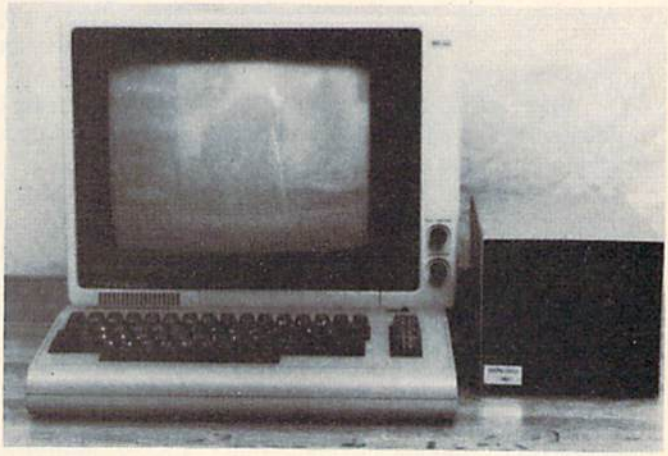
SAVE
OPEN
INPUT#
PRINT#
GET#
CLOSE



## USING QUIKDISK:

The **QUIKDISK** initialization is accomplished with the command SYS56843. The initialization sets the **QUIKDISK** default device number to eight. Program loading, saving, is done exactly the same as the Commodore disk drive e.g. LOAD "PROGRAM", 8. Special disk commands like NEW and SCRATCH are also identical in format. In addition, a special disk utility is available that makes disk maintenance functions much easier. Tasks like formatting (NEW), eliminating old files (SCRATCH), copying, and other functions are done via an easy to use menu display.

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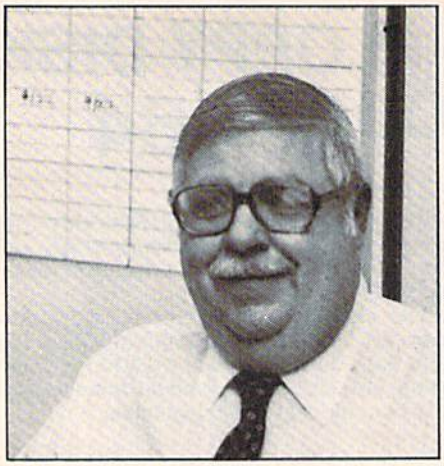

*We look at each game submitted. You never know when you'll come across the next Pac-Man.*

through the door.

**Q.** What advice do you have for those interested in entering the computer field in general as a career?

**A.** I suggest that they get good basic training; I really feel that's important. As for myself, unless somebody sends me some of their work or unless they have a degree, I won't hire them.

**Q.** What other new recreational products are you folks working on?

**A.** We don't have it yet, but we're working on a line of business simulations for 1984—running an airline, running a railroad and some others I can't talk about right now. As I said before, games are moving more in intellectual and strategic directions.

**Sol Davidson**
**General Manager**

**Q.** Where do you feel Commodore is headed in the near future?

**A.** The mass market field—it's ours; we will continue to feed that appetite. We expect to sell a machine and a piece of software to every family in the United States who can afford it and would be interested in using a computer. We're optimistic about everything we do here.

**Q.** Do you feel computer literacy is essential to the future of America?

**A.** No question about it. Not only that, but just think of the networking that's going to take place in time: imagine the research that will be available if you have a network to the libraries and other facts systems. It really makes you eager for tomorrow.

**Q.** What advice do you have for readers who would like to enter the computer field?

**A.** The person who goes into computers as a profession is another kind of human being. He or she has to be driven by interest; it can't just be someone who's placid about it, who says "it's a good field; I think I'll go into it because everybody's using a computer." That kind of person won't survive. It takes a tremendous amount of commitment.

**Q.** What impact do you feel computers will have on the future of the world as compared to the advent of television?

**A.** The television screen talks to you and reports the immediacy of an event, but the computer will give you the reason why the event took place. If they ever thought in the behavioral sciences that behavior creates the historical event, the computer will deal with the behavior, and the television with the event. That's the difference. I believe strongly in the computer as a communications tool.

**Q.** So you see computers as a way of enhancing human interaction rather than detracting from it, as some people have prophesied?

**A.** I think it's the greatest tool for interaction between human beings. I can only think of it [the computer] in terms of networks; I don't think of it as an individual thing in your house that you do alone—it will connect everybody to everybody. It's going to be better for peace than any politician. This thing [the computer] may eventually make a lasting contribution to peace among the peoples of the world.

**David Rosenwald**
**Director of Educational Sales**
*(Rosenwald is former director of curriculum and service for the New Jersey State Department of Education.)*

**Q.** What directions are being explored by Commodore in the educational fields?

**A.** S.A.T. preparation packages, speed-reading packages, typing tutors, products like that. We're also going to be looking heavily at science as well as advanced math.

**Q.** What kind of feedback do you get from students using computers in school?

**A.** Students like computers—that's the bottom line. Most kids like to be able to do something with a machine and have it respond.

**Q.** What kind of social impact do you foresee computers having in our lifestyles?

**A.** I think you'll see in ten or 12 years, maybe less, people—average people, not computer "nuts"—communicating all over the world by using the computer. You'll see information being transferred immediately. I see the computer as a tremendous boon for schools in communicating with international penpals. I think it will expand peoples' views of the world and societies within the world.

**Q.** How would you describe the Commodore company?

**A.** It's a can-do organization. For instance, somebody will say "we really should have this, but how do we do it?" and then we do our damnedest to try to develop it and get it out. It's a fun place for workaholics to work.

**Q.** We all know that the effectiveness of computers as an educational tool depends largely on how "user-friendly" they are. Would you care to elaborate on that point?

**A.** What we're trying to produce is not only user-friendly software but also user-friendly documentation. We realize that parents want to help their kids, and we're trying to help parents become more involved with their child in learning. We're putting out some parent/teacher help guides—how to set the right atmosphere to work with the computer and get the benefit of the computer, and how to ask questions of your child that complement this.

**Q.** How do teachers feel about using computers in their classrooms?

**A.** The response is mixed. Like any piece of technology, it's scary if you haven't used it before it's put into your classroom. It's much more complicated than an overhead projector, but it's also much more powerful in its impact on learning.

Whenever you dramatically change what's going on in the classroom, you're going to scare some people. It's a mind-set that we're trying to overcome through software, documentation and hardware that is easier to use. Teachers are getting very excited about being involved with computers, but it takes time.

**Q.** Do you feel that students should be computer-literate?

**A.** Students have to be, but this is a bad choice of words because I don't like the term "computer-literate." It doesn't mean they have to program; it means they have to understand what the impact of the computer is, what it does, how it works, what it can do and what it cannot do for them.


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Perhaps "computer-comfortable" is a better term—it means the appropriate use of the right kind of software to meet a particular need, and it's the ability to use that effectively to do what you want.

**Q.** As an education specialist, what are your feelings about computer games?

**A.** They're a form of entertainment; I don't see anything wrong with this form of entertainment. I think it has benefit in that it's not a socially undesirable form in any sense of the word.

We had the same debate more than 30 years ago as to whether TV was bad or not. Regardless of the technology, a lot of people are going to debate forever as to whether it's good or bad, but eventually it will just "be," and they'll stop this debate and pick on whatever comes out next.

The primary argument here is whether the child will become addicted to it. A child who's going to become addicted to this is probably going to become addicted to something, and I don't think addiction is good, period. Computers are as good or bad as anything else, and I think it's a matter of parental responsibility as to what they think is right or wrong for their child. Children, historically, have always decided whether they're going to listen to their parents, and how they're going to go about listening to them.

**Michael Tomczyk**
**Director, Market Developement and Publications**

**Q.** Mike, you're in charge of market development—exploring new directions for both hardware and software. What can we expect to see in the future?

**A.** There are several important trends happening in software that we are happy to pioneer. One is integrated software.

Integrated software can be thought of in two ways. One is the integration of software into the computer itself—in other words, designing software on silicon. Commodore specializes in designing software on silicon because we're in the ROM business. We make ROMs, and that ability gives us what's probably our strongest competitive advantage. Right now, for example, we're putting large word processors, database systems, electronic spreadsheets and other software products previously limited to disk (because of their memory) on ROM, and we're getting ready to put those inside the machine and inside cartridges.

*The year 1984 and beyond will be the time when software moves from entertainment and learning toward productivity.*

So integration in software means integrating the software inside the machine—building it in.

There's another way to think of integration, and that is combining several specific functions in one piece of software. For example, in the Commodore 264 we have a new product that will include a word processor, an electronic spreadsheet, a database and graphics—all built into the same piece of software. That product is an example of how software is being integrated so that many different types of packages will share the same disk or cartridge or the same place inside the computer.

The ultimate computer is one that has function-key software built in. All you'll do is push the function keys to select word processing, database, whatever you want, and all the data will be usable back and forth between the different packages.

The Magic Desk is an example of integration at the home consumer level. If you type something in the electronic spreadsheet portion of Magic Desk II, you'll be able to move that information over to the Magic Desk typewriter and use it easily in a letter, business chart or form, as well as in words.

So, to see where the future of software is headed, you should look at several key words: one is integration and another is windowing. Windowing relates to the ability to switch back and forth between several working areas within the computer, either at the same time on the computer screen or in different parts of the computer's memory, and bring them up separately.

We're also looking at concurrent processing on our larger computers; that will become important later on from both the hardware and software standpoints. We're looking at multitasking and networking so that a teacher can sit at the front of a classroom and send the same program to 16 or 32 different students, who will then learn something or send data back to the teacher separately. This not only makes it easy to teach computing and other subjects, but, in effect, to run classroom computing labs.

Thanks to speech technology, which Commodore is pioneering, we're going to see a lot more built-in speech in computers, either on cartridge or built into the computers themselves. Synthetic speech is becoming much more accurate in terms of being able to understand it, and here at Commodore we're now experimenting with talking help screens, whereby the computer will actually give you verbal instructions, or "voice prompts."

An example of this might be in deleting a file from the disk; the voice prompt will literally ask you if you are sure you want to erase the file. I have a car that reminds me when my headlights are on or when I'm low on fuel, and this is helpful to me. We have talking cars today and, probably by spring of this year, you'll see Commodore's first talking computers. That's an important development, because the next step beyond talking computers has to be artificial intelligence.

Artificial intelligence gives rise to robots, and robots may give rise to androids, and by the time we're done, we may have science fiction become a reality in our own lifetime, thanks to the few small but important developments we're promoting—not only here at Commodore, but in other parts of the industry.

**Q.** Let me ask you about voice recognition. Are you working on that as well, so that a user may give verbal commands to the computer rather than entering them via the keyboard or joystick?

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# Meet the Affordable Portable

If you love your Commodore 64 as much as I do mine, you'll really appreciate the SX-64, Commodore's portable version of the C-64.

The SX is a fully integrated unit containing a detachable keyboard, a 5-inch color monitor and a disk drive—all in a compact, easy-to-carry, 26-pound package. It may eventually be available with a dual disk drive configuration (this version will be called the DX-64; its projected release date is sometime later this year).

**What's in a Name?**

If you're wondering about the name, it's simple: SX stands for Single (Drive) Executive, and DX stands for Double (Drive) Executive, relating to the number of disk drives on each model. (The 64, of course, means 64K of portable power.) Suggested list price is $995 for the SX-64, but no price for the planned DX-64 model has been set at this time.

The Executive-64 supports all of the same software, peripherals and goodies as the stay-at-home 64, with the exception of the Datassette and cassette-load software; Commodore evidently felt that, since at least one disk drive is included in the unit, the cassette port was unnecessary. It still would have been a nice touch to include; those of us who use non-Commodore printers may miss this port. (I use a Star printer with Cardco interface, and the interface taps into the cassette port for the necessary operating voltage; I guess I'll have to figure out an alternate method of supplying power to the interface.) The vast majority of users, however, won't miss the cassette port in the least.

The machine was obviously well-thought-out by the engineering department; the most necessary controls are the most conveniently located. The power switch is located on the back of the SX-64 (it's the bottom when in transit), as are the dual joystick ports, audio/video connector, user port, serial port, power socket and fuse.

The cartridge port is located on top of the unit, cleverly protected by two spring-loaded retracting doors.

*Commodore's DX-64—the dual disk drive version of the Executive.*

The front (top) houses the color monitor, the disk drive(s) and the monitor control panel. On SX models, there is software room for disks above the drive, but on DX models this storage space is occupied by the second drive.

The monitor controls are concealed behind a small door to the right of the disk drive(s). The controls include volume, color adjustments, brightness, contrast and a reset button for "warm boots."

**Keyboard Quickness**

One of the nicest features of the portable is its keyboard. It attaches to the computer with a cable equipped with D-25 connectors at both ends. The keyboard is fast and comfortable to use, with all of the usual C-64 keys in the same places. The touch and action of the keys, however, are quite an improvement over the standard C-64; you can really fly on this keyboard—an important feature for those who use word processing software frequently in the course of conducting business.

A really nice touch is an LED indicator on the shift lock key that lights up to remind you that you're locked into the caps mode. Another feature that's been modified on the portable is a check-mark symbol when the shifted @ key is pressed, instead of the graphics symbols found on the C-64.

Surprisingly, the built-in 5-inch color monitor isn't hard to read at all; the color and resolution are excellent, and it sure beats lugging around a conventional TV or monitor.

There is an audio/video port on the back of the machine that allows the user to connect the portable to a standard monitor or TV (if an rf modulator is used); this greatly enhances the usefulness of the computer when used at home.

Another neat feature is the carrying handle, which doubles as a support for the unit when in operation. The handle will lock in a number of positions, affording the user variable viewing angles. A zippered pouch is supplied with the portable to store keyboard and power cables, extra disks and cartridges, and it attaches to the carrying handle easily with velcro fasteners. Both the set-up and repacking of the unit can be done in under a minute.

I've heard rumors that an inexpensive slide-in tuner available for the Executive 64 may be in the future; it will allow the unit to double as a conventional television set.

It's hard to find fault with the Executive 64 portable, but, like everything else in life, it falls short of perfection. Although it is a portable unit, there are no provisions for battery operation or for connecting it to the cigarette lighter outlet of your car, boat or plane.

While it makes bringing your computer along with you easy, you still can't actually use the unit unless you have access to a wall outlet supplying the juice. Perhaps we'll see a provision for auxiliary power on future units, or even rechargeable batteries built in. Now *that* would be perfection!

All in all, I have to give the Executive 64 a solid four-star rating—it's a dream to use, it performs flawlessly and it's easy to take along with you. In addition, it's fun to use and is a functional unit for those who can't be separated from their computers for any length of time due to business, whimsy or both.

So now that you've read the features, you probably want to rush right out and get one, right? Well, here's the bad news: dealers can't get enough of them. The demand for this hot little number is so great that you may have a hard time getting your hands on one.

—*T.B.*



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**A.** I can answer that simply by telling you that we're looking at the full spectrum of speech technology. There are some parts of technology whose times have not yet come, and speech technology in particular has many complexities.

**Q.** Do you see light pens and touch-screens figuring heavily in shaping things to come?

**A.** Commodore will definitely have a light pen. The question is, how large is the light pen marketplace? It may be that touch screens will replace light pens at some point. At the current time, light pens are useful mostly for home computers; on the business side, you'll see touch-screens coming into play at some future point.

**Q.** How about touch-sensitive graphics tablets?

**A.** Those are already hot products this year, and we have a hot product under development that combines the light pen with graphics capabilities. Whether we link that product to a graphics tablet or not is still up in the air. We like the potential of graphics tablets, but we don't have a formal product (that can be talked about) at this time.

Sig Hartman, the president of our software division, has said that "this is the decade of productivity in software." We all believe that. The year 1984 and beyond will be the time when software moves from entertainment and learning toward productivity, meaning that you will be processing your home correspondence, recipes and things like that through your home computer; you will order products, perhaps groceries, through your home computer and do your banking transactions the same way.

These types of futuristic trends are happening now, and the more places they happen, the sooner they will become the standard—it all depends on what people want.

**Q.** Here's your chance to be a visionary, Mike. What do you feel will be commonplace ten years from today?

**A.** You'll see robotics used in the home in interesting ways, not in terms of robots running around the living room, but probably in some form built into the home. You'll also see the viewing screen become the center of a system, with the computer, cassette recorder and other products attached.

The screens will be mounted either on or in the walls, with four-foot screens, so that when you're watching a movie, you'll really be watching a movie in the truest sense. You'll have digital television, devoid of scan lines and raster, for the image will be pixel-generated. R


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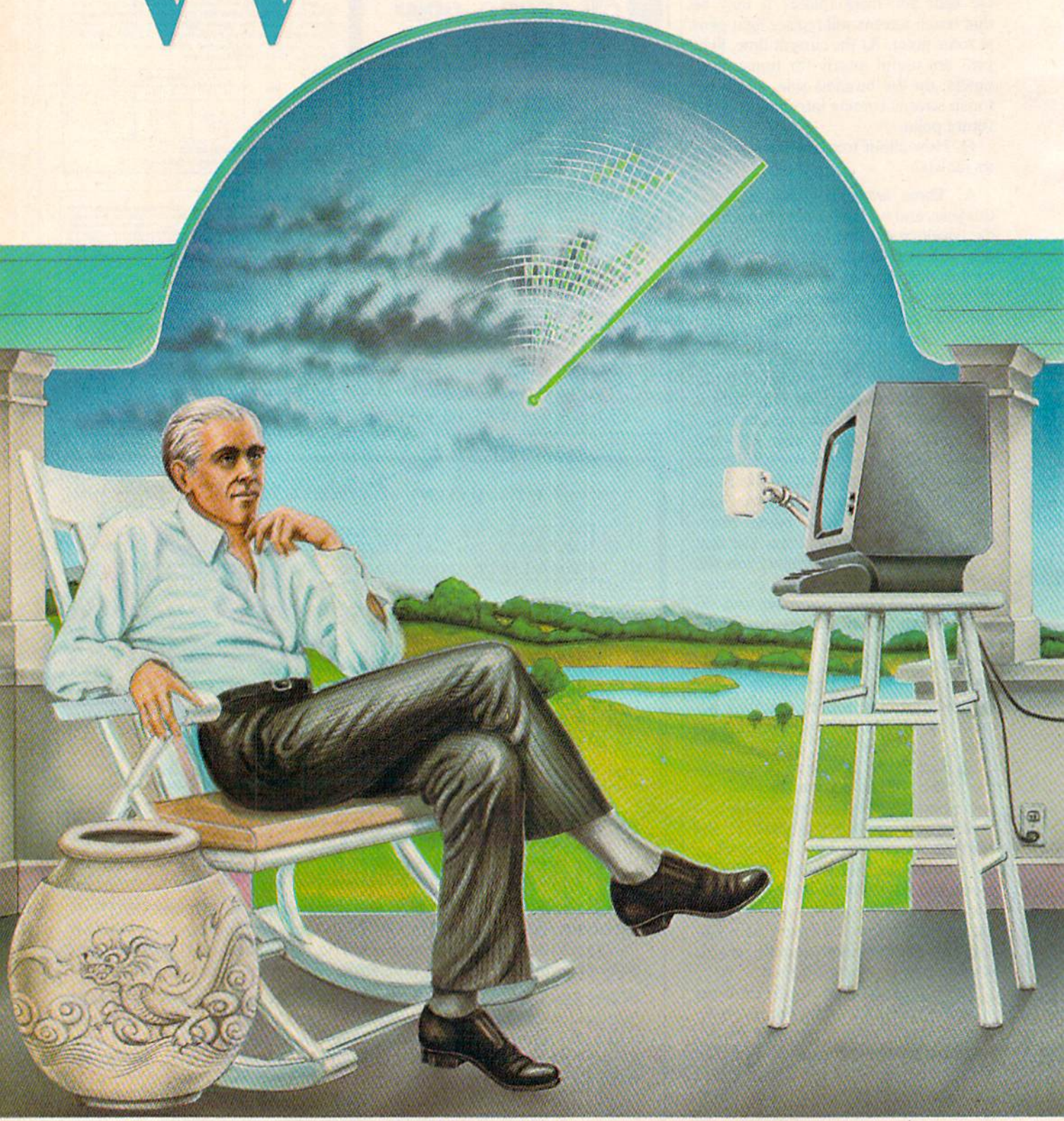


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# FORECASTER

By Christine Adamec

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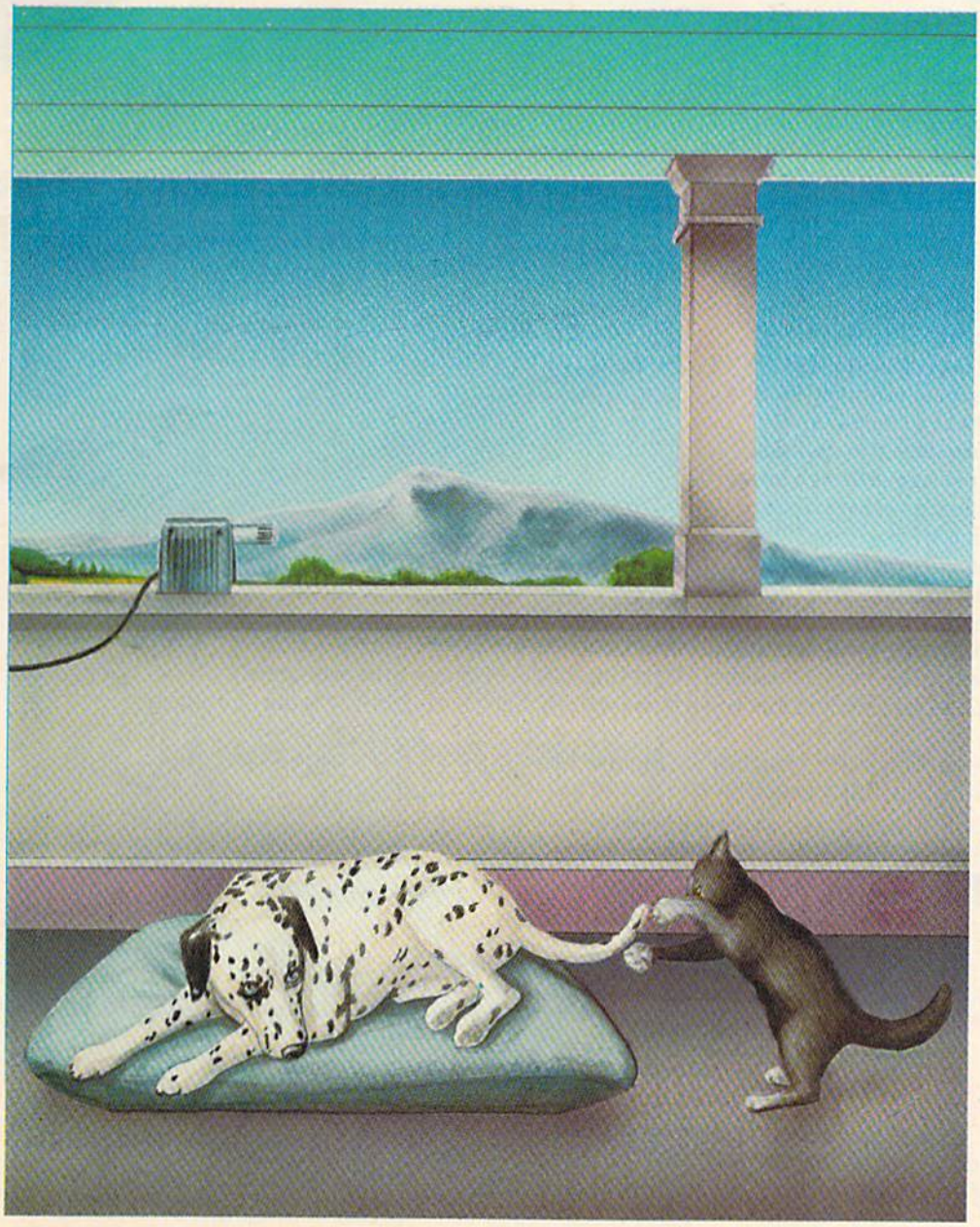

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What's a great age-old conversation-starter that works anywhere on the globe from Minneapolis to Madrid? Of course, the weather! How would you like to use your home computer to increase your weather wisdom and actually predict local weather conditions? If this interests you, Vaisala's Home Automatic Weather Station (HAWS) might be the program for which you've been waiting.

HAWS, produced by a corporation specializing in meteorological instruments, is a combination hardware/software package for the C-64 or VIC-20. It includes a high-tech external sensor, imported from Finland, to measure temperature, humidity, dew point and air pressure, a proven design used by professional meteorologists worldwide.

Other integral parts of this package are: a fifteen-foot (five meter) cable attached to the sensor with a C-64 or VIC-20 connector at the other end; a floppy disk encoded with the software

*Address author correspondence to Christine Adamec, 381 Ardmore St., Palm Bay, FL 32907.*

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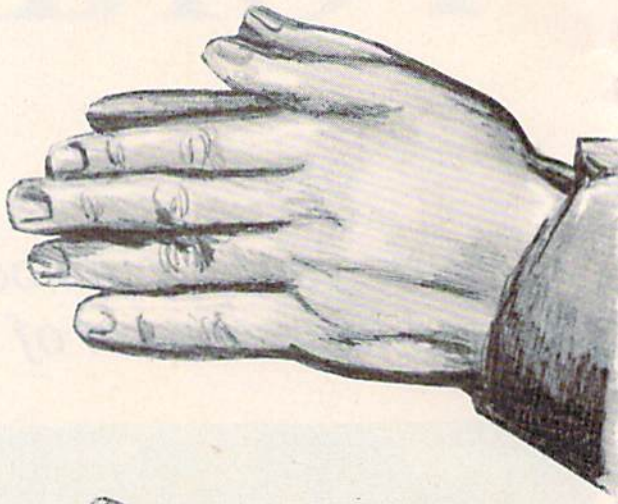

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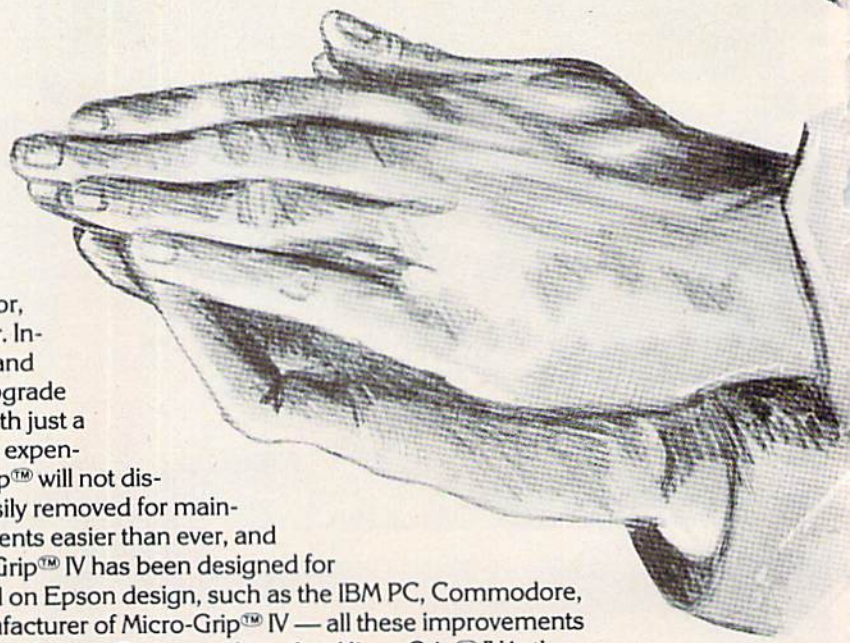

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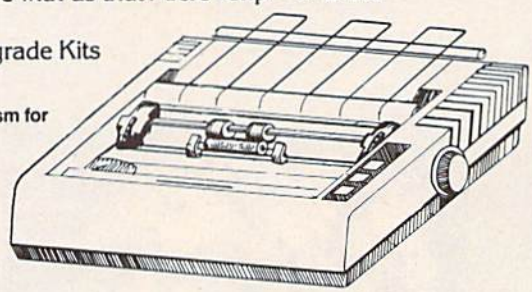

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needed to interface your HAWS sensor to your computer; and a manual, which is quite good for the most part.

Hook it all up to your computer, load your disk and you're ready to go, right? Not quite so simple: HAWS requires a little advance planning before you can brag to all your friends and neighbors about your super new meteorological capabilities.

### Setting Up Hardware

Before you begin using your HAWS, you must decide where you'll place the sensor and cable. If you put it outside, the sensor must be somewhat protected, and the manual recommends it be placed on the north side of your house away from direct sunlight or heat, as well as from rain or snow. My husband and I sited the sensor and its connecting cable under some eaves on the north side of our home, right outside our bedroom window. (You can also hook up HAWS inside to monitor the performance of your heating or cooling systems.)

Any problems? Well, first was the length of the cable—fifteen feet—which wasn't long enough for us, so we moved the computer closer to the bedroom window. The manual says you can splice in additional cable at the computer connector end, but the details provided were a little sketchy.

The next difficulty we encountered was the configuration of the cable itself—how to get it from outside to inside. The cable is soldered to the sensor and the connector, so a hole (other than a window) through which to pass the unit into your home or apartment and to your computer would have to be at least two inches across. (The cable itself is about ¼ inch in diameter and the connector is about 2 inches across at its widest point.) We filed notches in our aluminum window sill.

If you're unable to pass the cable under your window (don't crush the cable beneath the window sill), or if drilling two-inch holes in the wall wouldn't make a big hit with your landlord, there is another way.

Trek down to your local Radio Shack and buy a feed-through tube for $1.99. (Ask for RS Cat. No. 15-1200.) You'll still have to drill a hole, but one only about ¾ inch in diameter. The disadvantage: You'll have to unsolder and then resolder the computer connector to get the cable through the tube.

### The Software

Once we got everything hooked up, we discovered our constants, a critically important little slip of paper attached to the sensor. *Don't lose it.* As soon as you open the box, remove it from the sensor and stick it in the place provided in your manual. You'll initially need to type in those numbers to calibrate your individual system. After loading HAWS from the master menu, you're asked for the constants.

The first time, you merely type them in and save them. (Put a write-protect tape tab on your disk or make a backup.) Then each time you rerun the program, you merely select option "HAWS" from the master menu, then enter option 2, "load HAWS," and the computer will automatically load your constants. So it's a two-step process to get you started.

We loaded in our constants, and the computer asked if they were correct; we answered "Y." The computer then gave us a list of options: Display, Comfactor, Wind Chill Factor, Calc, Trend, Graph, Print, or Forecast. We started with Display, and the computer quickly took its first weather reading, reporting the temperature on November 19th at 77, the air pressure at 29.98, and the humidity at 56%. Curious, we turned on a local cable TV station that runs a continuous display of temperature, air pressure and so on, and their temperature was 81, air pressure 29.95, and humidity 65%, so we were pretty much in line with the weather for the area.

### Predicting the Weather

Next we chose the Trend mode, a data collection sub-program the computer would later use to analyze and give us our first weather prediction. Inserting a blank formatted floppy disk, which we had labelled "Trend," we told the computer the date and time (which it would later read as a file) and how many hours of data to read. (The program has an upper limit capacity of 36 hours, which would theoretically give the best predictions.) We ordered six hours, and watched impatiently to see what would happen.

The program takes continuous readings, but you will see a frantically moving counter at the bottom of the screen, with the number of readings shown above. The screen will not display temperature, humidity and so on while you're in the Trend mode. (Company officials say the C-64 has the capability to both display and read data, but the program was rewritten from the VIC-20, and the C-64's expanded memory isn't yet fully utilized.)

*Vaisala's Home Automatic Weather Station.*

Trend has an important advantage: You can start it running and leave for work, go shopping or go to bed, and your computer will consistently take samples and record data. You can also accumulate files, and go back at your leisure to use that historical data to check on weather trends.

Well, how did we do with Trend? After collecting our data, we saved it and went back to the master menu to select the Forecast mode. Waiting breathlessly, we watched the slot-machine style display flash "Stormy," "No Change," "Windy and Cooler," etc., until it finally stopped on "No Change." Big deal, but it *was* right—the next day was almost a clone of the previous one. This happened several frustrating times, but eventually we got a change. HAWS reported the weather would become warmer and more cloudy, and it

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*It's a heady feeling to do your own weather predicting!*

did—hooray!

To be a little picky, I would have preferred to be given a numerical reading or range (for instance, "70–75 and more cloudy") rather than the less specific prediction ("warmer and more cloudy") that I received. But it *is* a heady feeling to do your own weather-predicting, with or without number values!

**Graphs**

You can also call up the Graph mode on your HAWS to see your data displayed against time. But be careful: the first picture may show you a plunge in one of your factors, say temperature, and you'll think a dramatic change has occurred. When you press the return key, however, you'll find the variation between each point is just .2. So a dip of ten scale graduations indicates only two degrees difference! Check all the graph information to get a complete picture.

**Comfactor**

Another interesting mode is Comfactor (comfort factor). Comfactor reads the temperature, humidity, air pressure and dewpoint, then tells you what percentage of people would feel comfortable in this weather. (If the temperature is lower than 60 degrees, try the Wind Chill Factor mode.)

We tried Comfactor on December 11th at 8:39 AM. The program first asked if we wanted to use HAWS, rather than our own data. I entered YES, and HAWS reported the temperature at 71.5, the air pressure at 30.15, the dewpoint at 64 and the humidity at 77%. According to HAWS, 70% of the people would feel comfortable under these conditions. Sounded good to me.

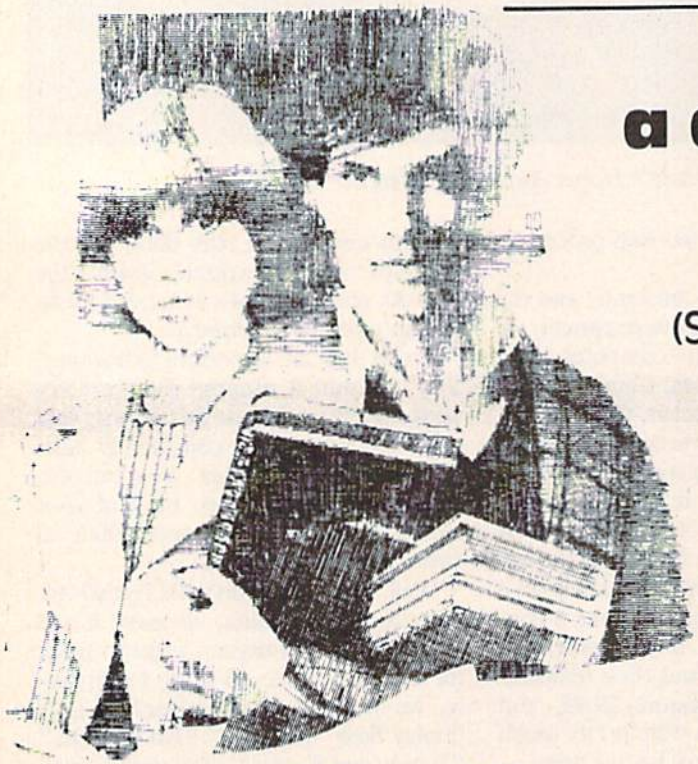
**Wind Chill Factor**

In the Wind Chill Factor mode, the computer reads the temperature (or you input your own data), then you estimate the approximate wind speed, from "light air" (under four miles per hour) to hurricane-force winds (over 75 miles per hour).

The computer then gives you a number for "K," from zero, for very hot, to a maximum of 2500, for intolerably cold. (At 2500 K, "exposed flesh freezes within thirty seconds.")

We ran HAWS on December 11th and discovered our Wind Chill on the K Scale was 50.9. According to our chart in the manual, 51 signifies that conditions are "warm; clothes should allow for circulation."

But since wind chill factor is far more meaningfully used in a cold climate, I decided to test another area. I looked up the predicted high and low temperatures for the nation, and learned that Chicago's high was predicted to be 27 on January 27th. I entered NO when the computer asked if I wanted to use HAWS, and I entered my own data.

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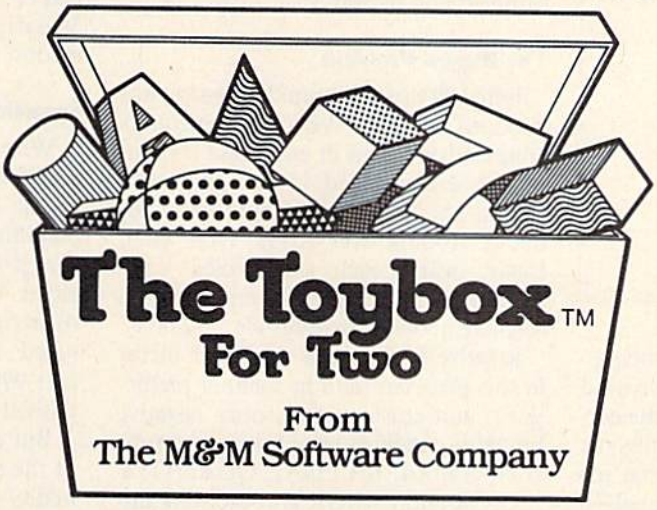


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*HAWS is an exciting product at the leading edge of technology.*

I typed in 27 for temperature, then selected "gentle breeze, 9 miles" for wind speed. (Press the space bar until the correct wind speed is shown, then press the return key. If you're not sure what the wind speed is, check the manual—a 4-mile wind, light air, means "wind felt on face; leaves rustle," while during a moderate gale, "entire trees sway; difficult to walk into wind.")

Using my data, HAWS came up with a K Scale of 949.9 and a wind chill of 13.7 degrees. This fell within the scale of 801–1400 in the manual, so Chicago weather for that day translated to "frigid; keep extremeties well-covered and dry; layer clothing; watch for gray or white skin patches, which indicate frostbite." (Don't worry, Chicago, summer's on its way.)

### The Biggest Problem

Reliability of the humidity sensor was a serious problem. We tested three units consecutively, and in each case the humidity sensor failed in less than two weeks. The first sign of failure was a humidity reading over 100%, (106, 107). Later, when each unit failed catastrophically, humidity was reported as a negative quality; for example, −278%.

Relative humidity is a critical factor in this program (and in weather prediction), and consequently, once negative humidity readings were taken, the program crashed; ILLEGAL QUANTITY ERROR and ERROR IN 6040 were displayed on screen.

Company officials admitted they'd discovered a bad batch of about 100 sensors, and, unfortunately, I got two of them. But the third one failed the same way. Each time, however, temperature and air pressure readings remained accurate.

Why did this third humidity sensor also fail? Perhaps the extremely high humidity here in Palm Bay could aggravate any failure tendencies. Or maybe it's another bad sensor. Whatever the cause, I shipped the third unit back to Vaisala, just as I shipped the first and second units.

### Something Useful

Who could use HAWS? Farmers could find "real time" data extremely useful in planning their crops, from planting to harvest. Students would find it fun as well as educational, using either HAWS readings or substituting their own data. (I ran Comfactor and typed in 99 degrees for temperature and 99% humidity, and the computer flashed "DANGER! DANGER!")

But every user will demand reliability of the system, and the cause of the humidity sensor failures must be identified and resolved.

Despite this technical glitch, HAWS is an exciting and unique product at the leading edge of technology. It's a brilliant and amazing application for the home computer. R


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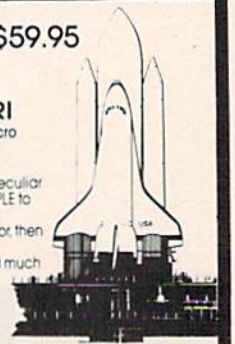

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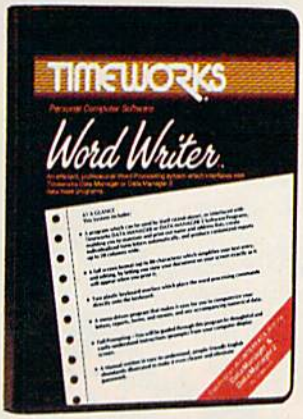


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A menu-driven program that easily lets you store information on a wide variety of subjects—from general name and address lists, to research data. This program will also calculate and store any corresponding numerical data.

Quick access to important information. Items can be easily retrieved and printed by category, name, index code, date range, amount range, or any category of information stored in the system.

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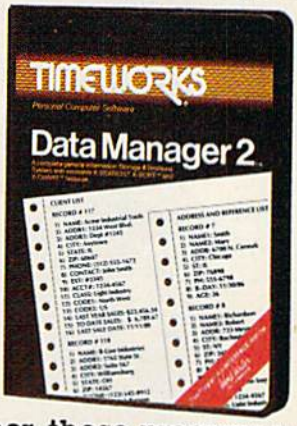


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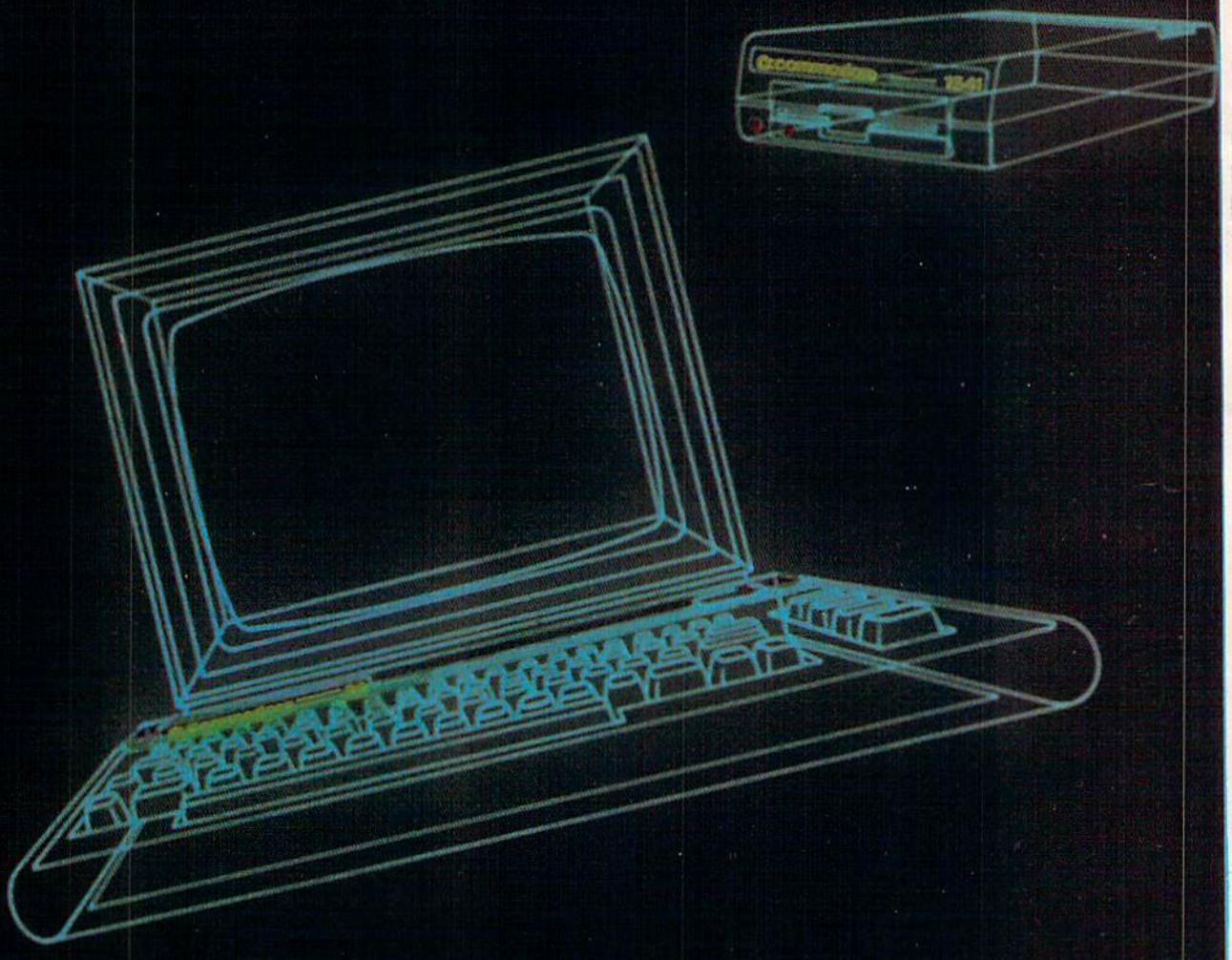
# JOURNEY

## To the Center of Your C-64



*Artwork by Jim Laurier. Design by Suzanne Torsheya. Photo composite and special effects by Mike Kressley.*



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By Philip I. Nelson

# *Take this excursion and explore the mysteries of your computer's memory.*

Have you ever wished you could really *see* what happens inside your computer? Snooper is a program that makes your TV screen a movable window that you can use for a graphic top-to-bottom tour of your Commodore's memory.

You'll see how a Basic program is stored and organized, get a good look at your computer's Basic language and operating system in ROM and pass by many other points of interest. I'll refer specifically to the C-64, but VIC-20 owners will find much that applies equally to their machines, since both computers are based on the 6502 microprocessor.

To make Snooper work properly, type it in exactly as listed, without adding any spaces or deleting any Remarks. The program contains machine language (ML), so be sure to save a copy before you run it, in case of a deadly typing error. Once that's done, turn the computer off and on to clean everything out of memory, then load and run.

First you'll see an instruction display scroll back and forth across the screen. When it stops, press the A key to check the address of your memory window. If the numbers don't match those in the instructions, press Q to quit, and check for typing errors. If the numbers *do* match, press any key to erase the address display, put on your Snooper's hat and follow along!

### Condensed Version

Pressing the down cursor key moves you to lower addresses in memory, one screen line (40 bytes) at a step. Try scrolling down a few lines from location 12288, where the instructions begin; the screen will start to fill with graphic gobbledygook.

Every graphic character on the screen before you represents an individual memory cell (location) in the computer. There are 65536 cells in all, numbered from zero through 65535, and each cell always holds some number within the range of zero through 255.

You can tell what number is stored in any on-screen location simply by looking up its character in the user's manual table of screen display codes. For example, the * character at the upper left of the instructions means location 12288 holds a value of 42. 12289 is blank, so the value in there is 32, and so on. Note that a zero value shows up as the @ character, and reversed-video characters represent values from 128 through 255.

Knowing this, you can tell what value is stored in any location and can identify locations with your address-checker and simple arithmetic. But don't waste your time trying to interpret the gobbledygook. It's just "free RAM," unused memory space that contains no meaningful pattern. There's plenty of this before you come to your Basic program, so keep scrolling down until your address-checker shows you've found locations 2084–3047. Press the cursor up key if you overshoot the mark.

Found the spot? If you don't see any English words, press the Commodore and shift keys simultaneously. The top line will show the word Snooper, flanked by asterisks. This is the Basic program's line 1, which contains a Remark. That much looks familiar, and you see other English words elsewhere, but what hap-

*Address author correspondence to Philip I. Nelson, 3801 Garfield Ave. South, Minneapolis, MN 55409.*

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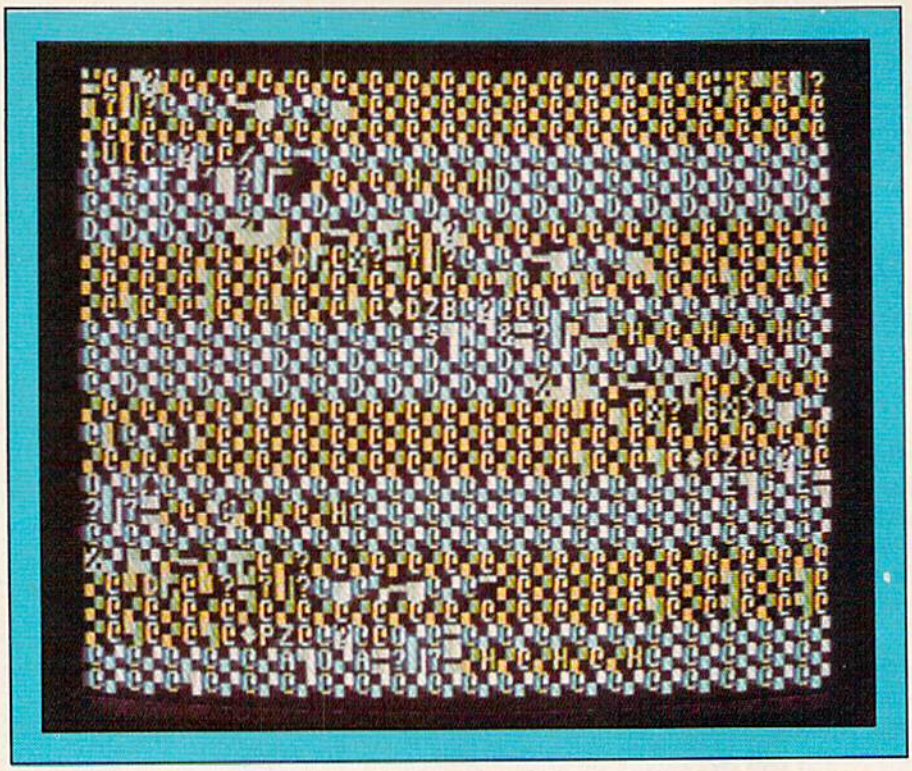
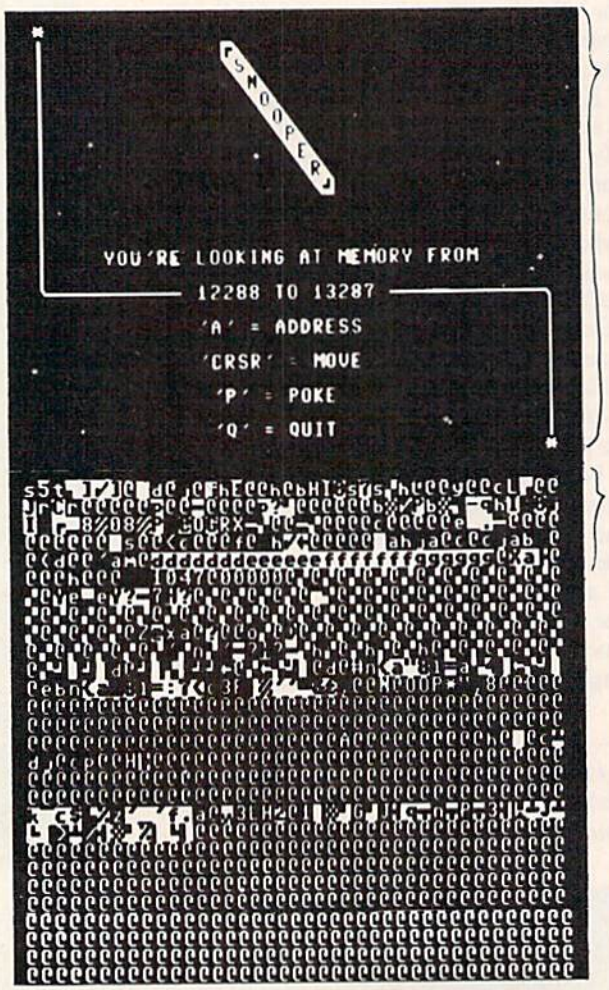


*The RAM "vacant" lot where your next software masterpiece will reside.*

*What you see when Snooper's screen scrolls.*




pened to the rest of your program?

Don't worry—the lines you typed in are still there. You're just looking at the "for-computers-only" edition. To save space and time, the computer condenses your Basic lines as it stores them in RAM, compressing each Basic keyword into a special one-character symbol called a token.

Compare this *Reader's Digest* condensed version with line 2 in the magazine listing, and you'll see that Poke is compressed into a reversed W character. The token for GOSUB is reversed M, and so on.

To realize how much space this saves, consider that this 1000-byte block of memory on your screen contains the Snooper program almost through the end of line 29. Listing those same lines would take up about 1650 bytes, two-thirds again as much memory space. And this is only part of the program.

Compressing your program text also saves time, since the computer can recognize the one-byte token and rush immediately onward, rather than wade through the three or four bytes of a Basic word. Your thrifty computer economizes even more by jamming all the lines together end-to-end. To mark the end of each line for itself, the computer stores a zero value there (look for the @ character). Your program line numbers are also squeezed down, but certain other things just can't be condensed.

As you've seen, Remarks (like line 1) have to be stored in memory just as they appear when you list. So even down here in the computer's innards, you can still read your Remarks. The same is true of Basic variable and array names and of any characters you stick inside double quotes, as in a Print statement. Spaces are also left in, except for the space after a line number. This literal storage of certain text items usually creates no problem for the generously endowed C-64, but using unnecessary Remarks on the VIC-20 is a waste of precious memory space.

### Storing Variables

This text storage zone is static. You can watch all day, but nothing will change here. Your Basic program must be stored as a fixed, reliable text for the computer to read as it runs. Like a diligent student, it starts at the beginning

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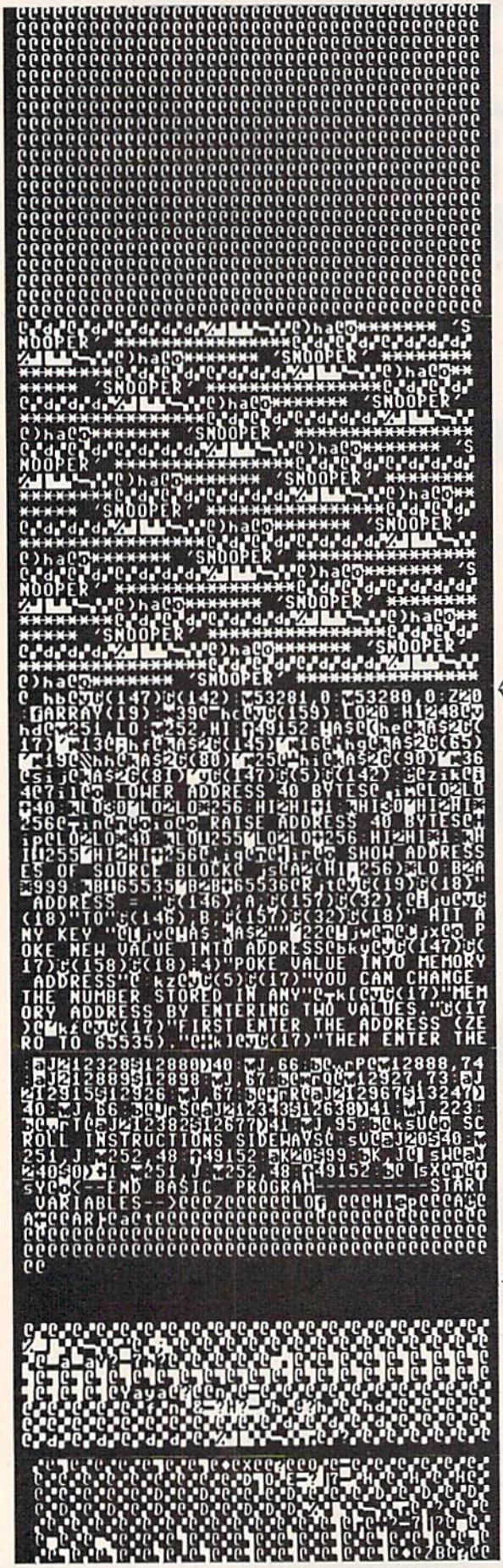


and takes everything in order, performing your instructions as it goes along.

C-64 Basic text storage normally starts at location 2048, so the computer has no problem finding the beginning. Actually, location 2048 must always contain a zero, so the text (including line numbers) really starts at location 2049. But some programs are longer than others, so how does the computer know when it has reached the end of the text? It knows when it comes to a marker. When it stores your Basic program, the computer marks the end-of-text point in memory by storing two extra zeros right after the zero that marks the end of your last Basic program line.

Now move back up in memory to see this. To make it easier to find, I drew some blank lines around where I knew Snooper would end in RAM, and I made the very last line a Remark that says <—END BASIC PROGRAM—START VARIABLES—>. Keep in mind that the dark, blank spaces you see are *not* normally present. I just planted them to simplify this first snoop.

Found the last Remark? After the last arrow comes the three-zeros marker. If you scroll this line up to the top of your screen and use the address-checker, arithmetic will tell you that the final character of the Basic text occupies location 5020, followed by the end-of-text marker. But if that's the end, who tacked that other stuff onto your program, and what does it mean?

The culprit is your computer, which needs more RAM to run your program than is taken up by the text alone. Before it can carry out your commands, it has to set aside three extra zones in memory for its own use: storage space for variables, arrays and strings.

Perhaps you've wondered, when programming in Basic, how your computer keeps track of the values for all those variables you're using. It's done with a surprisingly simple system, which you're looking at right now. As soon as you run the program, the computer sets up a series of pigeonholes in memory, one for every variable, and stores the current value for each variable in its own special slot. This variable storage space always begins immediately after (above) Basic program text.

For example, if your program uses the variable A, the computer sets up a pigeonhole and labels it A. Every time you change the value of A with a statement like A=A+1, the computer rushes back to the A pigeonhole to change its contents to the new value. Then, whenever you use A in a state-


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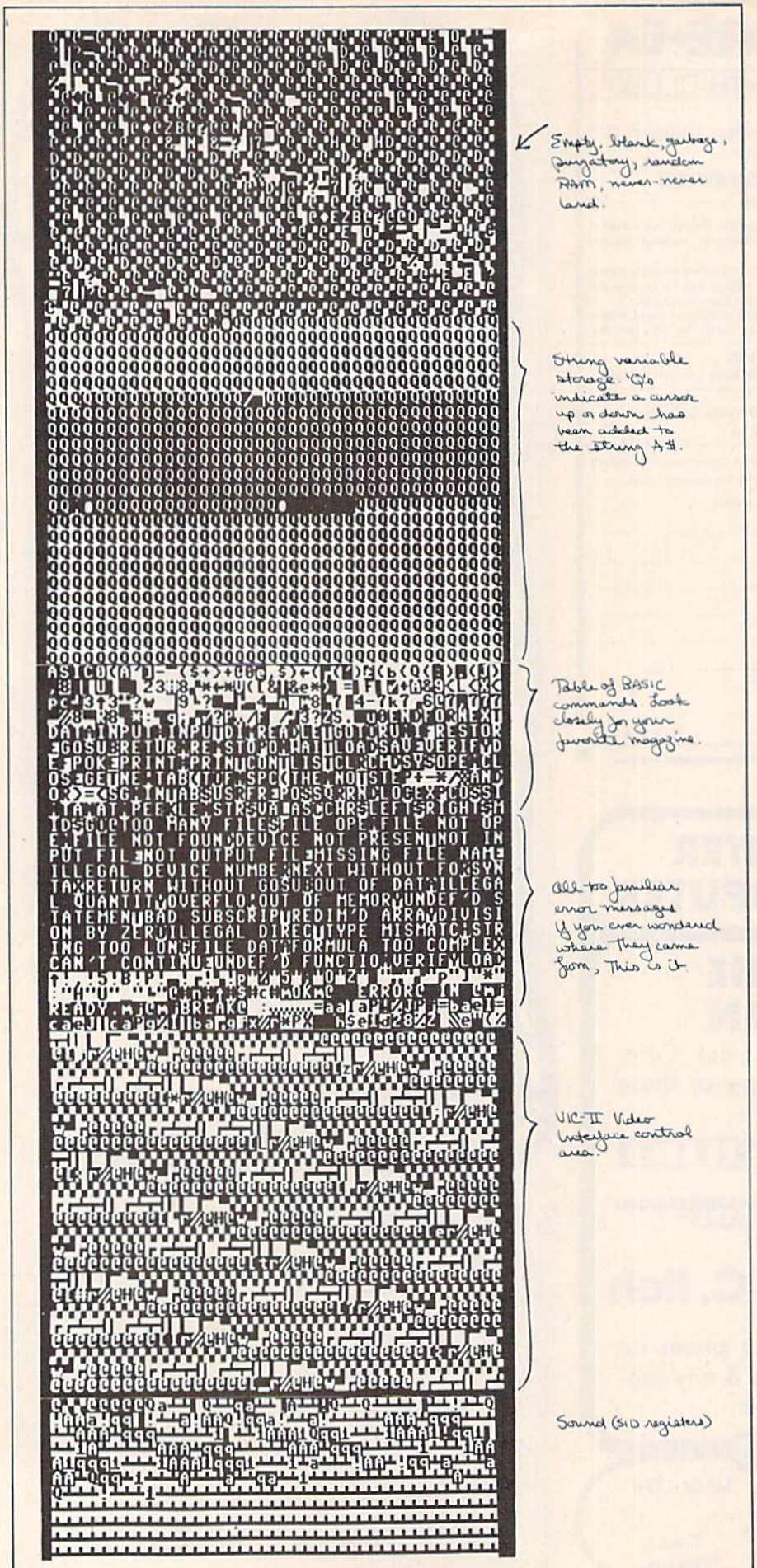


ment like C=A*B, the computer will rush back to the A pigeonhole to learn the current value of A before using it in the calculation.

The computer starts setting up this row of pigeonholes for your variables as soon as you tell it to run, and it creates one storage space for each variable in the order it actually encounters them during program execution. To see how this works in Snooper, note in the listing the immediate GOSUB out of line 2 to line 39. This sticks the machine language routine and instruction display into memory.

Thus, the first variables the computer runs into are Z in line 2, followed by J and Q in line 41 and K in line 86. Look carefully at the memory cells following the end-of-text marker, and you'll find each of these variable spaces labeled with its own letter. These variables aren't in use, so their pigeonholes are quiet now. But the next two pigeonholes will show you variable storage in action.

Snooper uses two variables, LO and HI, to keep track of its current location. Found LO and HI? Now scroll up or down in memory, one screen line at a time. As you do so, new characters appear right next to the variable labels, as the computer stores new values for LO and HI in their respective pigeonholes.

Following LO and HI is a space for your single string variable, A$. This is the busiest pigeonhole of all. If you haven't found it yet, hold the space bar down and watch the computer frantically jam new values into the A$ variable slot. This happens because line 4 of the program contains the statement GET A$, and it cycles again and again through that line.

Each time through, the computer stores a new A$ value if a new key is pressed. (As you'll see below, there's something else happening in high memory, too.) The next two variables, A and B, aren't updated until you use the address-checker. You'll see the values change in their spaces if you check your address every time you scroll up or down a line.

When the program first comes to the Poke routine, the computer will set aside space for the last two variables, C and D. You can have fun watching the characters change inside these pigeonholes, but don't bother trying to decipher what they mean, unless you understand arcane numbering systems like "excess 128 format." Just take it on faith that your computer knows what it's doing here.

Since every Basic program ends at a different spot, and variable storage


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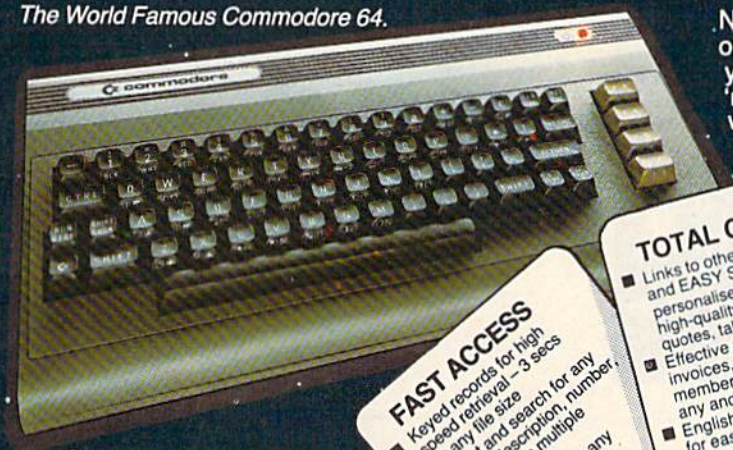

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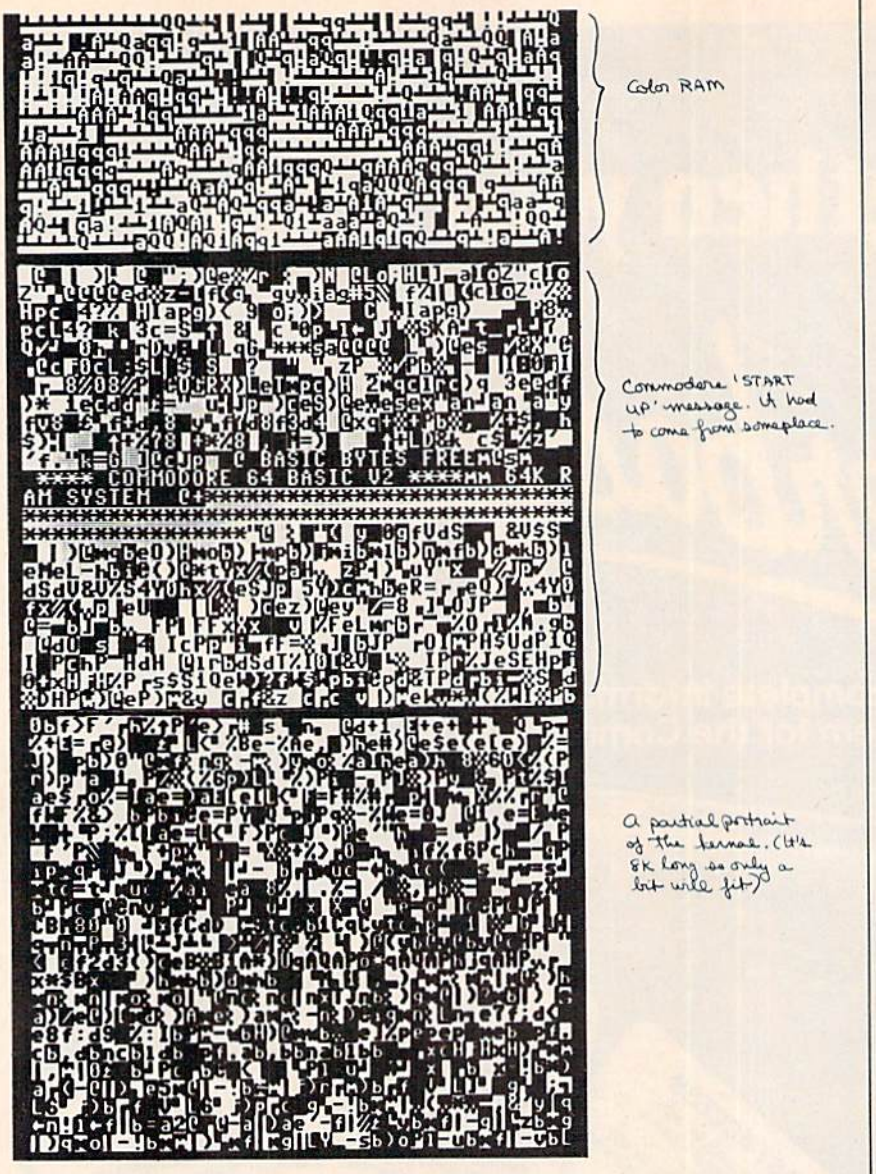


*Listing 1. Snooper program for the VIC-20.*

```
1 REM* 'VICSNOOPER' *
2 PRINTCHR$(147)CHR$(14):POKE36879,8:Z=0:DIMARRAY(19):G
    OSUB39
3 LO=0:HI=16
4 POKE251,LO:POKE252,HI:SYS828:GETA$
5 IFA$=CHR$(17)THENGOSUB13
6 IFA$=CHR$(145)THENGOSUB16
7 IFA$=CHR$(65)THENGOSUB19
8 IFA$=CHR$(80)THENGOSUB25
9 IFA$=CHR$(90)THENGOSUB36
10 IFA$=CHR$(81)THENPRINTCHR$(147)CHR$(142):END
11 GOTO4
12 REM LOWER ADDRESS
13 LO=LO-22:IFLO<0THENLO=LO+256:HI=HI-1:IFHI<0THENHI=HI
    +256
14 RETURN
15 REM RAISE ADDRESS
16 LO=LO+22:IFLO>255THENLO=LO-256:HI=HI+1:IFHI>255THENH
    I=HI-256
17 RETURN
18 REM CHECK ADDRESS
```

More

space is tacked onto the end of Basic text, the address where variable storage begins will depend on the length of your program. The size of the variable storage zone will depend on how many variables you use.

If you need to save space, it's more economical to use the same "junk" variables over and over in a series of For...Next loops, as you find in lines 41 through 87 of Snooper. Otherwise, memory will be set aside for a gang of lazy variables who do just one job at the start of your program and sit idle the rest of the time.

### Stashing Arrays

Smack-dab on top of variable storage is the second special zone, array storage space. An array works like a table or list of data inside your program. You plug in all the values beforehand, and then pluck them out whenever needed, simply by referring to their position in the array.

Snooper doesn't need this, but for demonstration it includes a do-nothing array called ARRAY. Every time you press the Z key, the computer will assign a new (random) value to the next space (element) in the ARRAY table. To see this happen, you'll need to find the "header" that labels and defines the array. First you'll find the first two characters of the name itself, AR. Next are five locations that define (in compressed format) the size and type of the array.

This is a "floating point" array, so the computer has reserved five cells to store the value for each element. Space is set aside by filling cells with zeros. As you define each element by pressing Z, the computer will plop new values into these spaces. Your values are all whole numbers, which can be stored in just two cells, so three of the five cells in each space remain unused.

Go ahead and press Z a few times, to see it work. Note that the array has 20 elements, even though dimensioned with the statement DIMARRAY(19). Here, as elsewhere, the computer counts zero as a number, so the first element is ARRAY(0), followed by ARRAY(1) and so on.

The end-of-variables point can change midway through a program run if the computer then encounters a new variable for the first time. When that happens, the entire array storage zone will be "bumped up" in memory to make room for a new variable storage space. Snooper's ARRAY doesn't take up much RAM, but keep in mind that array space, like variable space, doesn't come free.


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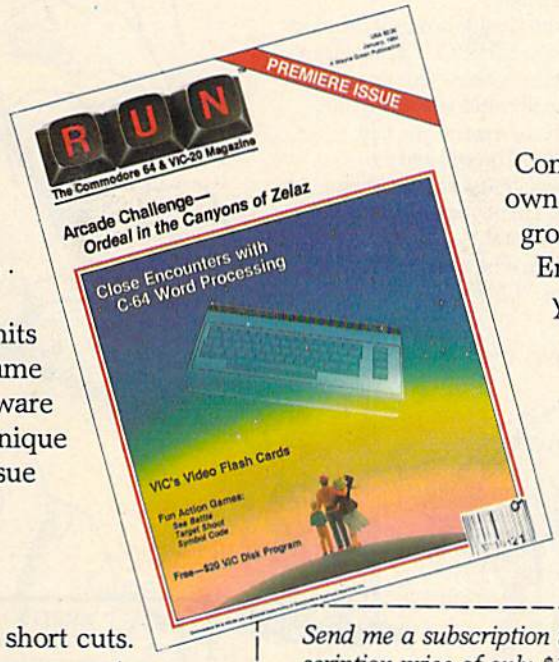


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# ADVENTURES IN THE LAND OF THE COMMODORE 64.

**Our brave companions Mighty VICTREE, Speedy ARROW, Professor MIKRO and his faithful dog ZOOM are off to help build a greater, more glorious Commodore Kingdom.**

"There, up ahead—I see it!" exclaimed the impetuous young Speedy Arrow. "Yes, I do too," said wise Professor MIKRO, as his dog ZOOM yipped happily. VICTREE squinted at the light shining in the distance. Earlier in the year, the Land of the Commodore 64 had asked for aid from the Wizard of Skyles Electric Works. The great Marketplace Flood had temporarily hurt the Kingdom, and so the Wizard dispatched the four journeyers to help build a greater, more powerful monarchy.

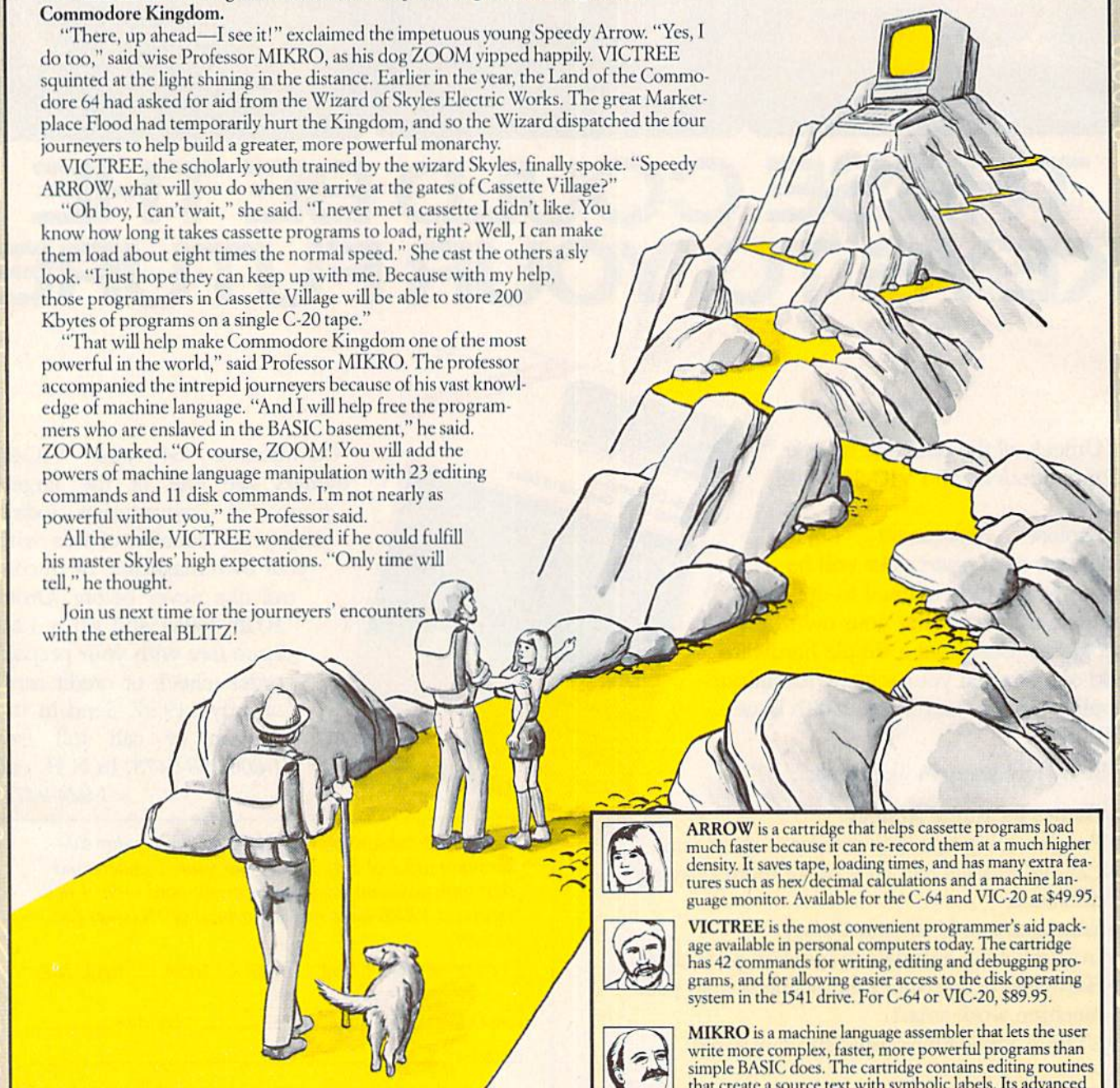
VICTREE, the scholarly youth trained by the wizard Skyles, finally spoke. "Speedy ARROW, what will you do when we arrive at the gates of Cassette Village?"

"Oh boy, I can't wait," she said. "I never met a cassette I didn't like. You know how long it takes cassette programs to load, right? Well, I can make them load about eight times the normal speed." She cast the others a sly look. "I just hope they can keep up with me. Because with my help, those programmers in Cassette Village will be able to store 200 Kbytes of programs on a single C-20 tape."

"That will help make Commodore Kingdom one of the most powerful in the world," said Professor MIKRO. The professor accompanied the intrepid journeyers because of his vast knowledge of machine language. "And I will help free the programmers who are enslaved in the BASIC basement," he said. ZOOM barked. "Of course, ZOOM! You will add the powers of machine language manipulation with 23 editing commands and 11 disk commands. I'm not nearly as powerful without you," the Professor said.

All the while, VICTREE wondered if he could fulfill his master Skyles' high expectations. "Only time will tell," he thought.

Join us next time for the journeyers' encounters with the ethereal BLITZ!





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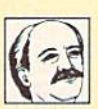
**VICTREE** is the most convenient programmer's aid package available in personal computers today. The cartridge has 42 commands for writing, editing and debugging programs, and for allowing easier access to the disk operating system in the 1541 drive. For C-64 or VIC-20, $89.95.



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*You can avoid grief and bafflement by never forgetting that screen memory and Basic text live right next door on the C-64.*

Your computer can't run a Basic program without first setting aside memory for these extra zones, which means the program occupies more memory space *after* you run it than it does when you've simply loaded it up. You can verify this sometime with the FRE function. What's the lesson here? If your text alone comes near to using up all of free RAM, you may have a program that saves and loads perfectly, but aborts with an Out Of Memory error the minute you try to run it.

While examining variables and arrays, perhaps you wondered how the computer keeps track of these special zones, since they'll be in a different place for every program. It's not done with mirrors, but with "pointers." In the same way it uses an individual pigeonhole to store the value for each variable, your computer uses other pigeonholes to store the addresses (locations) of these zone boundaries. Because of a peculiarity (which I'll explain later), it takes *two* adjacent memory cells to store these addresses.

Very low in memory, in locations 43 and 44, your computer stores the address that points it to the beginning of your Basic program text. To make things easy, the computer automatically puts 2049 in this pigeonhole when you turn the power on. When you tell the computer to run, it first rushes to this pigeonhole to find where your text begins, and then goes to the program.

Right next door, in locations 45 and 46, is the pigeonhole where the computer keeps the address for the start of variable storage. The computer can't store this address until it's done loading and knows where Basic text ends. Array storage always starts right on top of variable storage, so the computer can use just one pointer (in memory cells 47 and 48) to mark where one zone ends and the next begins.

To see where array storage ends, the computer looks at locations 49 and 50. You don't have to understand these pointers for simple Basic programming, since the computer manages them by itself. But you can play some fancy tricks if you know how they work.

```
19 A=(HI*256)+LO:B=A+505:IFB>65535THENB=B-65536
20 PRINT"{HOME}{CTRL 6}{CTRL 9}ADDRESS"A"{CRSR LF} TO"B
   "{CTRL 2}"
21 GETA$:IFA$=""THEN21
22 PRINTCHR$(19)"{22 SPACEs}"
23 RETURN
24 REM POKER
25 PRINT"{SHFT CLR}{CTRL 8}{CTRL 9} POKE NEW VALUE ":PR
   INT"{CRSR DN}{CTRL 2}CHANGE CONTENTS OF AN":PRINT"
   {CRSR DN}ADDRESS BY ENTERING"
26 PRINT"{CRSR DN}TWO NUMBERS. FIRST IS":PRINT"{CRSR DN
   }ADDRESS, SECOND IS":PRINT"{CRSR DN}VALUE YOU WANT
   TO"
27 PRINT"{CRSR DN}PUT IN THE ADDRESS.{CRSR DN}"
28 INPUT"{CTRL 8}ENTER VALUES";C,D:POKEC,D:PRINT"{CTRL
   2}ONCE MORE? 'Y'=YES"
29 GETA$:IFA$=""THEN29
30 IFA$="Y"THEN28
31 PRINTCHR$(147):RETURN
35 REM ARRAY MAKER
36 ARRAY(Z)=INT(RND(1)*255):Z=Z+1:IFZ=20THENZ=0
37 RETURN
38 REM POKE ML ROUTINE
39 IFPEEK(828)=160ANDPEEK(850)=96THENRETURN
40 FORJ=828TO850:READQ:POKEJ,Q:NEXT
41 DATA 160,0,177,251,153,0,30,200,208,248
42 DATA 230,252,160,0,177,251,153,0,31,200
43 DATA 208,248,96
44 FORJ=5482TO5635:POKEJ,32:NEXT
45 REM MOVE SIDEWAYS
46 FORJ=0TO30:POKE251,J:POKE252,16:SYS828:FORK=1TO130:N
   EXTK,J
47 FORJ=30TO0STEP-1:POKE251,J:POKE252,16:SYS828:FORK=1T
   O10:NEXTK,J
48 RETURN
49 REM<-END BASIC TEXT------START VARIABLES-->
```

*Listing 2. Snooper program for the C-64.*

```
1 REM******* 'SNOOPER' ***************
2 PRINTCHR$(147)CHR$(142):POKE53281,0:POKE53280,0:Z=0:D
   IMARRAY(19):GOSUB39
3 PRINTCHR$(159):LO=0:HI=48
4 POKE251,LO:POKE252,HI:SYS49152:GETA$
5 IFA$=CHR$(17)THENGOSUB13
6 IFA$=CHR$(145)THENGOSUB16
7 IFA$=CHR$(65)THENGOSUB19
8 IFA$=CHR$(80)THENGOSUB25
9 IFA$=CHR$(90)THENGOSUB36
10 IFA$=CHR$(81)THENPRINTCHR$(147)CHR$(5)CHR$(142):END
11 GOTO4
12 REM LOWER ADDRESS 40 BYTES
13 LO=LO-40:IFLO<0THENLO=LO+256:HI=HI-1:IFHI<0THENHI=HI
   +256
14 RETURN
15 REM RAISE ADDRESS 40 BYTES
16 LO=LO+40:IFLO>255THENLO=LO-256:HI=HI+1:IFHI>255THENH
   I=HI-256
17 RETURN
18 REM SHOW ADDRESSES OF SOURCE BLOCK
19 A=(HI*256)+LO:B=A+999:IFB>65535THENB=B-65536
20 PRINTCHR$(19)CHR$(18)" ADDRESS = "CHR$(146);A;CHR$(1
   57)CHR$(32);
21 PRINTCHR$(18)"TO"CHR$(146);B;CHR$(157)CHR$(32)CHR$(1
   8)" HIT ANY KEY "
22 GETA$:IFA$=""THEN22
23 RETURN
24 REM POKE NEW VALUE INTO ADDRESS
25 PRINTCHR$(147)CHR$(17)CHR$(158)CHR$(18)TAB(4)"POKE V
   ALUE INTO MEMORY ADDRESS"

26 PRINTCHR$(5)CHR$(17)"YOU CAN CHANGE THE NUMBER STORE
   D IN ANY"
```

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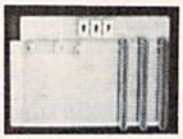

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*Listing 2 continued.*

```
27 PRINTCHR$(17)"MEMORY ADDRESS BY ENTERING TWO VALUES.
   "CHR$(17)
28 PRINTCHR$(17)"FIRST ENTER THE ADDRESS (ZERO TO 65535
   )."
29 PRINTCHR$(17)"THEN ENTER THE VALUE (FROM ZERO TO 255
   )"
30 PRINTCHR$(17)"YOU WANT TO POKE INTO THAT ADDRESS."CH
   R$(17)CHR$(17)CHR$(158)
31 INPUT"ENTER 2 VALUES";C,D:POKEC,D:PRINTCHR$(17)CHR$(
   5)"ONCE MORE? 'Y' = YES"
32 GETA$:IFA$=""THEN32
33 IFA$="Y"THENPRINTCHR$(158):GOTO31
34 PRINTCHR$(159):RETURN
35 REM{2 SPACEs}DEFINE ARRAY ELEMENT
36 ARRAY(Z)=INT(RND(1)*255):Z=Z+1:IFZ=20THENZ=0
37 RETURN
38 REM BASIC LOADER FOR ML COPY ROUTINE
39 IFPEEK(49152)=160THENRETURN
40 POKE214,12:PRINT:PRINTTAB(10)CHR$(18)CHR$(5)" JUST A
   MINUTE "
41 FORJ=49152TO49200:READQ:POKEJ,Q:NEXTJ
42 DATA 160, 0, 177, 251, 153, 0, 4
43 DATA 200, 208, 248, 230, 252
44 DATA 160, 0, 177, 251, 153, 0, 5
45 DATA 200, 208, 248, 230, 252
46 DATA 160, 0, 177, 251, 153, 0, 6
47 DATA 200, 208, 248, 230, 252
48 DATA 160, 0, 177, 251, 153, 0, 7
49 DATA 200, 192, 232, 208, 246, 234
50 REM ML RTN BELOW WHITES COLOR MEMORY
51 FORJ=49201TO49220:READQ:POKEJ,Q:NEXT
52 DATA 162, 0, 169, 1, 157, 0, 216
53 DATA 157, 0, 217, 157, 0, 218, 157
54 DATA 0, 219, 232, 208, 241, 96
55 REM INSTRUCTION SCREEN DATA
56 DATA 240, 147, 142, 143, 143, 144
57 DATA 133, 146, 253, 25, 15, 21, 39
58 DATA 18, 5, 32, 12, 15, 15, 11, 9
59 DATA 14, 7, 32, 1, 20, 32, 13, 5
60 DATA 13, 15, 18, 25, 32, 6, 18, 15
61 DATA 13, 49, 50, 50, 56, 56, 32, 20
62 DATA 15, 32, 49, 51, 50, 56, 55, 39
63 DATA 1, 39, 32, 61, 32, 1, 4, 4, 18
64 DATA 5, 19, 19
65 DATA 39, 3, 18, 19, 18
66 DATA 39, 32, 61, 32, 13, 15, 22, 5
67 DATA 39, 16, 39, 32, 61, 32, 16
68 DATA 15, 11, 5, 39, 17, 39, 32
69 DATA 61, 32, 17, 21, 9, 20
70 REM DRAW INSTRUCTIONS
71 FORJ=12288TO13327:POKEJ,32:NEXT:FORJ=5128TO5327:POKE
   J,32:NEXT
72 FORJ=12342TO12678STEP41:READQ:POKEJ,Q:NEXT
73 FORJ=12813TO12841:READQ:POKEJ,Q:NEXT
74 FORJ=12900TO12913:READQ:POKEJ,Q:NEXT
75 FORJ=12980TO12992:READQ:POKEJ,Q:NEXT
76 FORJ=13060TO13072:READQ:POKEJ,Q:NEXT
77 FORJ=13141TO13150:READQ:POKEJ,Q:NEXT
78 FORJ=13221TO13230:READQ:POKEJ,Q:NEXT
79 POKE12288,42:POKE13287,42:FORJ=12328TO12880STEP40:PO
   KEJ,66:NEXT
80 POKE12888,74:FORJ=12889TO12898:POKEJ,67:NEXT
81 POKE12927,73:FORJ=12915TO12926:POKEJ,67:NEXT
82 FORJ=12967TO13247STEP40:POKEJ,66:NEXT
83 FORJ=12343TO12638STEP41:POKEJ,223:NEXT
84 FORJ=12382TO12677STEP41:POKEJ,95:NEXT
85 REM SCROLL INSTRUCTIONS SIDEWAYS
86 FORJ=0TO40:POKE251,J:POKE252,48:SYS49152:FORK=0TO99:
   NEXTK,J
87 FORJ=40TO0STEP-1:POKE251,J:POKE252,48:SYS49152:NEXT
88 RETURN
89 REM<--END BASIC{2 SPACEs}PROGRAM----------START VARI
   ABLES-->
```


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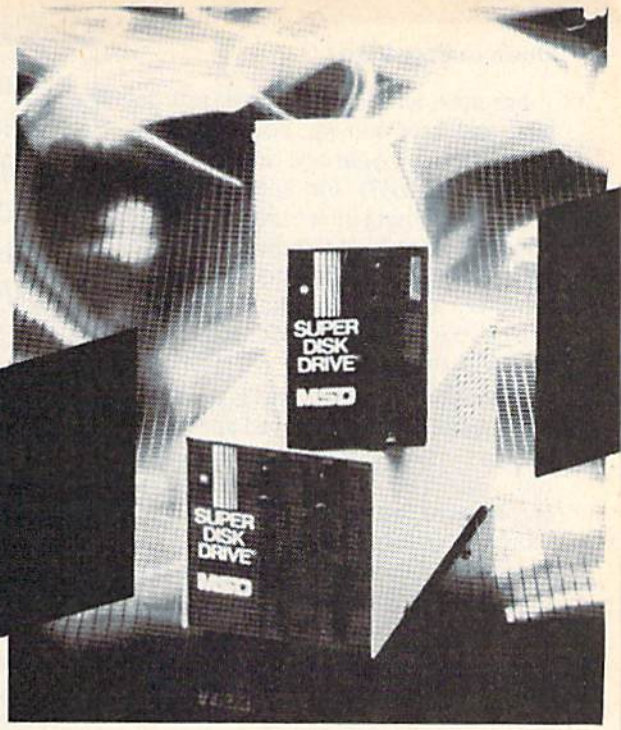


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### Down to Page Zero

For now, let's leave the Basic text behind and keep moving down in memory. Just below your text are eight locations (2040–2047) for sprite graphics pointers. Nothing interesting here, since Snooper doesn't use sprites. The area right under 2024 is in very heavy use, however, and as you snoop into that zone, your screen will do some very squirrelly things.

What you've barged into is the 1000-byte memory block reserved for screen memory (1024–2023). The computer uses this area to display messages, graphics, or whatever on your TV or monitor screen. Under normal circumstances, Poking a value from zero to 255 into any of these 1000 locations will make a character show up on your screen. Again, the screen display code table tells you what value to Poke to display any character.

But don't try to interpret the characters you see flowing around screen memory now—they're meaningless. Snooper is just copying and recopying higher parts of screen memory into lower parts as you change addresses. Play around for a while if you like. You'll find that moving one line at a time creates effects very different from those you see when plowing steadily through this zone. The screen won't behave normally again until you've moved completely below screen memory.

You can avoid grief and bafflement by *never* forgetting that screen memory and Basic text live right next-door on the C-64. If you write a graphics game that works by Poking characters onto the screen, but carelessly let your game character run past location 2023 into locations above 2047, you'll Poke into your precious Basic text and replace meaningful instructions with nonsense. To prevent the crash that invariably results from such random editing, you must strictly confine all Pokes to locations 1024–2023, or take other measures to safeguard your text.

*Next month we'll tour the highest block of memory, the ROM operating system, and take a peek at Peeks and Pokes.*

You're getting close to the bottom now, and your destination is the famous "zero page," so let's whiz past locations 256–1022, which are mostly full of work space and assorted gizmos for the computer itself. Move down until your address-checker shows you're on locations 8–1007. Don't worry if you accidentally go "below" location zero. The program will wrap all the way around your computer's memory and tack a few of its highest bytes onto the lowest.

Page zero, the lowest 256 memory cells in the computer, is one of the most important and useful zones of all. What makes it special is that the address of each location here is small enough to fit in just one memory cell, while all other addresses take up two cells (more of this later).

This makes it prime territory for ML programmers—so valuable, in fact, that the people who designed your computer have already furnished most of this page with special storage spaces and other goodies that the computer needs for its own operations. Unlike the static text-storage zone, there's always something changing here.

This zone is RAM, though, so the computer (or a nervy snooper) can Poke new values into any zero-page cell. And those thoughtful designers left four cells (251–254) of this costly real estate vacant, specifically for hackers like you to use as you please. Snooper uses two of these (251 and 252) to store a "source address" pointer for its ML subroutine.

To look at your very own pigeonhole, first find the screen line that begins with location 248. Scroll up or down and you'll see the character change inside 251. Don't confuse this storage space with the bigger space from 256–266 where a decimal number appears—that's a little work area used by the computer. All the addresses down here are one cell in size, so the second half of our pigeonhole, 252, just holds a zero now.

Next month, in the second part of this article, your guided tour will wrap you around below page zero to the highest block of memory. You'll see the operating system ROM, the zones for color, sound and the handling of external devices, and finally end with a close look at Pokes, Peeks and the arithmetic of addressing. R


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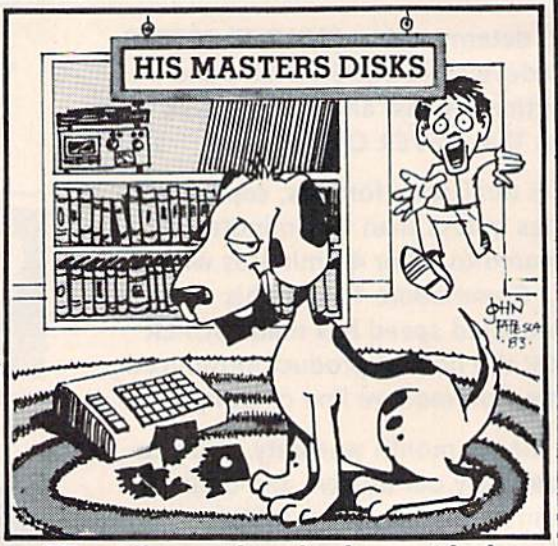


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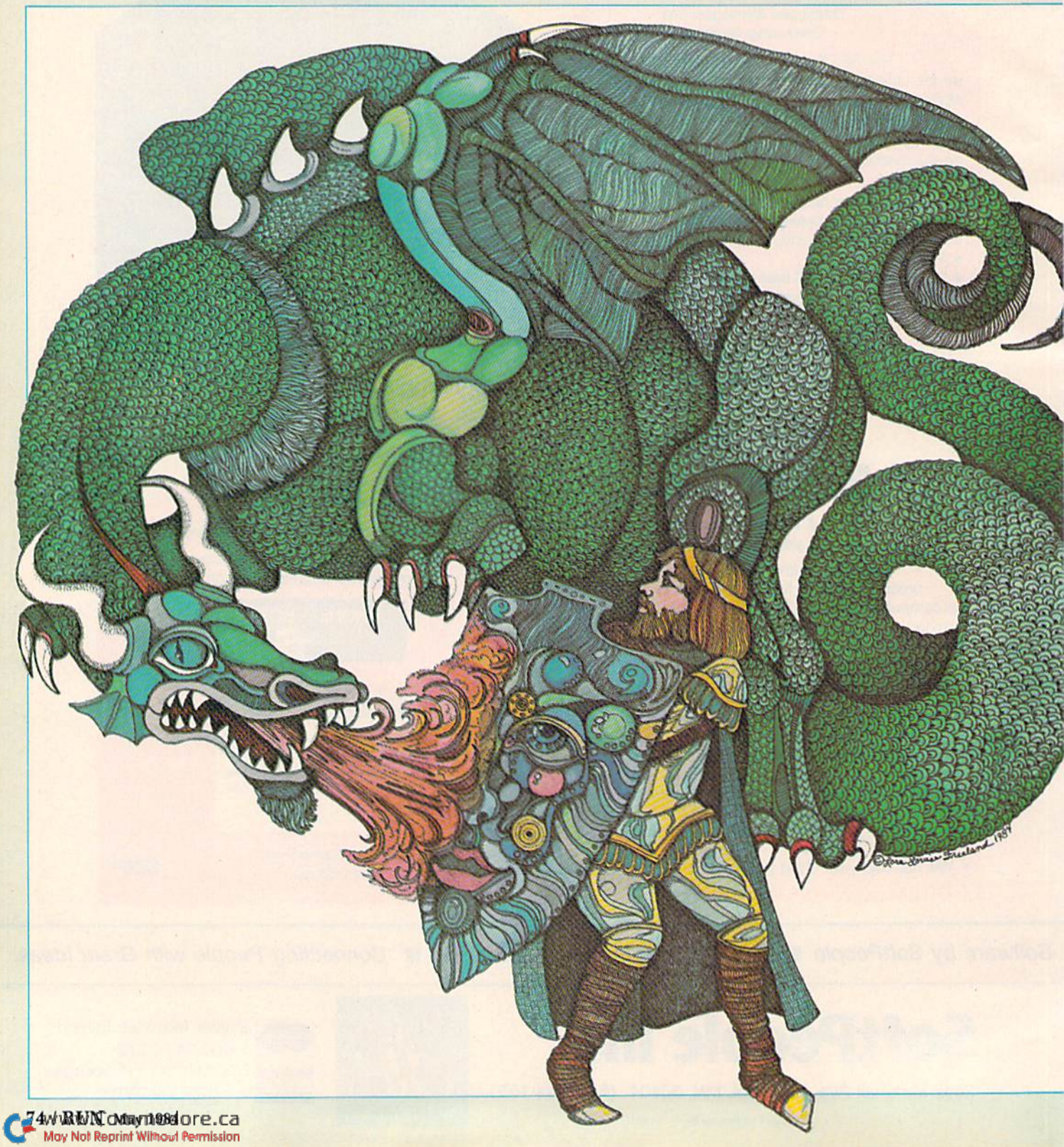


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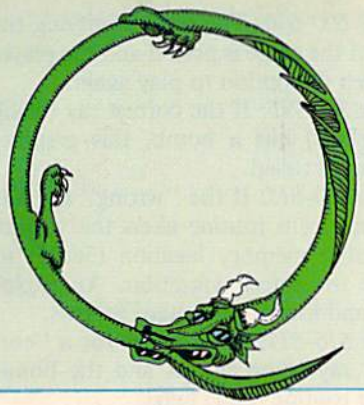

# QUEST

By Tom Meixner

**You must defend the kingdom of Par-ched from the onslaught of dragons. You'll have to dig down deep into your bag of tricks to outwit these clever creatures.**

Here's a game you'll probably always want to play "just one more time."

Dragon Quest is a fast-action game for the unexpanded VIC-20 that will challenge even the most avid video game player. The program takes full advantage of the excellent sound and graphics capabilities of the VIC and is run directly from the keyboard.

### Battle over Water

This year, the kingdom of Par-ched is suffering from the worst drought in history. The drought is so severe that all water has evaporated—except for the water in Par-ched's reservoir. Fortunately, the people of Par-ched will survive, but the neighboring dragons won't—unless they get water.

Since life without dragons is much easier, the king has appointed you, the bravest of the brave, to keep away the ugly dragons.

The dragons aren't too thrilled about the situation, and as a result, they've assembled their own "bravest of the brave" (who also happen to be quite thirsty) to challenge you.

You need only to stop the dragon's offensive rays, and you have a powerful shield for that. But, dragons can be very tricky. Some of their rays cannot be stopped unless they're exploded. Luckily, you have bombs, too.

The game also includes hyperspace, invisible rays, a wraparound screen, a slowly advancing dragon and more.

### How to Play

At the start of the game, you appear on the right side of the screen and the dragon immediately starts attacking. You move up and down by pressing the F1 and F7 keys, respectively. Because of screen wraparound, which is built into the program, when you move through the top of the screen, you come out the bottom and vice-versa.

To jump into hyperspace and reappear in a random place, press the F3 key. To stop rays, stand in their path and let them hit your shield. This method works for all rays except the black and yellow ones. When a black or yellow ray approaches, you must stand directly in its path, then press the space bar to drop a bomb. (A bomb explodes on contact with a ray.) Holding down the space bar causes a whole row of bombs to be dropped. (You appear directly underneath the most recently dropped bomb.)

For each ray you stop, you earn one point, and after 15 points, you're awarded an extra guard. If you acquire 30 points, powerful dragons who shoot invisible rays will take the place of the former dragons. (Incidentally, the author, at the time of this writing, has reached this point only twice.)

One guard is lost if: (1) he catches a black or yellow ray; (2) he bombs a ray other than a black or yellow one; or (3) any ray is allowed to hit the wall.

One final note: If you press two keys simultaneously, only the first key you press will be recognized by the program. In other words, *press just one key at a time.*

### Typing In the Program

Here's a step-by-step guide to follow while typing in the programs.

1. Remove any expansion RAM or any other cartridges.
2. Type in Program 1 (the main program)—see Listing 1.
3. Check for errors.
4. Save Program 1 on tape *before* running it. If you run the program at this time, it will want to read the alternate character-set data, which does not exist yet.
5. Type NEW, then type Program 2 *exactly* as it appears in this article. Any deviation will result in deformed characters and possibly a mix-up in the data-reading routine.
6. Make sure the tape containing Program 1 is in the Datassette with the tape positioned so that it is right after the copy of Program 1. In other words, *don't rewind the tape after Program 1 is saved.*
7. Run Program 2 when you are sure the numbers are correct. This causes the data file to be created. It would be wise to save a copy of Program 2 a little further down on the tape, or even on another tape. This precaution could save you the task of typing in all those numbers again, should something happen to your original copy.
8. After the data file has been created, rewind the tape to where Program 1 starts, load the program, run it and have fun!

### How the Program Works

Since Dragon Quest is a long program, I will highlight some important areas.

*Lines 5–8*: An area is set aside in memory for custom characters; values for these characters are read from the data file and are Poked into the appropriate memory area. This file is used solely for memory conservation.

*Lines 111 and 115*: The random values of the dragon's location as well as the random colors and shapes of the rays are set.

*Lines 120 and 165*: If F1 or F7 is cur-

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*Address author correspondence to Tom Meixner, RR4, Box 273, Owatonna, MN 55060.*

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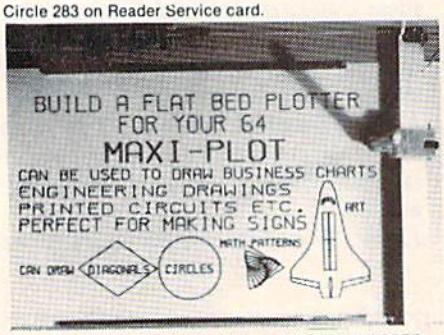


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rently being pressed, these lines recognize it and assign new values to change your vertical position.

*Lines 166–167*: The wraparound screen is created.

*Line 168*: If the space bar is pressed, a bomb will be dropped.

*Line 169*: Hyperspace.

*Lines 180–185*: If a ray has hit anything, the program branches to the corresponding subroutine.

*Lines 300–320*: This subroutine is executed after the wrong ray is caught.

*Lines 500–505*: This subroutine causes the dragon to glow and roar.

*Lines 550–570*: The horizontal centering location in memory is altered to cause the screen to shake (location 36864). An explosion and a dragon invasion follows.

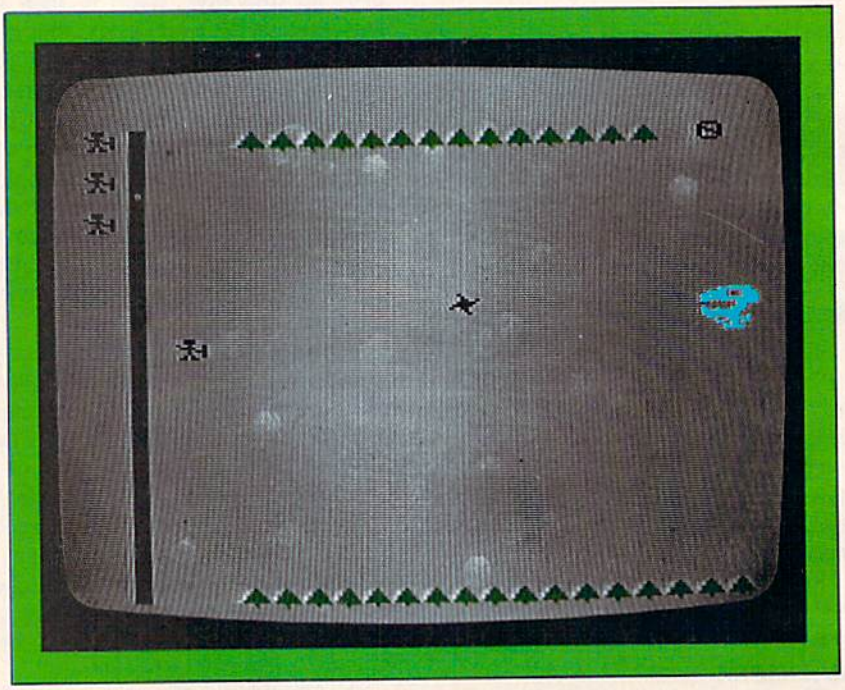
*Lines 600–630*: The song signifying the end of the game is played and the player is given the option to play again.

*Lines 700–715*: If the correct ray (black or yellow) hits a bomb, this graphics routine is called.

*Lines 800–815*: If the "wrong" ray hits a bomb, this routine alters the vertical centering memory location (36865) to cause the screen vibration. An explosion and loss of one guard follows.

*Lines 816–817*: The routine for a "correct" ray being caught and the bonus guard routine reside here.

For those of you who would like to have this program without having to type it in, just send $3 and a self-addressed, stamped cassette mailer, or send $5 and I will provide the cassette and mailer. Ⓡ



*Listing 1. The main program for Dragon Quest.*

```
5 POKE36879,25:IFPEEK(7168)=28ANDPEEK(7279)=13THENPOKE3
    6869,255:GOTO90
6 POKE56,28:POKE52,28:PRINT"{SHFT CLR}":FORI=7280TO7679
    :POKEI,PEEK(I+25600):NEXT:RESTORE:CLR
8 OPEN1,1,0,"CH":FORC=7168TO7279:INPUT#1,A:POKEC,A:NEXT
    :CLOSE1:POKE36869,255
90 S=0:SS=0:ZY=2:X=7701:P=0:Q=0:PRINT"{SHFT CLR}{CTRL 7
    }{2 CRSR DNs}AB{CRSR DN}{2 CRSR LFs}CD{CTRL 1}{2 C
    RSR RTs}VS @":FORT=1TO3000:NEXT
100 PRINT"{SHFT CLR}":C=30720:E=0:B=0:G=36874:Z=7680:V=
    1:J=0:N=0
103 FORW=7698TO8182STEP22:POKEW+C,0:POKEW+C-1,2:NEXT:FO
    RW=7701TO8185STEP44:POKEW+C,0
104 NEXT:FORW=7700TO8184STEP22:POKEW+C,0:POKEW,225:NEXT

105 IFFTHEN107
106 POKE7701,0:POKE7745,0:POKE7789,0
107 FORF=8164TO8180:POKEF+C,5:POKEF,6:NEXT:FORF=7683TO7
    696:POKEF+C,5:POKEF,6:NEXT
```

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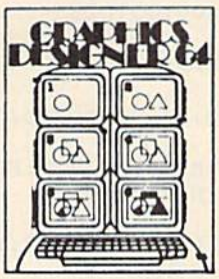

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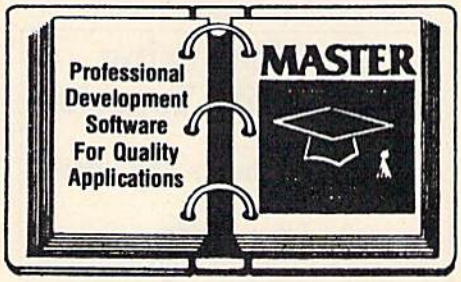


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*Listing 1 continued.*

```
110 IFS=SS+5THENZ=Z+ZY:SS=S
111 U=INT(RND(0)*8):H=INT(RND(1)*3)+7:IFU=1THEN111
112 IFN>=30THENU=1:IFN=30THENZ=7682:N=N+1
115 D=Z+(INT(RND(1)*20)+1)*22:IFX=7833+JTHENPOKEA,5:FOR
    T=1TO900:NEXT:GOTO600
116 IFN=15THENPOKE7833,0:J=J+44:N=N+1:ZY=1:I=4:GOSUB817

120 A=7918+B:POKEG+4,7:POKEG,228:POKEA,0:POKEA+C,0:IFPE
    EK(203)=39THENB=B-22
165 IFPEEK(203)=63THENB=B+22
166 IFA>8185THENA=7699:B=-220
167 IFA<7680THENA=8183:B=264
168 IFPEEK(203)=32THENPOKEA,12:B=B+22:A=7918+B:POKEA,32

169 POKED+E,32:IFPEEK(203)=47THENB=(INT(RND(1)*20)+1)*2
    2:POKEA,32
170 POKED+C,6:POKED+C+1,6:POKEC+D+22,6:POKED+C+23,6:POK
    ED,1:POKED+1,2:POKED+22,3
180 POKED+23,4:E=E+1:PRINT"{HOME}";S:POKEG,0:POKEG+4,15
    :IFPEEK(D+E)=225THEN550
182 IFPEEK(D+E)=12THENIFU<>7THENIFUTHENPOKEA-22,32:POKE
    A,32:GOTO800
183 IFD+E=ATHENIFU<>7THENIFUTHENPOKED+E-1,13:POKED+E-1+
    C,2:POKED+E,0:GOSUB816:GOTO255
184 IFPEEK(D+E)=12THENV=1:M=12:GOTO700
185 IFD+E=ATHENV=1:M=0:GOSUB300:GOTO255
200 IFVTHENGOSUB500:GOTO250
205 POKEG+3,0:POKED+E+C,U:POKED+E,H:V=0
250 POKEA,32:GOTO120
255 POKED,32:POKED+1,32:POKED+22,32:POKED+23,32:V=1:POK
    EG+2,0:GOTO110
300 FORR=1TO15:POKEG+3,200+3*R:POKED+E,M:FORT=1TO50:NEX
    T:POKED+E,10:FORT=1TO50:NEXT
305 IFR=8THENM=11
310 NEXT:POKED+E,5:POKEG+3,0:FORT=1TO1000:NEXT:E=0:V=1:
    POKEX,5:X=X+44:IFX=7833+JTHEN115
320 POKEA,32:RETURN
500 FORY=1TO5:POKED+C,7:FORT=1TO60:NEXT:POKED+C,2:POKEG
    +3,Y+202:FORT=1TO60:NEXT:NEXT
505 POKEG+3,0:POKED+E+C,2:POKED+E,H:V=0:RETURN
550 POKEA,5:M=-.1:POKEG+4,15:POKEG+3,163:FORL=15TO0STEP
    -1:POKE36864,5+M:M=-M
551 POKED+E,220:POKED+E+22,220:POKED+E-22,220:POKED+E+4
    4,220:POKE36864,5+M:POKEG+4,L
552 POKED+E+C,2:POKED+E+C+22,2:POKEG+4,L:FORT=1TO20:NEX
    TT:POKED+E,32:POKE36864,5
557 POKED+E+22,32::NEXTL:POKEG+4,15:POKED+E,32:POKED+E+
    22,32:POKED,32:POKED+22,32
560 FORK=1TO7699-Z:POKEK+D+C,6:POKEK+D+1+C,6:POKEK+D+C+
    22,6:POKEK+D+C+23,6
565 POKEK+D,1:POKEK+D+1,2:POKEK+D+22,3:POKEK+D+23,4:FOR
    T=1TO100:NEXT:POKEG+3,215
567 POKEK+D,32:POKEK+D+1,32:POKEK+D+22,32:POKEK+D+23,32
    :NEXT:POKEG+3,0:E=0:V=1:F=1
570 POKEX,5:X=X+44:POKEA,32:GOTO103
600 POKEG+4,15:FORJ=1TO11:READA:POKEG+1,A:IFJ=5ORJ=7ORJ
    =9THENN=350:GOTO603
601 IFJ=3ORJ=6ORJ=8ORJ=10THENN=150:GOTO603
602 N=650
603 FORT=1TON:NEXT:POKEG+1,0:NEXT:POKE36869,240
608 PRINT"{SHFT CLR}{CTRL 7}{2 CRSR DNs}GAME OVER.{CRSR
    RT}SCORE=";S:PRINT"{3 CRSR DNs}TRY AGAIN?{CRSR RT
    }({CTRL 9}Y{CTRL 0} OR {CTRL 9}N{CTRL 0})"
612 GETC$:IFC$=""THEN612
615 IFC$="Y"THENRESTORE:F=0:GOTO5
620 IFC$="N"THENEND
625 GOTO612
630 DATA195,195,195,195,205,201,201,195,195,191,195
700 POKEG+3,155:FORR=16TO0STEP-1:POKEG+4,R:POKED+E,M:FO
    RT=1TO50:NEXT:POKED+E,11
705 FORT=1TO50:NEXT:IFR=8THENM=32
710 NEXT:POKED+E,32:POKEG+3,0:POKEG+4,15:S=S+1:N=S:E=0:
    POKEA,32:IFX=7833+JTHEN115
```

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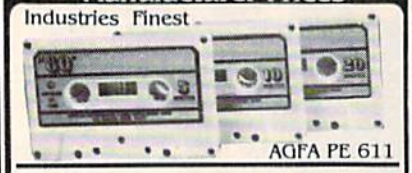

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*Listing 1 continued.*

```
715 GOTO255
800 L=2:FORT=ATO7698STEP-22:POKET,230:POKE36865,25+L:L=
    -L:NEXT:FORT=ATO8182STEP22
805 POKET,230:NEXT:POKE36865,25:FORT=ATO7698STEP-22:POK
    ET,32:NEXT:FORT=ATO8182STEP22
806 POKET,32:NEXT:R=15:FORL=7TO1STEP-1:POKEG+3,L+193:FO
    RM=1TO175:NEXT:R=R-2:POKEG+4,R
807 POKEG+3,L+173:FORM=1TO175:NEXT:NEXT:POKEG+3,0:POKEG
    +4,15
814 POKEX,5:X=X+44:E=0:IFX=7833+JTHEN115
815 GOTO255
816 S=S+1:POKEG+2,235:N=S:V=1:FORT=1TO20:NEXT:POKED+E-1
    ,32:E=0:POKEA,32:RETURN
817 FORO=1TO4:POKEG,247:POKE36879,26+O:FORT=1TO99:NEXT:
    POKEG,0:FORT=1TO99:NEXT:NEXT
818 POKE36879,25:RETURN
```

```
1 OPEN1,1,2,"CH"
2 READY:PRINT#1,Y:IFY=-1THEN4
3 GOTO2
4 CLOSE1:PRINT"CH CREATED":END
20 DATA28,28,137,158,232,136,148,54,63,112,242,240,255,
    252,120,28,192,248,254,246,254
30 DATA70,0,2,30,15,7,38,47,22,6,31,38,254,252,8,32,192
    ,0,128
35 DATA16,16,124,16,16,16,56,124,0,8,28,28,62,62,127,8,
    0,0,96,120,63,120,96,0
40 DATA4,8,152,124,62,25,16,32,0,6,29,191,79,15,6,0
50 DATA28,60,91,182,252,154,92,54,66,165,90,60,60,90,16
    5,66,1,6,8,60,118,122,126,60
60 DATA135,27,47,3,79,159,37,13,-1
```

*Listing 2. The data generator for the Dragon Quest program.*

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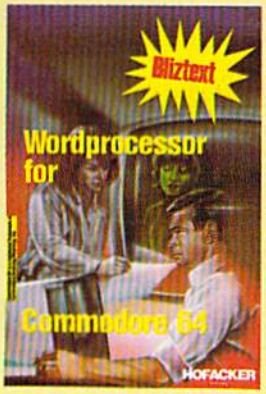


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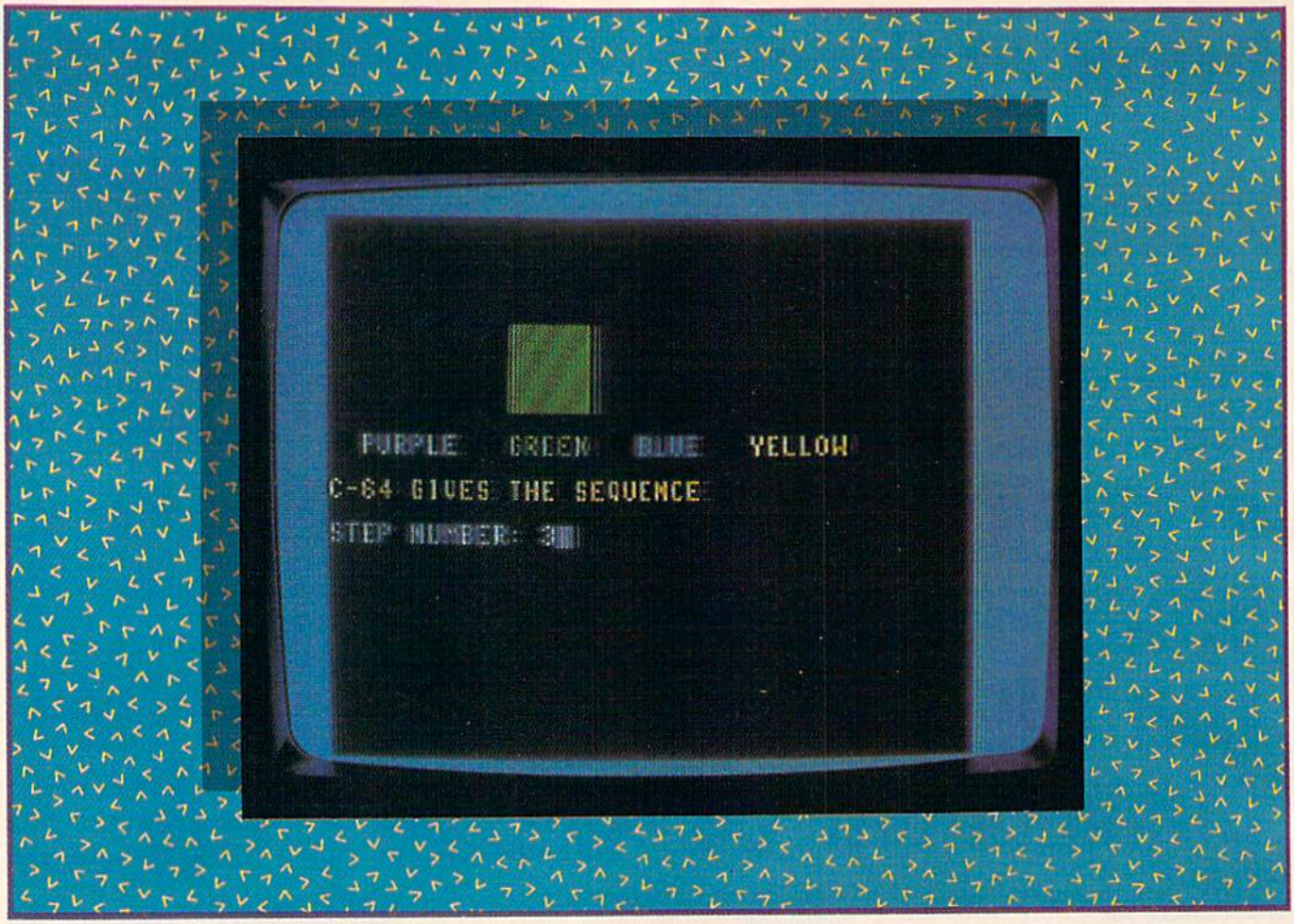


# Flash Glance

Quick color and sound flash sequences really test your memory and reaction speed in this fun program. What a feeling!

**By Zoltan Szepesi**

The Repeat the Sequence program enables you to play three games that exercise and improve both your visual and auditory memory. Another game in this program is useful for checking your reaction speed. The program (Listing1) is written in Basic for the Commodore 64, but it could be modified for use on other computers. (The VIC-20 version of this program was published in *Microcomputing*, January 1983, p. 86.)

The basic idea of these games is the same as that of the SIMON (copyright 1979, Milton Bradley Co.). However, by using the computer with its display, a better communication between machine and player can be achieved.

There are four different color squares displayed at four different places on the TV screen. Single color flashes are presented in random order, each accompanied by their special sound flash. You have to repeat it by pressing the same color keys (without pressing the control key). The colors used are purple, green, blue and yellow: consequently, keys 5, 6, 7 and 8 have to be pressed. If you repeat the color and sound flashes correctly, the game continues. Descriptions of the four games follow.

**Game 1. Create the Sequence.**

After you have repeated the first signal your C-64 gave, you have to add another signal. Following that, you have to repeat the sequence of the previous signals and add another to it. Continue this way until a given number of steps are finished (see Table 1), when the C-64 salutes you with the first eight notes of Beethoven's 5th Symphony. If you were not fast enough, or if you made a mistake in repeating the sequence correctly, the computer gives a noisy sequence of the 5th Symphony and the game is finished.

Before starting with each game, you can choose one of four difficulty levels by pressing one of the programmable function keys (F1, F3, F5 or F7). Table 1 lists the different parameters defined by these keys.

When the function key F3 is pressed (after the C-64 asks for it at the start of the game), eight sequences have to be correctly repeated for successfully finishing the game. The time lag between signals will be short; you have to push the proper color within three seconds after the previous color was pushed.

**Game 2. Repeating Sequence.**

The C-64 starts by giving one signal.


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After you have repeated it successfully, the computer repeats the previous signal and adds one new signal. You have to repeat this sequence again. In the following steps, your 64 repeats the previous sequence and adds a new one until the series is completed according to the number of sequences chosen.

**Game 3. Changing Sequence.**

This game is very much the same as Game 2. The only difference is that the computer does not repeat the previously given sequence, but always starts a new sequence with one more signal in it.

**Game 4. Single Flashes.**

In this game, the C-64 gives only one signal at a time and you have to repeat it within one second.

Table 2 shows the statement numbers and subjects of the different sections of the program. The list of main variables is shown in Table 3.

The variables N1, T1 and T2 are fixed by the four programmable keys in statements 55 to 70. You can change them by changing the numbers in these statements. The time between flashes (T1) is only a relative value. It is in addition to the time it takes to display the color square. T2 is in seconds. In Game 4, T2 is redefined in statement 355.

Since from the subroutine "REPEAT THE SEQUENCE" (statements 450 to 485) the program exits in given circumstances without using the Return command, the stack could be filled (after about 13 games at the same game number) and an error message "OUT OF MEMORY" could turn up. To avoid this disaster, three more Return commands were put in this subroutine with flag Q. The subroutine "FOR STACK CLEARING" (statements 700 to 710) gives the proper Jump statement.

Similar stack filling can also happen when a For...Next loop is left before ending it. The first part of statement 515 clears up this problem.

The program needs 3568 bytes of memory; another 400 bytes are needed when it is executed. R

**RUN It Right**

Commodore 64

*Address author correspondence to Zoltan Szepesi, 2611 Saybrook Drive, Pittsburgh, PA 15235.*

| Function key | Number of sequences | Time between signals | Time allowed to you |
|---|---|---|---|
| F1 | 4 | 100 | 5 seconds |
| F3 | 8 | 50 | 3 seconds |
| F5 | 16 | 10 | 2 seconds |
| F7 | 32 | 1 | 1 second |

*Table 1. Difficulty levels within a given game.*

| Statement No. | Subject and remarks |
|---|---|
| 5–10 | Title and author |
| 15–95 | Initialization. Choose game number and difficulty level |
| 200–230 | Main program of Game 1 |
| 250–275 | Main program of Game 2 |
| 300–310 | Main program of Game 3 |
| 350–360 | Main program of Game 4 |
| 400–435 | Subroutine of color and sound flashes |
| 450–485 | Subroutine for repeating the sequence |
| 500–520 | Error messages |
| 525–560 | Music program |
| 570–580 | Correct finish. Playing 5th Symphony. (Data in 540) |
| 600–640 | Repeat last correct sequence? |
| 650–680 | Want to continue? |
| 700–710 | For stack clearing |

*Table 2. List of principal sections of the program.*

| Variable | Remarks |
|---|---|
| B$ | 11 cursor down + purple code |
| C$ | marking of color spots |
| C0 | color memory location |
| G | number of games in the same kind of game |
| K(N) | position of color spot at *n*-th flash in the sequence |
| N1 | maximum number of flashes in a sequence |
| NM | number of flashes in a given sequence |
| P | number of flashes in Game 4 |
| Q | flag when exit from subroutine |
| S | screen memory location |
| SI | duration of musical notes |
| T | voice number address |
| T1 | time between flashes (see explanation below) |
| T2 | time delay allowed, in seconds, when repeating flashes |
| T3 | clock status, when measuring time delay T2 |
| TN | pitch code of musical notes |
| TT | total number of points in the same kind of game |
| X | game number |

*Table 3. List of main variables.*

*Listing 1. Flash Glance program for the C-64.*

```
5 REM REPEAT THE SEQUENCE          ZOLTAN SZEPESI
10 REM 2611 SAYBROOK DRIVE{2 SPACEs}PITTSBURGH,PA 15235

14 REM**INITIALIZATION*****************
15 POKE53281,0:DIMK(32):G=0:TT=0:PRINT"{CTRL 2}"
20 PRINT"{SHFT CLR}{2 CRSR DNs}**FOUR WAYS TO PLAY:{19
```

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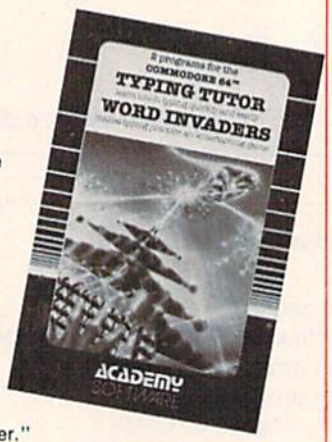


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*Listing 1 continued.*

```
      SPACEs}{CRSR DN}{5 SPACEs}1.OWN MADE SEQUENCE"
 25 PRINT"{CRSR DN}{4 SPACEs}2.REPEATING SEQUENCE
 30 PRINT"{CRSR DN}{4 SPACEs}3.CHANGING SEQUENCE{16 SPAC
      Es}{CRSR DN}{5 SPACEs}4.SINGLE FLASHES"
 35 PRINT"{2 CRSR DNs}**PRESS THE NUMBER:";
 40 GETA$:IFA$=""THEN40
 45 X=VAL(A$):PRINTX
 50 PRINT"{2 CRSR DNs}**FOR INCREASING DIFFICULTY LEVEL{
      7 SPACEs}{CRSR DN}{2 SPACEs}PRESS F1, F3,F5 OR F7"
 55 GETA$:IFA$=""THEN55
 60 IFA$=CHR$(133)THENT1=100:N1=4:T2=5
 65 IFA$=CHR$(134)THENT1=50:N1=8:T2=3
 70 IFA$=CHR$(135)THENT1=10:N1=16:T2=2
 75 IFA$=CHR$(136)THENT1=1:N1=32:T2=1
 80 B$="{10 CRSR DNs}{CTRL 5}":C$="{2 SPACEs}PURPLE{3 SP
      ACEs}{CTRL 6}GREEN{3 SPACEs}{CTRL 7}BLUE{3 SPACEs}
      {CTRL 8}YELLOW"
 85 V=54296:WA=54276:A=54277:SR=54278:HF=54273:LF=54272
 90 PH=54275:PL=54274:S=1227:CO=55499
 95 NM=1:G=G+1:Q=0
100 PRINT"{SHFT CLR}"B$C$:W=RND(-TI)
105 ONXGOTO200,250,300,350
199 REM**OWN MADE SEQUENCES***********
200 PRINT"{CRSR DN}C-64 GIVES THE FIRST{3 SPACEs}COLOR"
      :N=1:K(1)=INT(RND(1)*4):GOSUB400
205 GOSUB450:IFQ<>0THEN700
210 NM=NM+1:N=NM:PRINT"{CRSR DN}ADD A NEW COLOR":T3=TI
215 GETA$:IFA$=""ANDTI-T3<T2*60THEN215
220 IFTI-T3>T2*50THEN500
225 K(N)=VAL(A$)-5:GOSUB400:GOSUB450:IFQ<>0THEN700
230 GOTO210
249 REM**REPEATING SEQUENCES**********
250 PRINT"{CRSR DN}C-64 GIVES THE SEQUENCE":N=NM:K(N)=I
      NT(RND(1)*4):GOSUB400
255 GOSUB450:IFQ<>0THEN700
260 FORI=1TO800:NEXT
265 FORN=1TONM:PRINT"{CRSR DN}C-64 GIVES THE SEQUENCE":
      GOSUB400:NEXTN
270 NM=NM+1:GOTO250
275 FORI=1TO800:NEXT
299 REM**CHANGING SEQUENCES***********
300 FORN=1TONM:PRINT"{CRSR DN}C-64 GIVES THE SEQUENCE":
      K(N)=INT(RND(1)*4)
305 GOSUB400:NEXTN:GOSUB450:IFQ<>0THEN700
310 FORI=1TO800:NEXTI:NM=NM+1:GOTO300
349 REM**SINGLE FLASHES***************
350 P=1
355 T2=1:N=1:K(N)=INT(RND(1)*4):GOSUB400:GOSUB450:IFQ<>
      0THEN700
360 FORI=1TO400:NEXTI:NM=1:N=1:P=P+1:GOTO355
399 REM**FLASHING COLOR AND SOUND******
400 POKEV,15:POKEA,0:POKESR,240:POKEHF,20+K(N)*5:POKELF
      ,10:POKEWA,17
405 PRINT"{HOME}"B$+"{4 CRSR DNs}STEP NUMBER:";:IFX=4TH
      ENPRINTP:GOTO415
410 PRINTN
415 FORJ=0TO3:FORL=CO+J*40+8*K(N)TOL+4:POKEL,K(N)+4:NEX
      TL,J
420 FORJ=0TO3:FORI=S+J*40+8*K(N)TOI+4:POKEI,160:NEXTI,J
425 FORJ=0TOT1:NEXTJ:POKEWA,16
430 PRINT"{SHFT CLR}"B$C$
435 RETURN
449 REM**REPEAT THE SEQUENCE**********
450 FORN=1TONM:PRINT"{CRSR DN}REPEAT THE SEQUENCE":T3=T
      I
455 GETA$:IFA$=""ANDTI-T3<T2*60THEN455
460 IFTI-T3>T2*55THENQ=1:RETURN
465 Y=VAL(A$):IFY-5<>K(N)THENQ=2:RETURN
470 IFY-5=K(N)THENGOSUB400:NEXTN
475 IFX=4THENN=P+1
480 IFN=N1+1THENQ=3:RETURN
485 RETURN
499 REM ERROR MESSAGES****************
```

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*Listing 1 continued.*

```
500 PRINT"{SHFT CLR}{2 CRSR DNs}*YOU LOST-YOU WERE NOT
    FAST ENOUGH":GOTO515
510 PRINT"{SHFT CLR}{2 CRSR DNs}**ERROR-YOU LOST"
515 NS=1:FORN=1TO1:NEXTN:IFX=4THENNM=P
520 PRINT"{CRSR DN} "NM-1"STEPS WERE CORRECT":PRINT"{CR
    SR DN}{2 SPACEs}NO. OF GAMES:"G
524 REM **5-TH SYMPHONY**********
525 FORL=54272TO54296:POKEL,0:NEXT
530 POKEV,15:POKEA,0:POKESR,240:RESTORE
535 READH:IFH=-1THENFORL=54272TO54296:POKEL,0:NEXT:GOTO
    600
540 READL:READD:POKEHF,H:POKELF,L:POKEWA,17:IFNS=1THENP
    OKEWA,129
545 FORT=1TOD:NEXT:POKEWA,16:IFNS=1THENPOKEWA,128
550 FORT=1TO50:NEXT:GOTO535
555 DATA25,177,100,25,177,100,25,177,100,20,100,800,0,0
    ,250
560 DATA22,227,100,22,227,100,22,227,100,19,63,800,-1
565 REM**CORRECTLY FINISHED**********
570 PRINT"{SHFT CLR}{2 CRSR DNs}**CONGRATULATIONS.YOU F
    INISHED{10 SPACEs}{CRSR DN}{2 SPACEs}WITH"N1;"POIN
    TS."
575 PRINT"{CRSR DN}{2 SPACEs}NO. OF GAMES:"G:TT=TT+N1:P
    RINT"{CRSR DN}**YOUR TOTAL IS:"TT"POINTS":NS=0
580 GOTO525
599 REM**SEE THE LAST SEQUENCE**********
600 IFX=3ORX=4THEN650
605 IFNM=1AND(X=1ORX=2)THEN650
610 PRINT"{CRSR DN}**DO YOU WANT TO SEE THE LAST{11 SPA
    CEs}{CRSR DN}{2 SPACEs}SEQUENCE (Y/N)?"
615 GETA$:IFA$=""THEN615
620 IFA$<>"Y"ANDA$<>"N"THEN615
625 IFA$="Y"THEN PRINT"{SHFT CLR}"B$C$
630 IFA$="N"THEN650
635 IFN=N1+1THENNM=NM+1
640 FORN=1TONM-1:GOSUB400:NEXTN
649 REM**WANT TO CONTINUE?**********
650 PRINT"{SHFT CLR}{2 CRSR DNs}*DO YOU WANT TO{28 SPAC
    Es}{CRSR DN}1.CONTINUE SAME WAY"
655 PRINT"{3 SPACEs}{CRSR DN}2.CONTINUE WITH CHANGED CO
    NDITIONS{6 SPACEs}{CRSR DN}3.FINISH."
657 PRINT "{CRSR DN}*PRESS THE NUMBER"
660 GETA$:IFA$=""THEN660
665 Y=VAL(A$):IFY<>1ANDY<>2ANDY<>3THEN660
670 ONYGOTO95,675,680
675 GOTO20
680 POKEV,0:POKEWA,0:END
699 REM**FOR STACK CLEARING**********
700 IFQ=1THENQ=0:GOTO500
705 IFQ=2THENQ=0:GOTO510
710 IFQ=3THENQ=0:GOTO570
```





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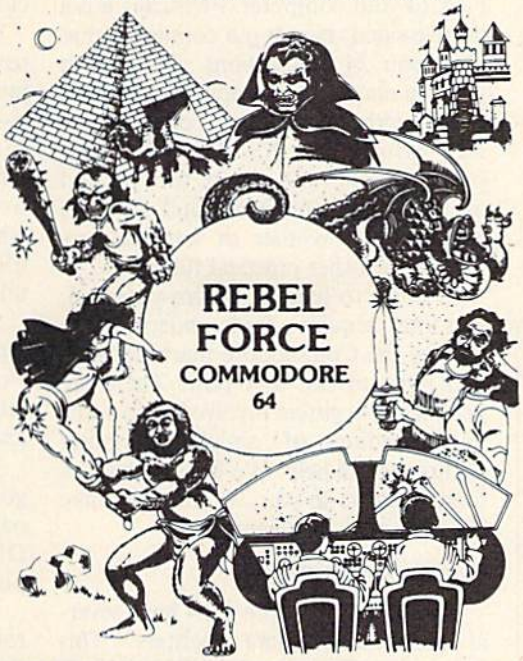


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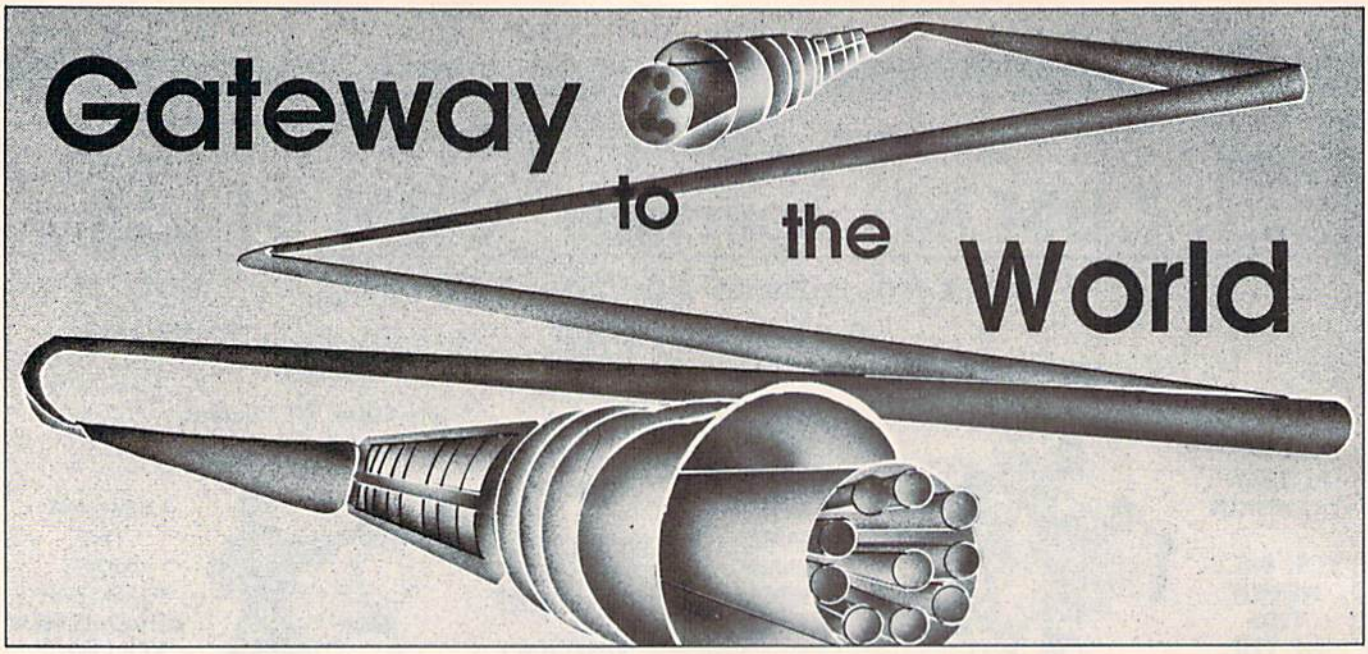


**Expand your computing horizons with this series that will open new doors for you and your Commodore. The Commodore user port is the key.**

**By Jim Grubbs**

For about the first twenty years of my life I did a lot of travelling. Our Air Force family was always on the move, either across town, or across the ocean, and I learned that certain cities are considered "gateways."

If, for example, you are headed for the Far East, Los Angeles is usually your point of departure. New York City serves almost all European traffic, while Miami is the place when you're headed for South America. I learned that no matter where you're going, if you get to the right gateway, the rest of the trip is easy.

The concept of gateways isn't limited to travel. The phone company routes calls to gateways in much the same manner, and trucking companies, too, have gateways. Even Commodore provides a gateway to the world—in each and every VIC-20 and C-64.

Commodore's gateway is known as the *user port*, and you'll find it on the back of your computer. Physically it is a double-sided, twelve-pin connector that gives you 24 connections. Through it you can make your computer talk to the world with a modem, communicate with virtually any RS-232 device, control your lights and stereo, turn on and off your air conditioner and furnace, monitor the weather or perform any number of other practical functions.

In order to harness all this potential, you must acquire a basic understanding of how the Commodore machines read and write to the user port. There are several key registers involved, and some understanding of simple computer arithmetic will help. We'll take a look at these registers so you can learn to make them do what you want.

This article contains information on using your Commodore Computer in a "real world" application. This includes connection of your computer to external devices. In any such application, the possibility exists that the external device can damage your computer. Proper interfacing techniques are discussed, but if you are not familiar with the electronics involved, do not attempt the connection(s) without the aid of someone knowledgeable in this area.

*Address author correspondence to Jim Grubbs, PO Box 3042, Springfield, IL 62708.*

### Register Arithmetic

The VIC-20 and the C-64 have several bidirectional data registers. This means you can use each individual bit in the register for either receiving or transmitting data. Even using a joystick is an application of these registers.

The VIC-20 registers are at memory locations 37137 for port A and 37136 for port B. The C-64 locations are 56576 for port A and 56577 for port B. But before you do anything with these registers, you must tell the computer how each bit in each register will be used; that is, whether you'll be sending or receiving information.

You do this with the data direction register (DDR), located at 37139 (port A) and 37138 (port B) in the VIC-20 and at 56578 (port A) and 56579 (port B) in the C-64. For this discussion, we'll be concerned only with port B on both machines.

(Note that the VIC uses a versatile interface adapter [VIA], actually a 6522 integrated circuit, while the C-64 uses two complex interface adapters [CIAs]. In the C-64, these are 6526 chips. This makes a significant difference when we're dealing with the joystick port, which is port A in a VIC, but the second 6526 in a C-64. For now, just keep in mind that these differences do exist.)

Setting the DDR is not a matter of using a simple Basic command. You must Poke the correct values into these registers. To do this properly, you need to know binary arithmetic.

Please don't turn to the next article or go feed the dog. Arithmetic, even in binary, doesn't have to be difficult! The DDR, like everything else in your computer, is laid out in binary form.

When looking at a mathematical representation of the register, you start on the right with the least significant bit (LSB) and move toward the left to the most significant bit (MSB). The register is a single byte (or eight bits) of memory, so you number the bits from right to left, 0 through 7.

Before you do some binary magic, re-


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turn to the good old decimal system for a moment. In decimal, or base 10 numbering, the right-most digit in a number is always the units column, which represents numbers 0 to 9.

From your high school math days, you may recall that any number raised to the zero power is 1. So multiply the digit in the units column by 1. The next column, the second from the right, is the tens column. This column represents 10 (our base) raised to the first power, or 10. Any digit in this column is multiplied by 10. The hundreds column (10 to the second power) is next. And so it goes right up the line.

Exactly the same rules apply no matter what number system you work in, including the base 2, or binary numbers, in the data direction registers. In binary, of course, you have only two values to use in each column, 0 and 1.

The first column is 2 to the zero power—once again a 1. Moving from right to left, just as in decimal, the next column is 2 to the first power, or 2. Next, 2 to the second power (2 times 2), or 4, and so on—8, 16, 32, 64 and 128.

### Cop on the Bit

With these rules firmly in mind, you can now determine what values you need to Poke into the DDR to set it for send or receive. The DDR is normally set to receive data on all bits (all bits set to 0). So if you only want to receive, you needn't take any action.

But if you want, for example, to transmit data using bit 2 in port B on the VIC, that bit must be Poked to 1 in the port B DDR. Since you want bit 2, raise 2 (the base) to the power equal to the bit number, then type POKE 37138,4. If you want bit 4, you'd Poke 2 to the fourth power, or 16.

In case you want to transmit on *both* bits 2 and 4, just add the decimal values together for a value of 20. That is why you sometimes see statements like POKE 37138,(4+16) in programs. A 20 in place of the (4+16) expression will accomplish the same thing, but writing it as a sum serves to remind the programmer (or anyone else) that bits 2 and 4 were set!

The DDR, or "traffic cop," keeps the traffic flowing in the proper direction. Depending on whether you are transmitting or receiving information, you now must Peek or Poke the actual data register at the appropriate bit(s).

If you Peek the register address, you'll get the entire contents. If you're interested in only one of the bits, you can use a "mask" over the register so you'll only see that bit when checking whether it is 1 or 0.

The 6500 family of processors performs this masking function with a logical AND instruction. Think of the mask in terms of an examiner's cardboard answer key, which, placed over a test answer sheet, shows correct answers through a pattern of holes.

To read a data register to see if bit 3 is set to 1, you might use the statement IF PEEK(37136) AND 8=1 THEN GOTO 500. Such a statement would transfer you to line 500 only if bit 3 contained a 1. You know to use 8 because you want bit 3, which is 2 to the third power, or 8.

### Open Communication

Armed with this knowledge, you can now start communicating with the outside world through your VIC-20 or C-64. Suppose you want the computer to sound an alarm when the front door is opened and print to the screen the time it happened. You can easily accomplish this by setting up the registers to look for the proper condition (an open or closed switch).

You could also apply this method to build a program timer for your TV or VCR. Write the program to allow as many events as you like; then, at the proper times, have the computer turn on a relay to start the VCR or turn on the TV. This can be done by using a simple one-transistor keying circuit. For those of you not familiar with electronic circuits, I'll cover the specifics of doing that in a future article.

If you're interested in monitoring the temperature, the wind speed, the water level in the well or other continually varying quantities, you'll need an analog-to-digital converter. If your application isn't too exacting, you can use your Commodore's converters, which have been cleverly disguised as paddle registers.

The VIC-20 and C-64 programmer's reference guides contain additional information on the VIA and CIA. You might wish to review this material before learning further how to interface your computer to the world.

Next time I'll take another look at the user port, but you'll then put on some RS-232 glasses and learn how to set up your gateway to communicate at any of the speeds implemented in the Commodore machines and at some that aren't. You'll also learn how to do code conversion and a few other things. R


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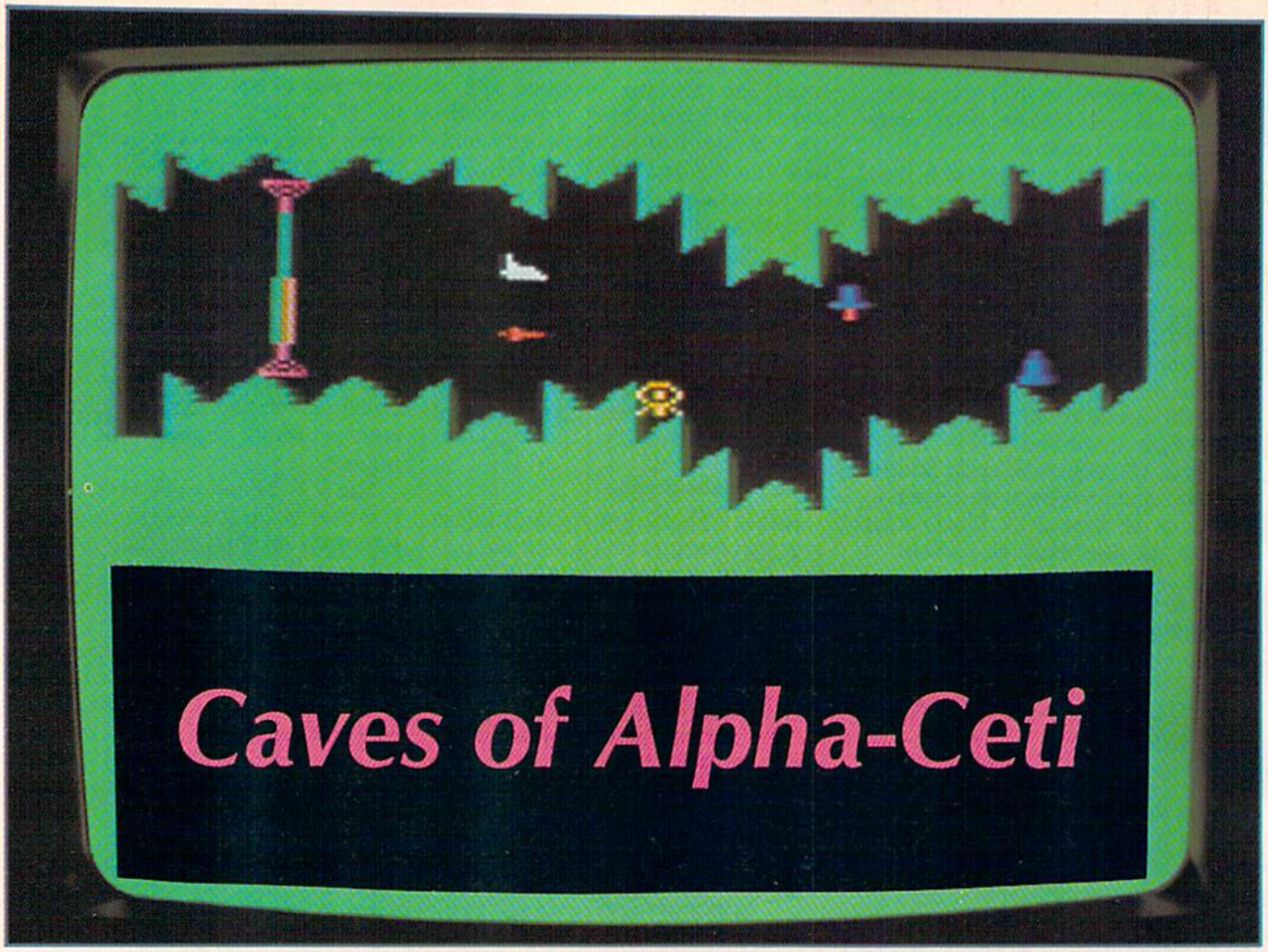


By Alan L. Keyser

***To survive as a member of this mysterious planet, you must make your way through an intricate network of caverns, where untold dangers await.***

Circling around the orange sun Menkar is a planet known as Alpha-Ceti. Because of the planet's nearness to its burning sun, the inhabitants moved underground to survive. After many years of warring over the limited space available, the people divided into several groups, each controlling its own cavern network.

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**Program Description**

In the first part of the program for the unexpanded VIC-20 (see Listing 1), the character set and a fairly involved machine language program are loaded in. The machine language routine takes care of moving the screen and missiles, changing the buoy colors and firing the lasers. When this loader program is finished, it automatically loads in the main program and begins execution.

In the main program (see Listing 2), some variables are set in line 10. After activating the character set in line 20, the program resumes execution at line 5000, where it sets up the introductory screen. When the ship has assumed its starting position, the program goes to line 50 and begins executing the core program.

**RUN It Right**

Unexpanded VIC-20
Joystick and Datassette

Lines 50–54 check for the end of the cave and update the cavern level if appropriate. Lines 55–140 read the joystick position and calculate ship movement. Lines 150 and 160 erase the ship and missile in preparation for screen movement via the machine language program. After execution, a check is made to see if it's all right to replot the ship.

Lines 170–230 calculate missile movement and give points for objects that are hit. If all is clear, the missile is replotted, and the tone is lowered as the missile falls. Line 240 then updates the score and goes back to line 50 again.

Lines 250–280 take care of the exploding ship if it has hit something. Then, if an extra ship is still left, the program starts over at line 5000 and redraws the cavern. Finally, lines 3000–3170 attend to the construction of the cave.

Line 3000 calculates the level of dif-


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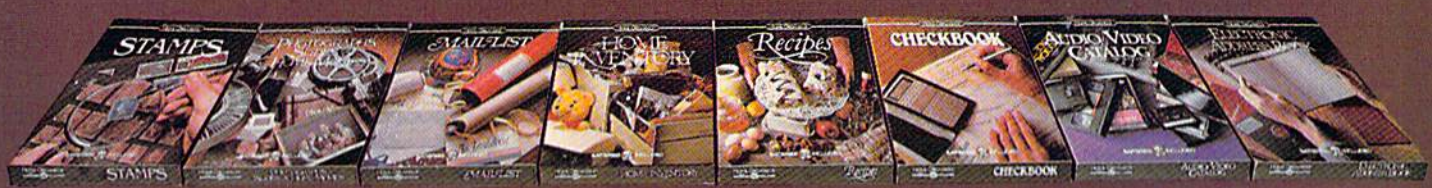


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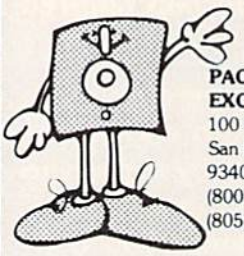

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ficulty, and line 3010 decides whether or not to draw a target. Lines 3020–3120 decide how to draw the cavern walls and then plot them, erasing anything in the space between. Lines 3130–3170 plot whichever target was selected in line 3000, also including the proper colors.

### End Note

Since there are probably a lot of you out there who love to play arcade-quality games but hate to type them in, here is a chance to avoid all that hunt and peck at the keyboard. Just send me $3, a blank cassette and a self-addressed, stamped envelope, and I will be happy to send you a copy of the program, all ready to run. R

*Address author correspondence to Alan L. Keyser, 5000 22nd NE, #411, Seattle, WA 98105.*

*Listing 1. Character set and machine language program.*

```
10 PRINT"{SHFT CLR}":POKE36879,104:POKE52,28:POKE56,28:
   CLR
20 FORI=7424TO7679:POKEI,PEEK(I+25600):NEXT
25 FORI=7179TO7408:READJ:POKEI,J:NEXTI
30 FORI=7432TO7551:READJ:POKEI,J:NEXTI
40 FORI=7632TO7679:READJ:POKEI,J:NEXTI
50 FORI=7416TO7423:READJ:POKEI,J:NEXTI
1000 DATA8,72,138,72,152,72,162,1,160,0,189,0,30,201,39
     ,208,46,138
1010 DATA72,56,233,23,170,189,0,30,201,32,240,13,169,58
     ,157,0,30
1020 DATA169,2,157,0,150,76,64,28,169,39,157,0,30,169,1
     0,157,0,150,104
1030 DATA170,169,32,157,0,30,76,150,28,201,35,208,22,32
     ,132,3,165,98
1040 DATA201,157,176,63,169,39,157,0,30,169,10,157,0,15
     0,76,150,28,201,40
1050 DATA208,8,169,32,157,0,30,76,150,28,201,37,208,25,
     189,0,150,41,15,201,10
1060 DATA208,8,169,9,157,0,150,76,150,28,169,10,157,0,1
     50,76,150,28,201,58,208,5
1070 DATA169,32,157,0,30,189,0,30,72,189,0,150,41,15,20
     2,157,0,150
1080 DATA104,157,0,30,232,232,200,192,21,208,61,232,224
     ,242,144,59
1090 DATA162,0,189,0,30,201,36,208,35,32,132,3,165,98,2
     01,160
1100 DATA176,26,138,24,105,22,168,185,0,30,201,41,240,1
     4,169,40
1110 DATA153,0,30,169,2,153,0,160,152,76,198,28,232,224
     ,220,144,209
1120 DATA104,168,104,170,104,40,96,76,21,28,76,19,28
2000 DATA255,255,255,255,255,255,255,255,60,66,153,153,
     66,60,90,153
2010 DATA8,8,28,28,28,28,62,62,255,165,90,36,24,24,24,2
     4
2020 DATA255,235,235,235,235,235,235,255,0,64,64,96,124
     ,254,127,0
2030 DATA12,12,12,12,63,8,8,8,24,24,24,24,24,24,24,24
2040 DATA24,24,24,24,36,90,165,255,255,254,252,252,240,
     240,192,128
2050 DATA255,127,31,63,63,15,7,1,1,3,15,31,31,63,127,25
     5
2060 DATA128,224,224,248,248,252,248,255,66,66,66,36,36
     ,24,24,0
2070 DATA0,0,0,48,191,48,0,0,73,107,186,28,255,28,171,1
     05
2080 DATA60,66,64,60,2,66,60,0,28,34,64,64,64,34,28,0
2090 DATA24,36,66,66,66,36,24,0,124,66,66,124,72,68,66,
     00
2100 DATA126,64,64,120,64,64,126,0
3000 DATA64,64,64,64,64,64,126,0
5000 PRINT"{13 CRSR DNs}{CTRL 1}{3 SPACEs}NOW LOADING M
     AIN{7 SPACEs}PROGRAM"
5010 PRINT"{CTRL 7}{HOME}":POKE198,5:POKE631,78:POKE632
     ,69:POKE633,37:POKE634,17:POKE635,131:END
```


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*Listing 2. Caves of Alpha-Ceti main program for the unexpanded VIC-20.*

```
10 LO=7680:CO=30720:L=0:H=3:N=4
15 FORI=900TO915:READJ:POKEI,J:NEXTI
20 POKE36869,255:POKE251,0:POKE252,0:POKE253,0:POKE3687
   8,96:GOTO5000
50 IFP<>150THENGOSUB3000:GOTO55
52 FORI=7701TO7921STEP22:POKEI,33:POKEI+CO,5:NEXT:POKE7
   833,32:FORJ=1TO50:NEXT
54 L=L+1:P=0:PRINT"{HOME}{14 CRSR DNs}{19 CRSR RTs}{CTR
   L 2}";L:H=H-1:IFH<1THENH=4
55 POKE37154,127:D=(PEEK(37137)AND28)OR(PEEK(37152)AND1
   28)
60 F=(PEEK(37137)AND32)/32:P=P+1
70 IFD=156THEN150
80 IFD=28THENX1=X1+1:Y1=Y
90 IFD=152THENY1=Y1-1:X1=X
100 IFD=148THENY1=Y1+1:X1=X
110 IFD=140THENX1=X1-1:Y1=Y
120 IFD=24THENX1=X1+1:Y1=Y1-1
130 IFD=20THENX1=X1+1:Y1=Y1+1
140 IFX1<0ORX1>21THENX1=X
150 POKELO+X+Y*22,32:POKEB,32:SYS7179:POKE36876,0:IFPEE
   K(LO+X1+Y1*22)<>32THEN250
160 X=X1:Y=Y1:POKELO+X+Y*22,38:POKELO+X+Y*22+CO,1
170 IFF<>0ANDB=0THEN240
180 IFF=0ANDB=0THENB=LO+X+(Y+1)*22:S=235:POKE36876,S:GO
   TO200
190 B=B+22
200 IFPEEK(B)=39THENSC=SC+40
210 IFPEEK(B)<>32ANDPEEK(B)<42THENSC=SC+10:S=0:POKE3687
   6,S
215 IFPEEK(B)=41THENPOKEB-110,58:POKEB-110+CO,2
220 IFPEEK(B)<>32THENPOKEB,58:B=0:S=0:POKE36876,B:GOTO2
   40
230 POKEB,47:POKEB+CO,2:S=S-10:POKE36876,S
240 PRINT"{HOME}{CTRL 3}{20 CRSR DNs}";TAB(8);SC:GOTO50

250 POKELO+X+Y*22,58:POKELO+CO+X+Y*22,2
260 FORI=15TO0STEP-1:FORJ=15TO1STEP-1:POKE36878,96+I:PO
    KE36877,200
265 POKE36879,8+I*J:NEXTJ,I
270 N=N-1:L=L-1:IFN=-2THENPRINT"{SHFT CLR}{CTRL 2}FINAL
    SCORE"SC:POKE36869,240:END
280 GOTO5000
3000 C=C+1:IFC>HTHENC=0:A=INT(RND(1)*4)+34:GOTO3020
3010 A=-1
3020 IFW=42ANDV=3THENW=43:GOTO3080
3030 IFW=43ANDV=0THENW=42:GOTO3080
3040 IFRND(1)<.7ANDW=42THENV=V+1:GOTO3080
3050 IFRND(1)<.7ANDW=43THENV=V-1:GOTO3080
3060 IFW=42THENW=43:GOTO3080
3070 W=42
3080 FORI=0TO10:J=22*I+7701:IFI<VORI>V+7THENPOKEJ,33:PO
   KEJ+CO,5
3090 IFI=VTHENPOKEJ,W:POKEJ+CO,5
3100 IFI=V+7THENPOKEJ,W+2:POKEJ+CO,5
3110 IFI>VANDI<V+7THENPOKEJ,32
3120 NEXTI
3130 IFA=34THENPOKE(V+6)*22+7701,A:POKE(V+6)*22+7701+CO
   ,7
3140 IFA=35THENPOKE(V+6)*22+7701,A:POKE(V+6)*22+7701+CO
   ,6
3150 IFA=36THENPOKE(V+1)*22+7701,A:POKE(V+1)*22+7701+CO
   ,4
3155 IFA=36THENPOKE(V+6)*22+7701,A+5:POKE(V+6)*22+7701+
   CO,4
3160 IFA=37THENI=(V+INT(RND(1)*3+1))*22+7701:POKEI,A:PO
   KEI+CO,9
3170 RETURN
5000 POKE36879,13:PRINT"{SHFT CLR}":C=0:B=0:X=0:Y=6:X1=
   0:Y1=6:P=0
5010 FORI=7922TO7965:POKEI,33:POKEI+CO,5:NEXTI
5020 L=L+1:PRINT"{HOME}{CTRL 2}{14 CRSR DNs}";TAB(14);"
   {LEFT ARROW}?.?{LEFT ARROW}"L
5040 PRINTTAB(7);"{2 CRSR DNs};<=>?{2 CRSR DNs}{4 CRSR
   LFs}"SC
5044 FORI=7988TO7988+N:IFN<0THEN5050
5046 POKEI,38:POKEI+CO,1:NEXTI
5050 V=INT(RND(1)*3):W=42:FORQ=1TO20:GOSUB3000:SYS7179:
   NEXTQ
5060 FORI=7900TO7812STEP-22:POKEI,38:POKEI+CO,1:FORJ=1T
   O500:NEXTJ:POKEI,32:NEXTI
5070 POKE36877,250:POKE36878,106:GOTO50
6000 DATA8,72,138,72,152,72,32,155,224,104,168,104,170,
   104,40,96
```

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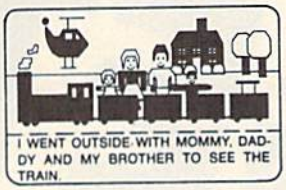


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# GET ORG

**You ain't seen nothing yet, until you've run a database management system on your Commodore computer.**

**By Neil Salkind, Larry Bihlmeyer and Mike Apsey**

First we had arcade-style games that thrilled us with their speed and graphics. Word processors then came along, and we could write, edit, recall and print letters, stories and business reports. Now we have in database management programs what may be the most powerful software tools available for the Commodore 64.

### What Is a Database Management System?

A database management system is a software program that allows you to organize and work with a large body of information (called a database) according to your needs. It works very much like an index card file, but it's electronic.

For example, you have a list of names, addresses and birthday and anniversary dates for a large list of friends. Instead of keeping all of this information in an address book or a file box, you can use a database management system.

Each month you can load your program, insert the "data disk" (the disk with the actual database on it) and direct the program to select those people who have birthdays that month. Rather than your having to search through each page of your address book, your database program gives you what you want in seconds. You can also use the program for such things as printing out mailing labels for holiday cards, which saves you lots of time if you have many friends. You can even use it to address new baby announcements!

There are many uses for this kind of program besides organizing your mailing list. A disk jockey at a Kansas City public radio station uses it to organize the sequence of classical pieces on her morning program. She records the artist, the name of the piece and the running time. She can then search her records and, for example, choose a piece by Bach that is between eight and ten minutes long.

The owner of a small bookstore keeps a record of customers who are looking for certain books. When he gets a new shipment in, he searches his database "file" by book title to see if any of the requests can be filled.

In database terminology, files are made up of records, which in turn are made up of fields. See the accompanying figure and table for more information about these terms.

### How Do Database Programs Work?

All database management systems require you to design a "form" (also called a record) that reflects the way you plan to organize and store your information.

It's a good idea to first design this form on paper. This allows you to include all the items you need, to see how long each entry is and to avoid the problem of finding out later that you forgot something. It's even wise to design your form and put it away to rest for a day or two. Then come back to it to see if you've overlooked anything.

Designing a record form is like imagining what an index card would look like with all your field headings written on it. In the case of your address file, there are separate lines for name, street address, city, state, zip code, birth date and anniversary. After you're sure what your form should look like, your next step is to select from the database menu the "Create a Form" option.

An important thing to remember about creating a form is that you want to avoid extra spaces or fields if you will not be using them. The reason for this is that the program limits the number of characters each record can contain (see the accompanying comparison chart). The more characters in a record, the fewer records you'll be able to fit on a disk. Also, the more characters per record, the longer operations such as Sorting, Searching and Printing will take.

To save space, you can use abbreviations for titles (such as N for name) and also in some field entries (such as TX for Texas, under S for state).

Remember that you can only sort or search for information if it is originally entered as a unique item on your form.



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# ANIZED!

## Put a Little Database in Your Life

For example, if you want to be able to sort by zip code, you must have a separate field for that information. But if you need to sort only by state, you can combine state and zip code into one field (e.g., KS 66044).

After you've completed the record format, the program will take over, store the record structure on your data disk and then request you to name the file. Some programs may ask you at this time to estimate the number of records you'll use, as well as other characteristics of your file. It does this so the system you're using can allocate blocks on the data disk and perform other housekeeping functions.

### Fun with Files

Now you're ready to add information to the file. The program will put on the screen an incomplete form that includes the titles of the fields you've already defined, but no entries after each field. You then complete each field by adding the appropriate information and then saving the entire record. This record then becomes part of the file that's saved on the data disk.

Now the fun begins! Once your database is established, you can do many different things with it. Here's a sample menu of some of the options usually available:

- Select A File
- Add To A File

### Explanation of Database Terminology

Here are definitions of some database program terms that you should be familiar with before purchasing your own database manager.

**Field**: "Pieces" of information that make up a record. Examples of a field might be "Name," "Batting Average" or "Birthdate."

**Record or Form**: An individual entry on a file, consisting of one or more fields, such as the subscription record for Mr. Michael Pause: his street address, city, state, zip code and date of subscription. Records are made up of fields.

**File**: A set of records that all have the same format or design, such as customer records, a record album collection or a subscription list. Files are made up of records.

**Sort**: The operation that a database management system performs when it orders data alphabetically or numerically. The user indicates which field should be sorted. Many database management systems allow for multiple sorts on more than one field. For example, you might want to alphabetize a list of friends, but sort them numerically by zip code.

**Calculated Field**: This option allows the user to perform arithmetic operations on fields in the file. For example, if there are ten fields, and each represents a student's course grade, one use of this option would be to calculate a student's average grade.

**Conditional Statement**: Sometimes you only want to examine a certain set of records, such as, for example, with birthdays in March. Using a conditional statement, you can select only those records with birthdates beginning with the number 3 or the word March.

**Report**: This usually means that the database management system can print out the records in almost any format you want to design, including headings, page numbers and column widths of your choice.

**Subfiles**: A feature of some database management systems that allows you to create a subfile from a larger file. This means you can select fields from an already established file and use them to create a new, smaller file.

**Mailing Label**: This is usually the standard name, address, city, state and zip code format that reflects one of the most frequent uses of this type of program.

**Merge Files**: The operation of an ordered merging of a set of fields (such as names and addresses) from one file with a like set from another file.

**Source Disk**: The disk that contains the database management system itself. It is also sometimes called the program disk.

**Destination Disk**: The disk on which you store your data. It may also be called the target or data disk.

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File #1

| Record #1 | Record #2 |
|---|---|
| Field 1 ..... | Field 1 ..... |
| Field 2 ..... | Field 2 ..... |
| Field 3 ..... | Field 3 ..... |
| etc. | etc. |

*Fig. 1. Relationship of Files, Records and Fields.*

- Review The Records On A File
- Edit A File
- Sort The Records On A File
- Print The Records On A File
- Create A New File
- Disk Commands

When any one of these options is selected, most programs will prompt you with more questions until the task is completed. For example, if you want to sort a group of names, the program might ask you for the field you want to sort on and whether you want to save the sorted index.

You continue to follow instructions until the operation itself is performed. Finally, when you're finished, you exit the program by choosing the appropriate option. Don't forget this final step, since it directs the program to close and save any files.

**Some Things to Remember**

Before I review some of the popular database management systems for the Commodore 64, there are a number of things you should know about purchasing and using such a system.

1. There are two general classes of database management systems. First, there are those designed for a particular purpose, such as the maintenance of mailing labels or inventory. Second, there's a set that's designed for the management of any kind of information. If you have a particular type of operation that needs to be done, you should look closely at one of the specialized systems.

2. You'll only be able to recall and use information from your database if you design your records so that each category or field of information you want is unique.

3. The larger your record is (the more fields and characters in it), the longer the program will take to perform simple functions such as Sort and Search. Remember that even if you use, say, only five of 20 possible spaces in a field, the blank spaces count as information. The program stores the entire field, regardless of whether there is "information" there or not.

4. Your disk is limited in the amount of information it can hold. Save your file frequently, just in case you exceed that limit and you find your program locked up.

5. If you're sorting or printing a large number of records, your disk drive will often have to work continuously to access the necessary information. For many 1541 drives, this can lead to overheating and possible trouble. Don't sort or search any more than is necessary. If possible, save the sorted file.

6. The primary difference among the various database management programs lies in their capacity to store information and their ease of use. See the comparison chart following this article to find out about maximum field length and other characteristics. Also, try to talk with other users to see what programs they use and what they do or don't like about them.

7. As with other software, buy only what you need. Shop around and compare program features. If you only need to perform a simple operation, buy a program that does just that.

## Datalog

Datalog (Midwest Software, Box 214, Farmington, MI 48024) is a disk-based system that offers a standard mailing-list format that can be eliminated or added to, based on your needs. The following master menu is available after you indicate whether the file is new or old:

Edit
Add
Print Records
Print Mailing Labels
Form Letter Files
Backup Files
End

Several sample data files are available at the beginning of the program for you to examine and practice on before entering the structure of your records.

**What I Liked...**

Datalog is a comprehensive and powerful system that has many of the qualities of much more expensive systems. Probably the most useful features of the program are the multiple-format options available for printing out mailing-labels, headers, user-generated messages, record numbers and more.

The option to create backup files is available if you have a dual disk drive, and, happily, the program also keeps track of the amount of memory used when adding new data.

Questions that I posed to Midwest Software were answered by the customer service people in a fast and very helpful manner. You're even invited to call the original programmer for help!

**What I Didn't Like...**

One possible source of confusion is that when Datalog is first loaded and run, the initial screen is not the master menu, but displays other prompts about the status and nature of your files. While clear, it does take a while to get used to the first steps of creating a new form. In addition, the choice of keys to perform certain operations could be more logical, such as using a function key, rather than (?), for add.

The documentation I received was in draft form, but a new 40-page manual is promised well before this article is published.

**Summary...**

Datalog is a powerful program that allows immediate use in mailing applications as well as other functions characteristic of the most expensive and complex database management systems available. For the price and capabilities, it is certainly a best buy.

## Database Manager

Database Manager (Mirage Concepts, Inc., 2519 W. Shaw, Fresno, CA 93711) is a machine language disk-based database management system that has the following main menu:

1) Select File
2) Append File

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*Seeing is believing with Mirage Concepts' Data Manager.*

3) Review/Edit
4) Sort Records
5) Print Record
6) Create New Form
7) File Commands
8) Quit

You select the number of the option you want to perform, press the return key, and the program continues to prompt you as to what you should do next. The program allows for multiple sorts up to five fields deep and uses all the function keys.

**What I Liked...**

First of all, Mirage's Database Manager is easy to use and well documented and offers a wide range of options. What is most impressive about it is the clarity and logical organization of the documentation. The first five lessons form a tutorial for beginners, while the last five are a more advanced set of instructions on how to fully use the capabilities of the program.

For a first-time user, this approach makes things much easier than might otherwise be. The documentation even includes a discussion of the C-64 keyboard, basic information about cursor keys and more.

Another nice feature is that the program offers its own set of file commands, including Format a Disk, Create a Subfile, Replace Fields, Pack File, Merge File and Delete File. These allow you to manage the disk and perform specialized file operations without leaving the program and loading some other utility.

The Pack File option is unique in that it allows you to close up any empty spaces that might have resulted from the deletion of records. It's similar to the Validate function that your 1541 disk drive can perform. Printing is also in upper- and lowercase.

Finally, there's a glossary, an index and a reference section that walks you through the various operations. Even the metal rings of the notebook are shaped in such a way as to prevent the pages from binding. Obviously, a great deal of thought went into the preparation of this documentation; it could serve as a model for other software companies to follow.

**What I Didn't Like...**

The one thing in particular that bothered me about this program is the lack of a memory indicator to tell you how much space is still available on the disk as information is added. While entering a large data set, I exceeded the room available on the disk and had to call the company to have them help me reconstruct the file. An easy three-line program did it, but a way to prevent such an incident would be welcome.

The customer support I received at the time was excellent. The Mirage people were patient and helpful, and I was told that a memory indicator will be included in the next version.

One other thing I found lacking was a way to make a backup disk of the data without the use of some external program. Since the data disk is constantly being accessed and changed, I couldn't read the contents of the disk into machine memory and then write it to a blank disk without leaving the program. I used the 1541 File-Copy program, which worked fine, but I would have preferred some other arrangement.

**Summary...**

This is a well-designed and very easy-to-use database management system, offering excellent user support. I highly recommend it.

## Data Manager II

Data Manager II (MicroSpec, Inc., PO Box 863085, Plano, TX 75086) is a disk-based program that has the following main menu:

CReate
ADd
CHange
DElete
BRowse
SEarch
DUmp File
REport
COlor Selection
PRinter Setup
EXit Program

You select the option you want by entering the first two characters of the word, and the program prompts you through the next set of steps. In order to sort (up to two fields deep), you use the Report option, and then identify the fields you want to sort on.

**What I Liked...**

This is an easy program to learn, with documentation that is clear and straightforward. A nice feature of the program is that it has audio cues to help you prevent certain mistakes that could be costly and time-consuming. Another very helpful feature is the ability to recover damaged data files when a


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- ★ Flexible Reports function allows complete report definitions for horizontal, vertical, or label printing with 18 selection criteria, two level sorting, automatic paging and numbering, and totaling. Complete report formats may be saved to disk.
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*The easy-to-use Data Manager II.*

backup was not made.

One error occurs if, when you're designing the original form, you define a field with more characters than is possible (18). In this event, part of the screen flashes, and you hear a beeping sound. A more serious mistake you might make is the inadvertent deletion of a record. When you indicate you want to delete a record, the program warns you with sound and graphics.

**What I Didn't Like...**

The most serious shortcoming with Data Manager II is that there are no disk-utility options available. The most direct consequence is that you cannot put more than one file on a disk, since there are no Select File, Read File or Write File options. Unless you are adding to an already-established file on a disk, you have to erase and format the disk, thereby erasing the contents.

Finally, the documentation, while informative, is not printed very clearly and is difficult to read. Some pages are left blank without explanation, and there is no index or reference card.

**Summary...**

This is an attractive and easy-to-use program, but it could be improved if some disk utility options were available that allowed Select- and Write-File commands, and if documentation were upgraded.

## M'File

M'File Data Management System (Double E Electronics, Inc., 12027 Pacific St., Omaha, NE 68144) is a disk-based program that provides these five options from the main menu:

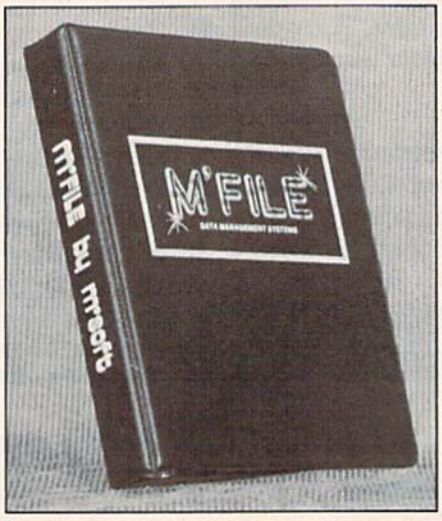
1—Access A File
2—Print A Report
3—Create A File
4—Sort A File
5—Exit

After choosing an option by pressing the corresponding number, you are directed through a series of steps that allow you to complete that task. As you create your form, you indicate special "key" fields that help speed up such operations as Sort and Search. The program uses a "dongle" (a key that fits into one of the joystick ports), and will not run without it. While this doesn't prevent the copying of the program, it limits its use by those who don't have the key.

**What I Liked...**

One of the most useful features M'File offers is the option to both the master disk and the data file, a capacity absent from most of the database programs reviewed here. You can also design complex arithmetic operations using a formula function.

Another nice feature is that files you create using M'File can be merged with seven of the most popular word processors for the Commodore 64: Quick Brown Fox, WordPro 3 Plus, Easy Script, Script 64, Totl.Text 2.6, Busi-




*M'File database for your Commodore M'Computer.*

Writer and Paper Clip. This allows for the creation and use of "boiler plates" for form letters and other repetitive output, and probably accounts in part for the popularity of the program.

The documentation is clear and includes actual photographs of the way screens should appear at various points throughout the program's use. This is a definite advantage to those who are reluctant to tackle new software.

**What I Didn't Like...**

I didn't appreciate the lack of lowercase letters (now available on a later version, however) and the absence of disk utilities. You also need to switch back to the program disk to perform various functions so these routines can be added. After finishing a sort, I chose the Exit option, but this exited the program, rather than returning me to the main menu, as I had assumed it would.

**Summary...**

This is a popular and well-documented system that's easy to learn and use. The lack of lowercase entering could be a disadvantage, especially for those who want to include sentences as field entries.

## MailPro

MailPro 64 (Pro-line Software, Ltd., 755 The Queensway East, Unit 8, Mississauga, Ontario, Canada L4Y 4C5) was designed as a disk-based mailing-label generator, but has many of the features of full-fledged database systems and can be used as such.

The initial menu is as follows. It offers a variety of options, including direct merging with WordPro, the word processor developed by Pro-line.

Create a New File
Edit Field Names
Add New Records
WordPro Data Entry
Merged Data Entry
Recall a Record
Load an Existing File
Setup Editor
Output to Printer
Disk Output
Quit (Shifted)
Index of Files

After you choose the option you want, the program prompts you through the various steps that are neces-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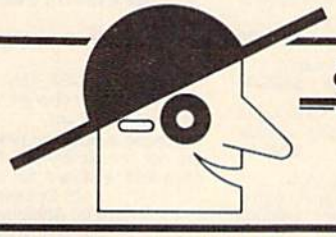

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sary. Setup formats can be "memorized" and stored for later use.

**What I Liked...**

If you are a WordPro user, you will notice how the documentation and formatting of this program is very similar. In fact, the manual itself looks very much like the WordPro manual, and is just as clear in its presentation. You can key on numerous fields for later sorting, as well.

Perhaps the best feature of the program is the free hand you have in designing the output format, coupled with the ability to save and use that format with other data files if necessary.

The documentation includes a sample mailing-address file that even a very inexperienced user could step through without any difficulty. Finally, I liked the no-nonsense approach to the structure of the software. It is best suited to the experienced Commodore user, since it has no information about the computer itself.

**What I Didn't Like...**

The only change in MailPro I believe would be helpful would be to have the information on the sample file (called Example) placed at the beginning of the documentation.

**Summary...**

This is a well-designed program most suited to those who want to maintain mailing-list records with many options available for manipulation and output. It's not designed as a general database management system, although you could use it as such if you're sufficiently experienced.

## Mini Jini

Mini Jini Record Keeper (Jini MicroSystems, Inc., Box 274, Kingsbridge Station, Riverdale, NY) is the only cartridge-based program reviewed here. It has the following main menu:

C = Create
L = Look Through
O = Order (Alphabetize)
S = Search
F = Fix
P = Print
M = Mathpack
W = Write
R = Read
E = Exit

After inserting the cartridge and turning your C-64 on (in that order!), the menu appears on the screen. Prompts are given throughout all the operations, and you continue to complete whatever operation you choose.

**What I Liked...**

This is a straightforward and simple-to-use database program. One of its big advantages is that you can save your output to tape as well as disk, and even direct it to a modem if you have one set up and ready to go. There is also a memory counter on the screen that indicates how much room is available when you add additional information to a file.

Another nice feature of the system is the ease with which you can make a backup copy of your file, simply by inserting a new disk (or tape) and writing directly to it. The documentation is


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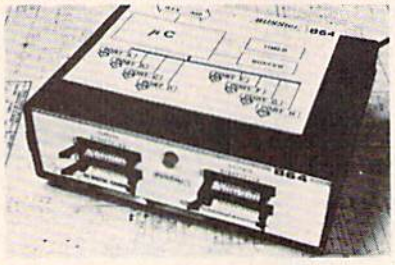

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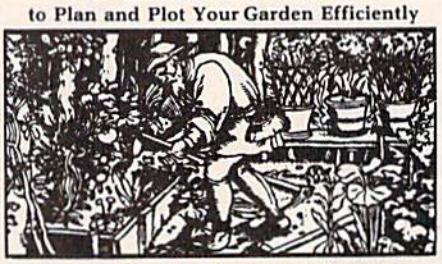

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brief, but clear, containing plenty of "plain English" (as the authors say), thus making it easy to understand.

They do use the word Alphabetize to describe the ordering or sorting function Mini Jini can perform, but it sorts numerically as well. The Mathpack option also allows arithmetic operations on the data with a single keystroke—a nice feature for people who keep lots of numerical data on record and want to do some simple manipulations.

**What I Didn't Like...**

The program has some limitations. For example, only single sorts are possible, but a program that can sort ten deep should be ready soon. When you're adding new information (under the Change Field option), you need to press the A key for each addition. Mini Jini also suffers from the garbage-collection problem common to many C-64 programs, where the program often has to catch up with itself before it can continue to operate.

The most troublesome feature is the exclusion of the comma and colon symbols from use in any field. It's conceivable that you might want to use these punctuation marks in a field (in a product description, for example), and this would not be possible.

**Summary**

This is the only cartridge data management system reviewed here, as well as the only one that can save to tape. This allows the non-disk user to take advantage of this kind of software. Cartridges are convenient and easy to use, but are, of course, somewhat limited in capacity.

## PowerFile

PowerFile (City Software, 735 W. Wisconsin Ave., Milwaukee, WI 53233) is a disk-based system that prompts you with a range of questions and offers you a variety of menus throughout different sections of the program.

A tutorial guides you through the design, addition to, and printing of a mailing-label list. Succeeding chapters focus on disk-creation, report-writing and more advanced features.

When you create a work disk, the titles of 18 different types of files are listed on a split screen under "Source Directory," and you choose the files necessary to perform the function you need. For example, to print mailing labels, you need to load the file of the same name.

To access files, you need to use the files named Data Base and Direct. The four programs named Powerfile, Data Base, Start File and Direct are automatically loaded, since they're needed for all functions.

New files are created by selecting that option from the main menu. A series of questions then leads you through the formatting of the fields.

**What I Liked...**

The introduction and tutorial that PowerFile offers are clear and to the point. I found it easy to begin the tutorial, and when it was time to design a record, the prompts forced me to think through the information that I needed. Color configurations can easily be changed to suit your taste, and the documentation is presented in a physically

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clear, easy-to-read manner.

**What I Didn't Like...**

One problem I had with PowerFile was the excessive number of times I had to switch program and data disks when starting up. This seems unnecessarily cumbersome, since other programs with many of the same features don't require it.

A more minor concern is that certain symbols such as the asterisk, colon and semicolon cannot be used in field titles or fields.

Finally, there's an offer of help from the company, but unless you're a registered owner (at a cost of $15), your question may not be answered. If you do call with a question and aren't registered, have the serial number of your copy of PowerFile and a MasterCard or Visa number available. This policy is in sharp constrast to many other companies that are happy to offer whatever assistance they can at no charge.

**Summary**

This is a well-designed program that's a bit cumbersome to get started and somewhat expensive compared to other systems.

## Superbase 64

Superbase 64 (Precision Software, Inc., 820 2nd Ave., New York, NY 10017) is a disk-based system originally published in Great Britain. It has an extensive number of options available, as illustrated by the two main menus:

| Menu 1 | Menu 2 |
|---|---|
| f1 Enter | f1 File |
| f2 Select | f2 Format |
| f3 Find | f3 Batch |
| f4 Output | f4 Sort |
| f5 Calc | f5 Prog |
| f6 Report | f6 Maintain |
| f7 Execute | f7 Menu |
| f8 Help | f8 Help |

You begin using Superbase 64 by loading the program disk and then switching the program and data disks until the tutorials and help screens are loaded on the data disk. When all the tutorials are loaded, you again load the original Superbase 64 program, and the database automatically starts up. You choose which option you want to perform from one of the two menus. Menu 1 and Menu 2 are reached by pressing the return key.

*A super database from Precision Software.*

**What I Liked...**

This is the most elaborate and extensively documented of all the programs reviewed here. It not only contains sophisticated options, but also offers detailed tutorials, both in printed and screen form. For example, both menus offer a Help function, which produces on-screen information about how to use the option you've selected.

Another nice feature is the availability of a "memo screen," where you can call the memo option and write yourself a note about the current file (or anything else for that matter). There are also a simple program for copying data disks, seven different predefined field formats and a reverse function for changing the background of selected fields.

There are two other very impressive things about this program. The first is the physical documentation, consisting of separate tutorial, reference, programming and appendix sections. I found the 81-page reference section alone very useful. Clear instructions are offered, including visuals as to which sequence of keys should be pressed to accomplish a particular function.

The second is the availability of extensive programming options, including Linking Files, Wait (for user input), Do, Load, Save and over 40 others. These are not Basic language commands, but they allow you to sequence a series of operations and then execute them with one general command.

For example, you might want to select, sort, and then print a certain file in some defined format. This can be done with one set of commands, rather than waiting for each separate step to be completed before moving on to the next. You can also program in Basic and incorporate these options.

**What I Didn't Like...**

Although you have to switch disks frequently, this need only be done at the beginning of the session. If there was anything I didn't like about Superbase 64, it was the lack of a memory indicator and a lack of clarity in the writing of some sections of the tutorial, the latter possibly due to "English" vs. "American" usage.

**Summary**

This is a complete database management system that offers many options not available in other programs. The detailed nature of many of these options takes some time to learn, but it's well worth it. This is one of the best of the lot.

## The Filing Assistant

The Filing Assistant (Rainbow Computer Corp., 490 Lancaster Pike, Frazer, PA 19355) is a disk-based system that presents the following options on the main menu:


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1) Change/Update an Existing File
2) Create a New File
3) Load the Report Generator
4) Load Label
5) Set Function Key Displays
6) Set Printer Configurations
7) Set Screen Colors
8) Stop Program

In creating a new file, you have to go through a number of steps that might seem elaborate, but that force you to be sure of what form your record should take. As you choose different options, you're instructed to switch the program and the data disks when necessary.

**What I Liked...**

The Filing Assistant has many nice features. Detailed attention is paid to the design of the original record form as you create a file, and lower- as well as uppercase printing is available. Another nice aspect is a clearly-written set of documentation materials, including a brief glossary and an index (although the index is not mentioned in the table of contents).

Perhaps the handiest feature of the program is the use of the function keys, where all eight can be reprogrammed to fit your needs. They are already programmed to do things such as add a record, copy a record, change a record, delete a record and more, but could be used to enter a string of data that is repeatedly present in a database.

You can design the printer configuration so that almost any printer can be used with the program. It's also compatible with the same company's word processor. Finally, all records are automatically sorted as they are added.

**What I Didn't Like...**

There are two things that I found particularly troublesome in using The Filing Assistant.

The first is the design of the system that requires you to constantly switch the program and data disks to first access a certain option and then perform that option. To sort a file, for example, you need first to go to the program disk to load the Sort routine, then back to the data disk to actually perform the sort.

The second problem is that certain punctuation marks (the comma, quotation mark and colon) cannot be used as part of a field. For those who want to write sentences as a field (perhaps a description of a recipe), this can be awkward.

Finally, the utility options are limited. Besides formatting a new disk and selecting old files, no other options are available. There also is no indication as to how much memory is being used.

**Summary**

The Filing Assistant is a well-documented system that performs basic data-keeping functions, but takes a lot of preparation to establish new files.

## MicroBase

MicroBase (Dedalus Digital, 309 Rena Drive, Lafayette, LA 70503) is a "memory-resident" disk-based system for the C-64 and the VIC-20. Its memory-resident nature allows the program itself, as well as entered data, to be stored in memory at all times.

There are two menus that guide the user through MicroBase. The initial one asks the user whether the file is new or old. If new, the program prompts you with a series of easily-understood questions, including field name and length, that define the nature of your data file. If old, you indicate the filename you want to work on, and it is then loaded.

After designing the file structure and adding data, you can return to the main menu, where the choices are as follows:

N New File
L Load File
S Save File
A Add a Record
O Order
P Print
Q Quit
F Find

Pressing the corresponding letter (without a return) places you in the option of your choice. Each of the options contains prompts to perform the task you selected.

**What I Liked...**

This is an extremely simple database program to use; it could be a good first choice for the beginner. It's user-friendly, and you can almost get by without even reading the manual.

One big advantage of this program is the memory-resident nature of its design. Since all data is stored in the memory of the machine, operations such as Sort and Find are very quick. It allows for the use of tape or disk as a storage medium, saves the previous print format for later use and contains a memory-indicator telling you how many records your memory configuration currently contains. You can make your own backup and can use the program on a VIC-20.

**What I Didn't Like...**

The primary limitation of this program is the size of the entries. Although you can have a field up to 87 characters in length (with a record size limited to 174), the memory-resident nature of the program limits the number of entries allowed. For a 174-character record, you can fit only around 170 records on a file.

Other shortcomings are the inability to change the file structure once you have begun entering data (which is a characteristic of most of the programs reviewed here) and the cumbersome and unclear language at the beginning of the documentation. One glaring omission is that there are no directions about how to load the program.

**Summary...**

MicroBase is an extremely easy-to-use filing system for small jobs around the house, or even for small businesses.

## Inventory Manager

Inventory Manager (Sundial Software Associates, Inc., PO Box 14507, Rochester, NY 14614) is the most specialized of all the systems reviewed here.

It is designed specifically for inventory management, and offers four different functions. File Maintenance creates the master file of information on each stock item in the inventory. Reports Generation summarizes inventory status. Daily Entries performs daily operations on sales and receivings, and also enters orders. Finally, Utilities clears sales, records quantities sold, initializes the data disk and customizes reports. The initial menu looks like this:

| | |
|---|---|
| File Main | A Add Items |
| | B Change Items |
| | C Delete Items |
| Reports | D Inventory Report |
| | E Price List |
| | F Sale & Cost Analysis |
| Daily Entries | G Receive Items |
| | H Order Items |
| | I Sales Entry |
| Utilities | J Clear Sales & Cost |
| | K Initialize Data Disk |
| | L Customizer |
| | M Item Inquiry |

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After a file is created (using A above), you can choose the option you need and proceed according to the prompts. Since the program is so specialized in its purpose, the prompts allow for few errors. For example, when adding inventory, the user is asked for a description of the item, three prices, quantity on hand, inventory location, vendor code and more.

You should be aware that this is *not* a general database management system.

**What I Liked...**

This is an easy-to-use inventory manager, and the authors have made every effort to make it friendly and crash-proof. For the small-business owner, it seems an ideal way to track inventory.

**What I Didn't Like...**

I have one major complaint about this software package: the *very* poor quality of the documentation. It seems as if it had not been proofread, since it's filled with misspellings and run-on sentences that are difficult or impossible to understand. Misspellings are also present in the program itself ("to large" instead of "too large").

Finally, you *must* initialize an already-formatted disk, selecting an option from the menu, or the program will not continue. This limits you to one file per disk.

**Summary...**

Inventory Manager is an easy-to-use, highly specialized inventory management control program. It is friendly, but poorly documented.

## Delphi's Oracle

Delphi's Oracle (Batteries Included, 186 Queen St. West, Toronto, Ont., Canada M5V 1Z1) is a comprehensive database system that does justice to the oracle it was named after. It doesn't answer all questions, as Delphi did, but allows for the management of information through a series of prompts located at the bottom of the screen.

After the program is loaded, the main menu appears and shows the following options:

1 = Set data-file name.
2 = Create a new data file.
- New record format
- Modify existing format

3 = Modify an existing file.
- Add new record
- Delete records
- Change records

4 = Searching and Reporting.
- Find records
- Print reports

5 = Disk Utilities.
6 = Exit from this program.

Each of these operations is menu-driven. New records are created through the use of Open field and Close field commands and the definition of their length. After the record is completed, the program computes and shows the "statistics of creation" for that form, giving you information such as the number of possible records and the file structure.

Other operations, such as sort (to 15 deep), form-design and print, are all completed by selecting from the main menu, which is reached at any time by pressing the f8 key.

**What I Liked...**

Delphi's Oracle is a very attractive system that not only manages information in a quick and efficient manner, but also has some very helpful features.

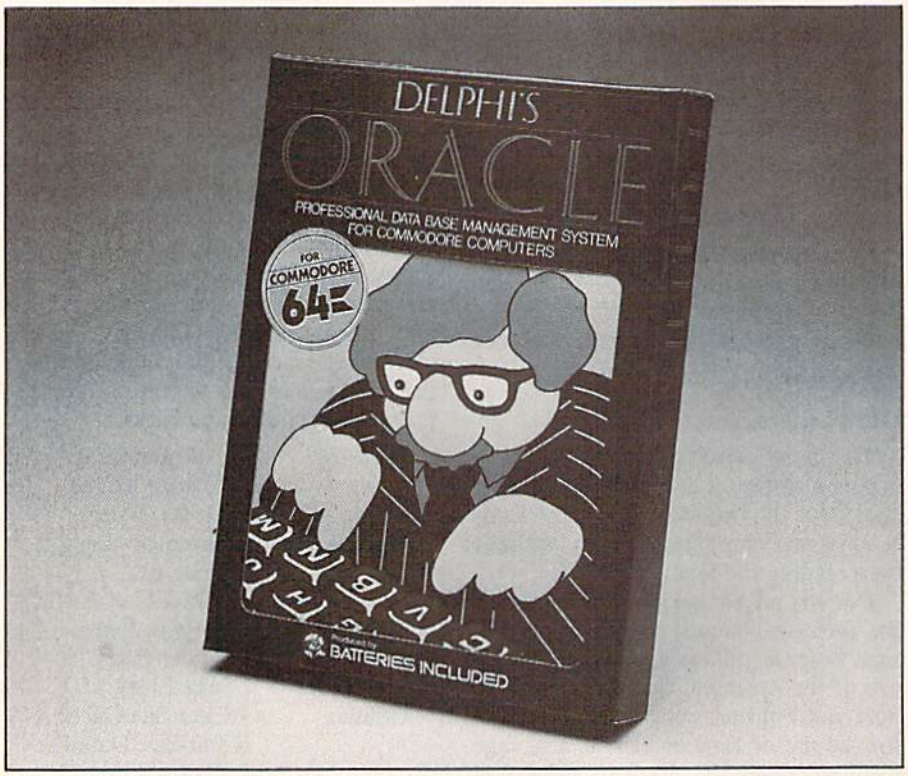
One of these is the placement of more than one field on a line, which not only saves space, but makes it easy to design complex forms. Another of these handy features is the ability to modify the format of the record after information is added.

Like some of the better programs reviewed here, you can add information from an external sequential file, as well as from the keyboard. Finally, Delphi's Oracle allows for filling in a standard form, much like a word processor/database management system merge might do. This option can, for example, allow the reprinting of a membership form and the completion of the fields as the form is printed.

The documentation contains a glossary, a reference guide and an index, allowing you to find almost any information you need quickly and easily.

**What I Didn't Like...**

While the documentation is complete, I found the 151-page tutorial too cumbersome and wordy to be as effective as it could have been. In fact, the reference section, which lists the steps that one goes through in performing each function, was much easier to follow. The reference guide is an outline of the tutorial and seemed more to the point. The documentation itself is printed on glossy paper that's difficult to read after a short time because of the reflection of light.

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One other shortcoming is that the initial instructions fail to tell you that the Load command ("Oracle 64.run") needs to be typed in lower- *and* uppercase characters. When the C-64 is turned on, it will enter upper- and lowercase characters unless the Commodore and shift keys are pressed simultaneously. While a minor point, this is easily overlooked and can delay getting started.

**Summary...**

This is a very comprehensive database management system—one of the best reviewed here. It does suffer, however, from an overambitious tutorial, which is cumbersome to get through. [Note: Delphi's Oracle will soon be marketed as The Consultant.]

## FCM

FCM (Continental Software Company, 11223 South Hindry Ave., Los Angeles, CA 90045) is a Filing, Cataloging, and Mailing system that consists of a series of four different modules. Each of these modules is reached through the main menu, which appears after loading. Conversely, the main menu can be reached from any module.

1. RECORD/EDIT/PRINT ENTRIES
2. SORT ENTRIES
3. TRANSFER ENTRIES
4. SYSTEM UTILITIES
5. EXIT

Module 1 allows you to record, search and sort entries, and you can also use it to print labels, a master list and envelope addresses.

Module 2 creates duplicate files and sorts entries.

Module 3 allows you to transfer entire lists or parts thereof from one disk to another—convenient for making backups or creating subfiles.

Finally, Module 4 provides for the renaming of fields, assigning hardware configurations and starting a new list.

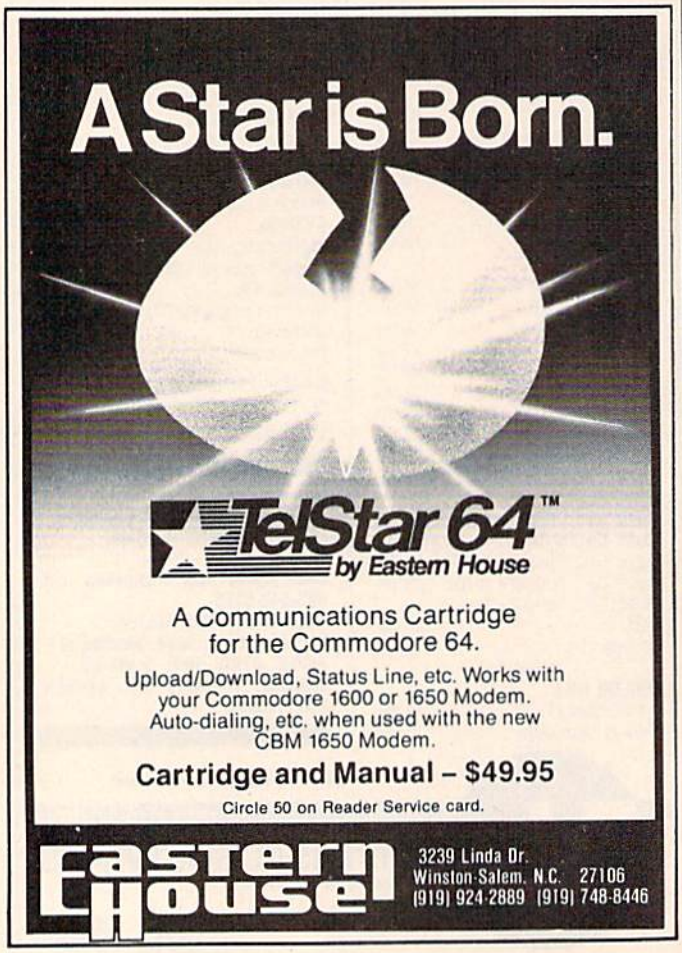
This database management system is ideally suited for the creation and maintenance of mailing lists. There is even a preformatted mailing-record setup containing ten fields, which is very easy to use. If you want to create your own form, you have to be patient in finding the section in the documentation that can help (System Utilities), and proceed from there.

**What I Liked...**

As primarily a mail-maintenance program, FCM does a nice job of providing all the options you'd need, including printing envelopes with a return address! This is an especially attractive feature, now that continuous-form envelopes are available.

The documentation is well-written and clearly explains the steps you need to take to produce a customized list, print mailing labels and so on. The manual is filled with examples of what your monitor screen should look like, so it's easy to quickly spot errors.

One really nice feature of FCM is the way the master list option prints out the data in a 17-character-per-inch format, allowing for a great deal of information on one page. I'm not sure what this option does for printers other than an Okidata (which I have), but I assume it does the same if the printer has the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capability.

Finally, you can redefine fields and their lengths in any record. Actually, this is what you have to do to create a new record, since the mailing list format is automatically presented. In other words, you don't start with a blank slate, but change what is already there.

**What I Didn't Like...**

Although the documentation is clearly written, it mentions nothing about the disk switching that is necessary every time you want to go from one module to another. I found this cumbersome and time-consuming.

Interestingly, you don't save or read files, since you can only put one file on a disk. Even if the disk is newly formatted, the program still tries to read existing files before you begin a new one.

Other shortcomings are the lack of a lowercase option and no information in the manual or on the screen as to memory used or the capacity of the program.

**Summary...**

FCM is a good choice if you need a program that can create and print a set of mailing labels. For general database management, other programs might be preferable.

## Infomaster

Infomaster (TOTL Software, Inc., 1555 Third Ave., Walnut Creek, CA 94596) is a disk-based full-feature database program. Data records can contain up to 100 fields of up to 245 characters until a maximum of 2500 characters is reached. Unlike similar database programs, up to 10 files may be stored on each data disk. The number of records per disk is limited only by disk capacity and field lengths chosen. One key per record is permitted.

Data file password protection is offered, and fields may be redefined after a database is created. Two disk drives are supported. The program disk contains a sample database and configuration file that controls screen colors, Centronics and RS-232 printers, 40- or 80-column screens (with optional 80-column board), and selected printer-control codes. This file can be rewritten to match your hardware.

Data-editing features include Add, Change, Delete, Display, Browse Records, Browse Keys, Replicate, Sort, Search and Select. Fields may be tested for up to five equality types.

Infomaster includes a report writer and can store up to 20 predefined report formats. It includes up to five levels of sorting, five levels of control breaks and subtotals, arithmetic calculations between any two fields, horizontal screen scroll to preview a report before printing, multiple report lines per record, up to 16 heading lines, labels up to 4-across, and upper- only or upper/lowercase output. The post office prefers uppercase labels.

Infomaster includes a conversion program to load files generated by other TOTL programs and an extraction program to create sequential files for use with TOTL.LABEL and TOTL.TEXT.

**What I Liked...**

True to previous releases from this company, Infomaster is familiar ground to owners of other TOTL programs and includes an excellent step-by-step man-


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ual for the first-time database users.

The Repeating Field option allows several levels of subcategory to be added to a record on which you may search. This allows the database to contain a variety of additional information.

The included sample database files illustrate all program functions including arithmetic calculations, and they are easy to understand.

**What I Didn't Like...**

The program is compiled Basic, and although data can be backed up, you cannot back up the program master disk. Having only a single key available can slow searches when you need to search fields other than the key field. This restriction applies to other available databases when key fields are not used in searches.

**Summary...**

Infomaster will be familiar territory to many owners of previous TOTL releases—a valuable program asset. Clear documentation makes this an attractive home or small-business package for the uninitiated. Once you learn it, you'll see it's a surprisingly powerful yet inexpensive data management tool.

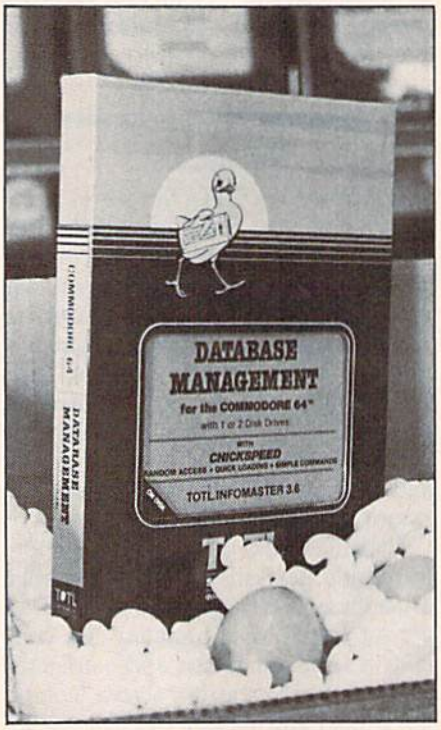
## Inventory

Inventory (William Robbins, Box 3745, San Rafael, CA 94912) is a preformatted database program, designed to handle inventory information. Available on both disk and cassette, Inventory is written in Basic and can be easily modified.

The program can support printer output to both the serial port as device #4 and the RS-232C port as device #2. Minor modifications may be needed depending on your specific printer requirements.

Inventory is designed to create and edit a list of inventory items and to develop reports, either to the screen or printer. Three report formats are included: list of stock, list misc. data and print order form. Basic Data statements are initially used to set up the suppliers (companies) from which you buy stock.

After entering this information, you start the actual inventory tracking procedure. First, you need to assign supplier numbers and stock numbers to your inventory. Then a main menu allows you to enter data, make changes, sort, search, track sales and purchases,




*Infomaster is the TOTL answer for first-time database users.*

print reports and load/save data to files on cassette or disk.

**What I Liked...**

This program is easy to work with and to modify since it's written in Basic. You can make backup copies of the master disk. Most printers can be supported, and you have a choice of three hardcopy formats.

Up to 20 companies (suppliers) can be tracked and inventory data sorted by stock number or item name. And you can also print an order form for each supplier to help restock your low inventory items.

**What I Didn't Like...**

The File Command selection from the main menu is quite limited. You can only load and save files. There are no utilities such as formatting disks, renaming files or erasing old files, but these are easy to add.

I also didn't like the instructions. They are only two pages long and do not give any examples. While this program is easy to learn once it's used for a time, getting started is awkward.

**Summary...**

Inventory is a good buy if you need to manage a small inventory database. To get the most out of Inventory, you need some knowledge of the Basic language.

## Data Manager

Data Manager (Timeworks, Inc., 405 Lakecook Road, Deerfield, IL 60015) is a disk- or cassette-based database program whose wide range of features include X-search (cross search), data analysis and use of an index code system that lets you set up your own classifications.

To set up a database with Data Manager, you first decide how to format your data for entry into the program. You have up to eight screen lines, which act as fields, and each line can contain up to 30 characters. Each eight-line screen makes up one record, so you can have up to 240 characters per record.

As you set up your data record format, you may insert pointers and index codes to aid you in handling data. Pointers consist of letters or groups of letters followed by a greater than sign (>), then followed by a value or date. These pointers are then used by the computer when searching for certain values.

Index codes quickly recall records dealing with a specific subject. They can be used anywhere in your record, but must always be on the same sequential line. An example of an index code in a mailing list database would be R for relatives or WF for work friends.

Data Manager also uses a General Information Screen, which keeps tabs on your database by providing information on the subject, what pointers are used and last revision date.

**What I Liked...**

For its price, Data Manager contains a wide range of features. For example, you can analyze stored data with certain math functions, which include sums, averages, standard deviation and frequency distribution. This frequency distribution chart gives you a graphic view of your data. The horizontal axis shows the lowest to highest ranges of data, with the vertical axis showing the tally of each range.

Data Manager also is very helpful when you're working with disks. After you load Data Manager, it can format a blank disk for you without your having to quit the program. Because this will erase all data on a disk, Data Manager gives a stern warning for you to double-check the disk you want to format.

Finally, when you quit working with Data Manager, the program closes all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files and gives you a prompt "Do you want a backup data disk (Y/N)?". This makes it easy to keep several copies of your data for safekeeping.

**What I Didn't Like...**

First, even with a wide range of features, Data Manager is hard to work with. While pointers and index codes are nice ideas, they are somewhat difficult to use. And the manual is quite confusing when describing how to use them. If you forget to enter them in some records, you'll get incomplete information when doing searches.

Second, this program runs slowly in comparison to other database programs. It takes four to five minutes to format a disk for the database format you design, then it takes 10–20 seconds to save a few records and return to a blank screen for more data entry.

Finally, actual entry of data is difficult due to the screen layout, limited number of fields (eight maximum) and movement as data is entered. The first record shows your selected field names, but then it scrolls up as you enter new records. After two or three records are entered, your field names are no longer on the screen, so you need to have them recorded somewhere else for easy reference.

**Summary...**

Like many low-cost programs, Data Manager has both strong points and drawbacks. While it can store and manipulate data in many nice ways, it takes learning and practice to get the most out of the program.

If you have a limited budget (who doesn't?) and don't mind spending extra time learning how to use pointers and index codes, then Data Manager may fit your needs. And if you handle lots of numbers, the statistical analysis feature may greatly help you.

Data Manager 2, an enhanced version of Data Manager, is now available.

## Info-Manager

Info-Manager (Pyramid Software International, 30-A Fairfax St., San Rafael, CA 94901) is a disk-based database program designed to be an electronic index card file. The program simulates a traditional card file, with each record referred to as a card.

Each card can have up to 18 fields with a maximum of 35 characters per field. So you basically have one screen set up as a record, with up to 18 lines acting as fields. When storing data, you must put similar types of information on the same line for each record.

Info-Manager is menu-driven, with commands presented as options on the menu. Once you decide on a format for handling your data, each card in that file must have the same format, so you have only one format per file. If you need different formats for different types of data, you'll need to set up different files for each type.

Info-Manager uses sequential files for storing data to disk. Each record can contain a maximum of 630 characters. The maximum number of records varies with disk space available. As for printing, you can print all or part of the information in each record. Also, any two fields (two screen lines) can be printed out as one line to get a 70-character hardcopy line.

**What I Liked...**

Some programs are slowed down by too many menus, but not Info-Manager. The menus are concise, well placed and followed with helpful prompts to help you through the program and avoid losing data. Also included on the disk are start-up instructions, which can be selected or skipped over.

When actually setting up a database, the screen displays a grid on the top screen line to help you align information. This is especially helpful when you enter many records, because when you sort or search data later, you'll need to know the line and column position of the data to be located.

Finally, Info-Manager is well supported by Pyramid Software. Several of my questions were answered over the phone, and later, I received a Special News Bulletin, which described a bug in the sorting routine and a simple way to fix it. While I don't like buying bugs, it's reassuring to know that a manufacturer will support you after the initial purchase.

**What I Didn't Like...**

While Info-Manager is a relatively complete program, it has some drawbacks. The manual, though complete, is hard to read. Pyramid indicates this

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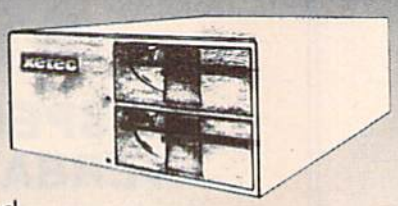


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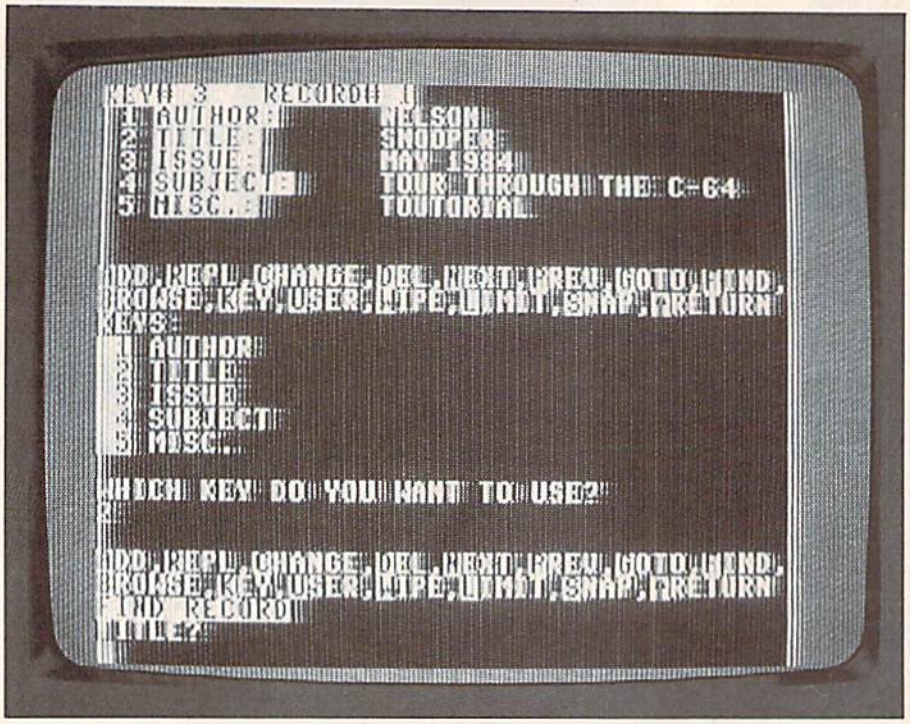


*Faultless Flex File from Webber Software.*

issue has been resolved with a larger print edition.

Another drawback is you have to be very careful in formatting and entering your data. For example, if you incorrectly position data on a line, it can be ignored during a sort or search routine. Therefore, you must enter your data very carefully—a somewhat time-consuming process.

One other drawback involves the procedure for doing a printout. If you don't have the master disk in the disk drive, the program will crash if you select the Print Cards menu option.

Also, when I did a sample printout, the hardcopy did not skip a line between records when instructed to do so by the program.

**Summary...**

Overall, Info-Manager is a relatively low-cost database with many strong features. It's easy to use and can be put to use quickly after purchase. While not capable of handling large databases efficiently, it should find a place for home and small-business uses.

## Flex File

Flex File (Webber Software, Box 9, Southeastern, PA 19399) is a disk-based, full-feature database program. Data records can hold 20 or more fields with 79 characters maximum for each field. Each record can contain up to 254 characters, and a 1541 disk can store about 1000 records (with two keys).

The program disk contains about 97K of menu-driven programs and four demo sequential files. Data can be set up with 20 keys, and five sort levels are supported. Printer output supports both the serial port (device #4) and the RS-232C port (device #2). Screen color display can be changed to suit your likes.

Data editing features include add, replicate, change, delete, next, previous, GOTO, find, browse, key, user, limit, snap, wipe and return to menu. In addition, Flex File has very complete data selection and handling features. For example, records can be selected by testing any field against nine equality types, and simultaneous multiple tests are permitted.

For example, let's say we have a database containing information on subscribers for a club newsletter. With Flex File, you can select all members who owe dues (over 60 days) and who live in other states. You can sort and alphabetize up to five fields together, and Flex File includes complete mathematical operations of data, such as totals, averages and subtotals. You can also define your own calculating operations.

Flex File also comes with a Report Writer program, which is like a small word processing program. With Report Writer, you have complete control over the printed format. For instance, you can have headers, column numbers, titles, calculated results and justification, and you can send special character commands to your printer.

Finally, other advanced features provide you with the ability to restructure random files and create sequential files from random access files, and there's a Batch Entry mode for large amounts of data.

**What I Liked...**

Flex File is one of those programs that you never seem to outgrow. The more you use it, the more features and uses you discover. The program comes on disk, but also includes a dongle, which is a ROM chip that plugs into the cassette port. As long as you have this dongle, or key, you can make backup copies of the master disk.

The program also comes with sample files, so you can immediately get started and learn to use Flex File quickly. Sample files include mailing list and inventory files. The instruction manual is very complete and well organized for both the beginner and experienced database user. You can select color combinations for screen display, and the master disk will customize itself for your hardware requirements.

**What I Didn't Like...**

It's tough to find fault with Flex File; there just aren't any worth noting.

**Summary...**

Flex File is so complete it's hard to think of anything that's missing. While the price may seem high, this is a high-quality program with wide flexibility. You probably would not need it to handle small amounts of data, but then again, neither will you outgrow it. I highly recommend you consider making Flex File your primary database program. R

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Records per File | 1K | L | 1200 | 1000 | L | 250 | L | L | 250 | L | 1200 | 750 | L | L | L | L | L | L |
| Files per Disk | 1 | 1 | 1 | 1 | L | L | L | L | 1 | 1 | 1 | 1 | 10 | L | L | 1 | L | L |
| Maximum Record Size (in Characters) | 250 | 2K | 254 | 250 | 254 | 100 | 254 | 1108 | 254 | 174 | 15 | 132 | 2500 | 7K | E | 240 | 630 | 254 |
| Fields per Record | 12 | 200 | 18 | 32 | 20 | 10 | 20[B] | 127 | 25 | 12 | fixed | 10 | 100 | 99 | 8[E] | Variable[I] | 18 | 20[B] |
| Maximum Field Size (in Characters) | 40 | 250 | 24 | 78 | 99 | 79 | 254 | 255 | 79 | 87 | fixed | 24 | 245 | 877 | E | 30 | 35 | 79 |
| Cost of Backup Disk | 4.00 | 7.00 | 7.50 | Yes (key protected) | No (it's protected) | — | free[F] | free | 10.00 | free | — | 20.00 | 3.00 | free | free | $12.50 | free | free[F] |
| Cost of Update | 5.00 | free | 20.00 | 5.00 | N | N | 10.00 | 5.00 | Y | N | — | free | 15.00 | — | 0[C] | 0[G] | 0[C] | not offered |
| Function Keys Used | N | Y | Y | Y | Y | Y | Y | Y | N | N | Y | Y | Y | Y | N | N | N | N |
| Subfiles Created | N | Y | N | Y | N | Y | Y | Y | N | N | N | Y | Y | Y | N | N | N | N |
| Files Merged | Y | Y | N | Y | Y | N | Y | Y | N | N | N | N | Y | Y | N | N | N | Y |
| Merge with Word Processor(s) | Y | Y | Y | Y | Y | Y | Y | Y | Y | N | N | N | Y | Y | N | N | N | Y |
| Reference Card or Section | Y | Y | N | N | N | Y | N | Y | N | N | N | Y | N | N | N | N | N | N |
| User Friendliness; Scale of 5 (very) to 1 (not at all) | 4 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 2 | 3 | 3 | 5 |
| Dump Screen Contents to Printer | Y | Y | Y | Y | Y | Y | N | Y | Y | N | N | Y | Y | Y | Y | Y | Y | Y |
| Print Database in List Form | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | N | Y | Y | Y | Y | Y | Y | Y |
| Print Database in Report Form | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | N | N | N | Y |
| Print Mailing Labels | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | N | Y | Y | Y | N | Y | Y | Y |
| Does Multiple Sorts | Y | Y | Y | Y | Y | Y | Y | Y | Y | N | N | N | Y | Y | N | Y | N | Y |
| Change Colors | Y | Y | Y | N | Y | Y | Y | Y | Y | N | N | Y | Y | N | Y[D] | N[A] | N | Y |
| Copy Data Files | N | Y | Y | Y | Y | Y | Y | Y | Y | N | N | Y | Y | Y | Y | Y | Y | Y |
| Screen Tutorials | Y | N | N | N | Y | N | Y | Y | N | N | N | N | Y | N | N | N | N | Y |
| Print Uppercase | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Print Lowercase | N | Y | Y | Y | Y | Y | Y | Y | Y | N | N | N | Y | Y | N | Y | N[H] | Y |
| Indication of Remaining Memory | Y | N | N | Y | Y | Y | N | N | Y | Y | N | N | Y | N | N | N | N | N |
| Disk Utilities Available | N | Y | N | N | Y | Y | Built-in | Y | N | N | N | N | Y | Y | N | N | N | Built-in |
| Output to Screen | Y | N | Y | Y | Y | N | Y | Y | N | N | N | Y | Y | Y | Y | Y | Y | Y |
| Does Conditionals | Y | Y | Y | Y | Y | N | Y | Y | Y | Y | N | N | Y | Y | N | N | N | Y |
| Has Index | N | Y | N | N | N | Y | N | Y | Y | N | N | Y | N | Y | N | N | N | N |
| Has Memo Screens | N | N | N | N | N | N | N | Y | N | N | N | N | N | N | N | N | N | N |
| Rename a Field | N | Y | Y | Y | Y | Y | Y | — | Y | N | N | Y | Y | Y | Y[D] | Y | N | Y |
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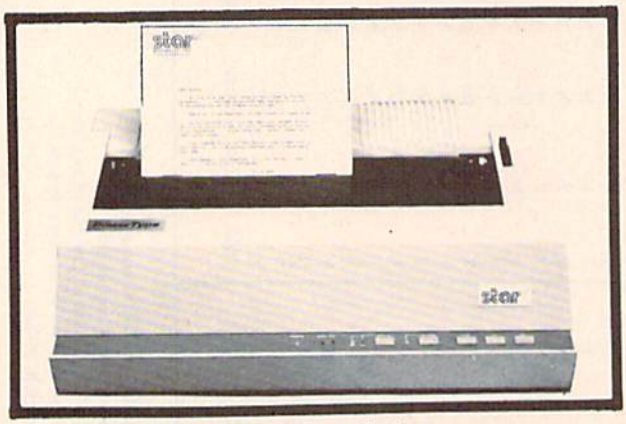

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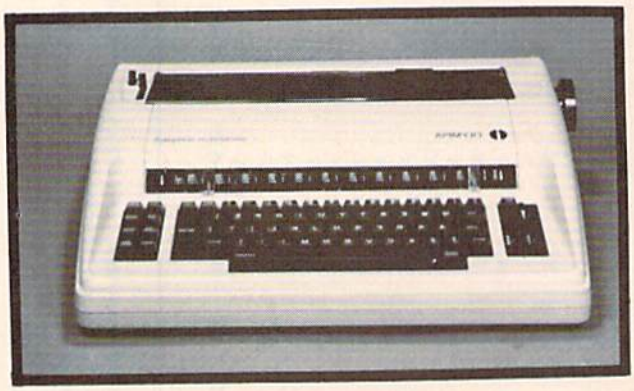

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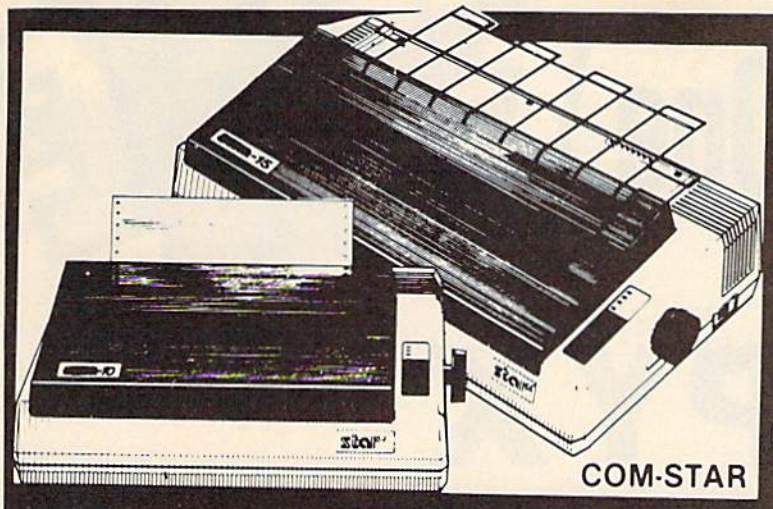


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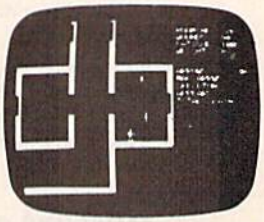

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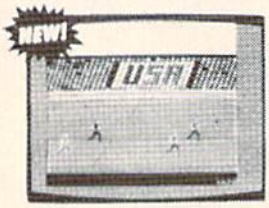


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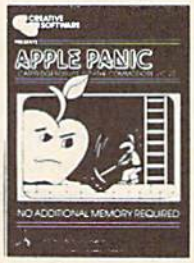


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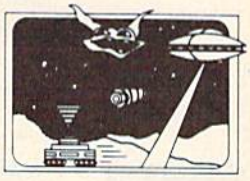

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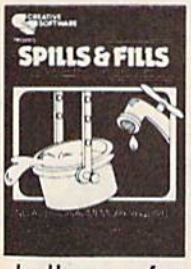


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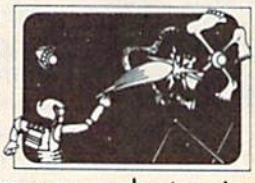

**Video Mania** — You're in an open field and strange alien creatures are roaming all over. If you stand still too long, they'll collide with you, causing instant annihilation. Your only defense is to destroy them by throwing your electronic, football-shaped alien zapper at them. **Sale $9.95.**

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# The Art of Flowcharting

**Chart a smooth course for your programs, and become a better programmer at the same time, by using flowcharts.**

**By Enoch L. Moser**

**RUN It Right**
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*Address author correspondence to Enoch L. Moser, 335 Oahu Drive, Merritt Island, FL 32953.*

Writing a software program in any language involves four distinct processes or phases: program definition, flowcharting, coding and debugging.

Though it might be possible in simple programs to eliminate one or two of these processes on paper, each phase must be done at least mentally. Each person has his own talent in this regard; some are able to create fairly complex programs by going straight to the coding process.

Most programmers, however, should perform these phases as described for all but the simplest programs. Programs generated following these steps will, in nearly all cases, be of a better quality than those that are coded directly.

### Program Definition

Before you can write a program, you must first know what it is you want it to do. This might sound too obvious, but, as students of science are taught, the first step in solving any problem is to *define* the problem.

Suppose you want to write a program that provides arithmetic exercises for a student. It's not sufficient to know that you want to write an arithmetic tutorial. You must have in mind a complete set of specific objectives—and it's best to write them down.

Your objectives must be fairly detailed, but don't assume that they're fixed once you write them. You may, and should, revise them as your understanding of the program evolves, although you should initially give them enough thought to know where you're going.

For example, let's start with the following objectives:

1. Randomly generate arithmetic problems.

2. Let the student select any of the four arithmetic functions (addition, subtraction, multiplication and division).

3. Let the student select one of four levels of difficulty within each function.

4. Keep track of the score and present it after each problem.

5. Permit change of options after any problem.

6. Reset the score after any option change.

7. Permit resetting of the score without changing options.

8. Indicate the correctness of each problem when performed.

9. Show the correct answer if the student's answer is wrong.

10. Provide progress reports based on the score and level of difficulty.

With the program objectives thus defined, it's time to move to the next phase.

### Flowcharting

Any program, no matter what language it is written in (whether it's machine code or a higher-order language such as Basic), consists of a set of sequences of operations and a set of decision points governing the selection of the sequences.

A flowchart—a pictorial representation of those sequences and decisions—permits easy visualization of program flow. When properly done, it provides the program author with the opportunity to structure his program efficiently.

With a flowchart the author can:

- Assure himself that all program objectives are met;
- Verify that all possible conditions have been considered and accounted for;
- Identify code that is required in several places within the program and put it into subroutines, thus avoiding replication.

In addition, the remaining programming processes are easier and the resulting code more professional when you use a flowchart.



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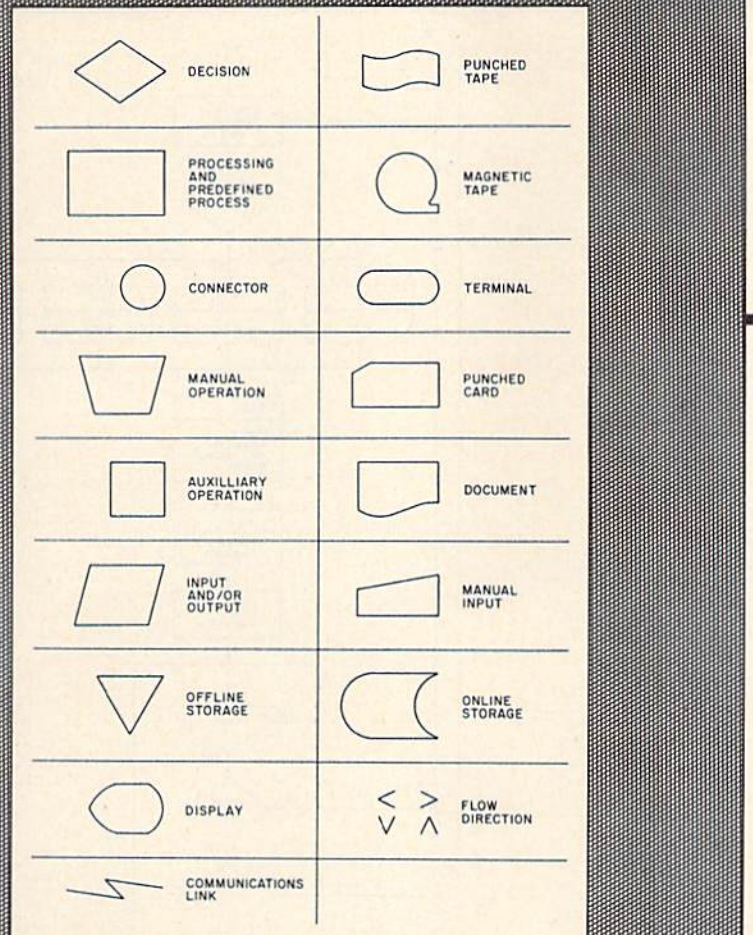


*Fig. 1. Standard flowchart symbols.*

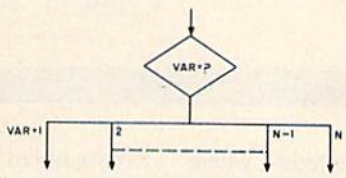


*Fig. 2. Multiple exit-point decision symbol.*

The symbols used in flowcharting have become standardized, and templates are readily available if you want to be especially neat in flowcharting. However, a template is not necessary for successful flowcharting, nor is it necessary to use all the symbols that have been defined. In fact, many—if not all—programs can be adequately flowcharted with only three symbols.

Fig. 1 shows the flowchart symbols from a template based on USA standard X3.5-1966. Of these, the three you'll need are: decision, processing and predefined process, and the connector.

It's useful to distinguish the predefined processes (usually subroutines) by adding a stripe (vertical or horizontal) to the symbol. This is an indicator to the reader that many program steps, possibly both operations and decisions, are represented by the single symbol. You'll find it beneficial to flowchart these predefined processes in all but the simplest cases.

One variation of the decision symbol you'll find useful in the case of multiple exit points (for example, the On statement in Basic) is shown in Fig. 2. This situation can be represented by a sequence of single-decision blocks, but this variation is more compact and more conducive to visualization of the program flow.

**For Flowchart Finesse, Without Fail...**

When designing a flowchart, you should keep in mind four major points.

First, assume that the flowchart is for someone other than yourself and that you won't be available to explain it. You will appreciate the results of this assumption when, in a year or two, you decide to modify the program to meet a new application. In this instance, *you* are that other person, and no one is available to explain it to you.

Second, don't include too many details. The idea is to create a graphic portrayal of the program flow. Too many details distort that portrayal. The details will be put down in the next phase.

Third, when you have completed the flowchart, review the program objectives listed in phase one, and ensure they are met. This may be a good time to revise the objectives, but be sure you reflect any revisions in the flowchart.

Finally, be sure to check that all conditions have been considered and that appropriate flows have been included. For example, what happens if a keyboard input other than one of the ones you expect occurs? Or what if a division by zero occurs?

During the flowcharting phase you should start a list of variable names that you'll use in your program. The needs for variables that will be used for loop counters, for flags (indicators to decision points), for reflecting operator-selected options and for storing keyboard input are usually apparent during the flowcharting phase.

Variable names assigned during flowcharting should be used on the flowchart as well as included on the variable list. This will facilitate the coding process by reducing the number of times you must scan the list.

The variable list development continues into the coding phase, since you'll undoubtedly find needs for additional variables when you get to the final level of detail.

Such a list will reward you many times over. It eliminates time you'd nor-

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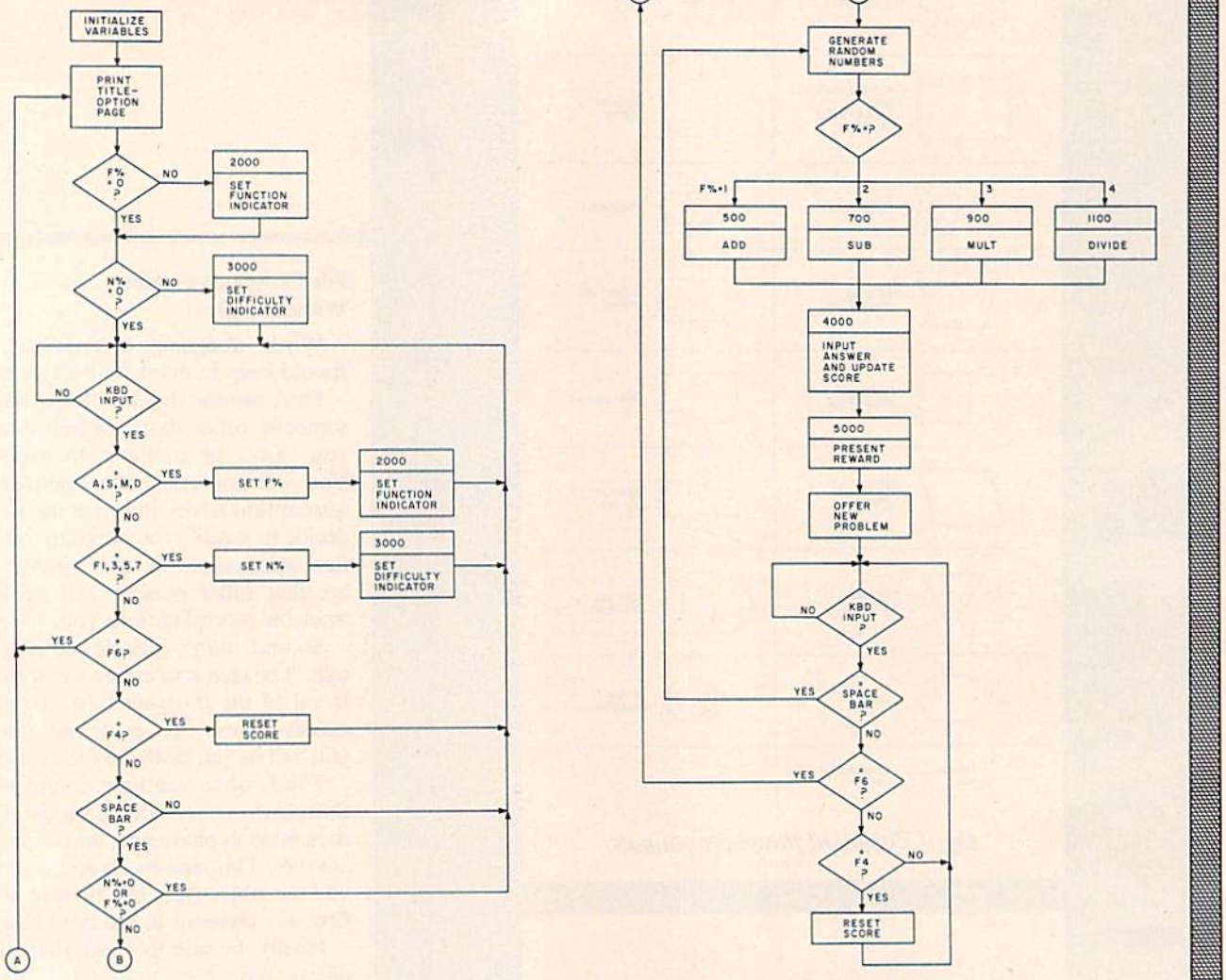
*Fig. 3. Flowchart of sample program.*




mally waste searching your code to see if a variable name has already been used, or recoding segments in which you used a previously assigned variable name.

Fig. 3 shows the flowchart of a program that meets the objectives previously defined.

In this program, as will be the case in most programs that are looping in nature, the first time through must be treated differently than the rest. The reason is that conditions that are set or determined during the first and subsequent passes must be set to initial conditions. These initial conditions are used to assure that the program starts off in an orderly fashion.

In this flowchart, the first block reflects the setting of initial conditions. Note that the program flow takes into account these initial conditions and does not print function or difficulty indicators on the first pass.

Variable names are included where they are known at this point. Subroutines are then identified. In fact, at this point, it's usually possible and desirable to select subroutine line numbers. For the VIC-20, don't worry about using large line numbers since all line numbers take up the same space in memory (two bytes).

*The VIC-20 Programmer's Reference Guide*, p. 79, is in error in this regard. The only possible effects of large line numbers on memory usage are the lessening of the 88-character line length and references to the line in other statements that are stored in ASCII (one byte per character). The first effect will be a factor only when you are trying to crunch your program by including as many statements as possible in each line.

Other points you should note about the flowchart in Fig. 3 include:

- Undesired keyboard inputs are effectively ignored;
- The program will proceed to generate a problem only if the necessary options have been selected;
- All decision block outputs are charted;
- There are no dead-end sequences.

## Coding

Now that the objectives have been defined and a flowchart has been prepared to meet those objectives, you're ready to do the actual coding. With the material you've prepared, this phase is easy. The only other tools you need are a familiarity with the instruction set of the language you're using and a reference guide for that language.

After you write a few programs, you'll find your trips into the reference guide become infrequent. As you proceed with the coding process, continue to update the variable list with each new variable name you assign.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*Listing. Arithmetic Tutor program.*

```
10 YES=0:NO=0:F%=0:N%=0
20 PRINTCHR$(147)"ARITHMETIC TUTOR":PRINT:PRINT:REM OPT
    'S
30 PRINT"1.SELECT FUNCTION BY{3 SPACEs}PRESSING:"
40 PRINTTAB(4)"A FOR ADDITION"
50 PRINTTAB(4)"S FOR SUBTRACTION"
60 PRINTTAB(4)"M FOR MULTIPLYING"
70 PRINTTAB(4)"D FOR DIVISION"
80 PRINT"2.SELECT LEVEL OF DIF- FICULTY BY PRESSING:"
90 PRINTTAB(4)"F1 FOR EASY"
100 PRINTTAB(4)"F3 FOR NOT EASY"
110 PRINTTAB(4)"F5 FOR DIFFICULT"
120 PRINTTAB(4)"F7 FOR BAD"
130 PRINT"3.DEPRESS F6(AFTER ANY PROBLEM)TO CHANGE OP-
    TIONS"
140 PRINT"4.DEPRESS F4 TO RESET{2 SPACEs}SCORE"
150 PRINT"5.DEPRESS SPACE BAR TO START"
200 IFF%>0THENGOSUB2000:REM MN PROG
210 IFN%>0THENGOSUB3000
220 GETA$:IFA$=""THEN220
230 IFA$="A"THENF%=1:YES=0:NO=0:GOSUB2000:GOTO220
240 IFA$="S"THENF%=2:YES=0:NO=0:GOSUB2000:GOTO220
250 IFA$="M"THENF%=3:YES=0:NO=0:GOSUB2000:GOTO220
260 IFA$="D"THENF%=4:YES=0:NO=0:GOSUB2000:GOTO220
270 IFA$=CHR$(133)THENN%=1:YES=0:NO=0:GOSUB3000:GOTO220

280 IFA$=CHR$(134)THENN%=2:YES=0:NO=0:GOSUB3000:GOTO220

290 IFA$=CHR$(135)THENN%=3:YES=0:NO=0:GOSUB3000:GOTO220

300 IFA$=CHR$(136)THENN%=4:YES=0:NO=0:GOSUB3000:GOTO220

310 IFA$=CHR$(139)THEN20
320 IFA$=CHR$(138)THENYES=0:NO=0:GOTO220
330 IFA$=CHR$(32)THEN350
340 GOTO220
350 IFF%=0ORN%=0THEN 220
360 FORI=1TO5:RN(I)=INT(RND(X)*10{UP ARROW}N%):IFF%=4TH
    ENRN(I)=RN(I)+1
370 NEXT
380 ONF%GOSUB500,700,900,1100
390 GOSUB4000
400 GOSUB5000
410 PRINTCHR$(19)TAB(220)TAB(220)
420 PRINT"PRESS SPACE BAR FOR{3 SPACEs}ANOTHER PROBLEM"

430 GETA$:IFA$=""THEN430
440 IFA$=CHR$(32)THEN360
450 IFA$=CHR$(139)THEN20
460 IFA$=CHR$(138)THENYES=0:NO=0
470 GOTO430
500 RES=0:REM ADD
510 PRINTCHR$(147):PRINT"ADDITION":PRINT"--------"
520 FOR I=1TON%
530 RES=RES+RN(I)
540 PRINTSPC(6)RIGHT$("{6 SPACEs}"+STR$(RN(I)),N%+2)
550 NEXT
560 RES=RES+RN(N%+1)
570 PRINTSPC(6)RIGHT$("{4 SPACEs}+"+STR$(RN(N%+1)),N%+2
    )
580 PRINTSPC(8)RIGHT$("-------",N%)
590 RETURN
700 IF RN(1)>RN(2) THEN 720:REM SUB
710 B=RN(1):RN(1)=RN(2):RN(2)=B
720 PRINTCHR$(147):PRINT"SUBTRACTION":PRINT"----------
    "
730 RES=RN(1)-RN(2)
740 PRINTSPC(6)RIGHT$("{6 SPACEs}"+STR$(RN(1)),N%+2)
750 PRINTSPC(6)RIGHT$("{5 SPACEs}-"+STR$(RN(2)),N%+2)
770 PRINTSPC(8)RIGHT$("-------",N%)
780 RETURN
```

More

| | |
|---|---|
| F% | Function |
| N% | Difficulty |
| RN(5) | Random number array |
| RES | Result (calculated) |
| RC | Remainder (calculated) |
| ANS | Answer (input) |
| RI | Remainder (input) |
| YES | No. of right answers |
| NO | No. of wrong answers |
| M | Correctness indicator (M = 1 = correct) |
| B | Temporary storage |
| A$ | Input variable |

*Fig. 4. Variable list.*

Another important thing to do is to provide internal documentation, using remark statements, for your program. You'll especially appreciate this when you must understand your program at a later date.

When memory is at a premium, as it often is in the unexpanded VIC, and crunching is required, the remark statements must go. In this case, an alternative is to provide the remark information in external documentation by writing it on your program listing. The remarks in the program included with this article are brief because the VIC was running out of memory.

**Distinguishing Features**

When you complete the coding, you'll undoubtedly find that your program has several characteristics that distinguish it from one coded without the benefit of the first two phases. Among these are:

1. A logical flow with equally incremented line numbers.

A sure indication of direct coding is uneven incrementing of line numbers due to inserting newly-realized objectives, converting redundant blocks of code to subroutines or adding statements to fix problems found during debugging.

2. Few GOTOs. It's easier to stuff in new code by putting it outside the main line of flow and using a Goto statement to get to and from it than it is to renumber. This is another giveaway as to the approach used in creating the program.

3. The program segments, or modules, are clearly defined.

This becomes important to you when you want to use these modules in future programs. This can mean a significant


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*Listing continued.*

```
900 PRINTCHR$(147):PRINT"MULTIPLICATION":PRINT"--------
    ------":REM MULT
910 RES=RN(1)*RN(2)
920 PRINTSPC(6)RIGHT$("{6 SPACEs}"+STR$(RN(1)),N%+2)
930 PRINTSPC(6)RIGHT$("{5 SPACEs}X"+STR$(RN(2)),N%+2)
950 PRINTSPC(8)RIGHT$("------",N%)
960 RETURN
1100 PRINTCHR$(147):PRINT"DIVISION":PRINT"--------":REM
     DIV
1110 IF RN(1)>RN(2) THEN 1130
1120 B=RN(1):RN(1)=RN(2):RN(2)=B
1130 RES=INT(RN(1)/RN(2))
1140 RC=RN(1)-RES*RN(2)
1150 PRINTSPC(6+N%)CHR$(176)+RIGHT$("{7 SHFT *s}",N%+1)
    +CHR$(174)
1160 PRINTSPC(5)RIGHT$("{5 SPACEs}"+STR$(RN(2)),N%+1)+C
    HR$(125)+RIGHT$(STR$(RN(1)),N%+1)
1170 RETURN
2000 PRINTCHR$(19)TAB(110):REM IND(F)
2010 FOR K=1 TO 4:PRINTTAB(3)" ":NEXT
2020 PRINTCHR$(19)TAB(113+22*(F%-1))"*"
2030 RETURN
3000 PRINTCHR$(19)TAB(242)
3010 FOR I=1 TO 4:PRINTTAB(3)" ":NEXT
3020 PRINTCHR$(19)TAB(242);
3030 PRINTTAB(3+22*(N%-1))"*"
3040 RETURN
4000 IF F%<4 THEN PRINTSPC(5);:INPUT ANS:RC=0:RI=0:GOTO
     4020:REM ANS
4010 PRINTTAB(22):INPUT"QUOTIENT";ANS:INPUT"REMAINDER";
     RI
```

More

saving in time after you have a few programs on your shelf from which to draw. Directly coded programs are not well-modularized, and this hinders both the recognition of needed code segments and the transporting of these segments to new programs.

4. Finally, the remaining phase-debugging is greatly simplified.

**Debugging**

Debugging your program is a snap, you'll find, when you follow the steps thus far defined.

First, you probably won't have many bugs because of the planning inherent in these processes, although no amount of planning will preclude typos.

Secondly, the logical structure, graphical representation of that structure and the list of variables make it simple to trace your program flow and detect any problems. You'll have to use your ingenuity and experience to come up with debugging techniques that will work for the particular problems you might have.

Two debugging techniques you might find useful are the Stop command and the Gosub subroutine.

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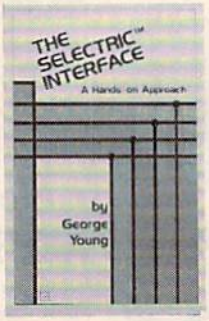


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You might wish to temporarily place Stop commands in your program when you want to determine if a particular segment is being executed or whether the variable values are as required. When the program stops as a result of the Stop command, you can examine the variables or change their values using direct (as opposed to program) commands and then continue the program. Note that you cannot continue the program if you've changed any code or added or deleted any lines after the stop.

When you want to exercise a Gosub subroutine and test its performance, you might find it difficult or time-consuming to get to it through the main line program. Such would be the case when you try to debug the Reward subroutine in the example program. The following temporary insertion into the program would then be useful:

```
1 M=1:F%=1:N%=4:YES=20:NO=0
2 GOSUB 5000
3 STOP
```

You can now run the temporary program and test for proper results. The conditions in line 1 can easily be changed to complete the testing of this subroutine.

When all is done and your program is finalized, named and saved, you should annotate the documentation produced in its development with the program name and file it for future use.

**Overwhelmed?**

A new programmer may feel overwhelmed at the thought of doing all of the above. It's difficult to convey in words, however, the advantages that this programming process will provide. Your programs, when written this way, will be better and produced faster. Only experience can really convince you of that.

If you have a use for the Arithmetic Tutor program but would rather avoid the typing, I will be glad to copy it onto tape or disk for you. Send me $3, a blank cassette or formatted disk and a self-addressed, stamped mailer. R

*Listing continued.*

```
4020 IF ANS=RES AND RC=RI THEN YES =YES+1:M=1:GOTO 4040

4030 NO=NO+1:M=0
4040 PRINTCHR$(19)TAB(220)TAB(66)"RIGHT-";YES,"WRONG-";
     NO
4050 RETURN
5000 PRINTCHR$(19)TAB(220):REM REWARD
5010 IFM=1THENPRINT"THAT'S CORRECT!":PRINTTAB(66):GOTO
     5060
5020 IFF%<4THEN PRINT"SORRY,THE ANSWER IS:":PRINTSPC(6)
     RES:PRINTTAB(44):GOTO5060
5030 PRINT"SORRY,THE ANSWER IS:"
5040 PRINTSPC(3)"QUOTIENT:";RES
5050 PRINTSPC(3)"REMAINDER:";RC:PRINTTAB(22)
5060 IF YES=10ANDNO=0ANDN%<4 THEN 5200
5070 IF YES=20ANDNO=0ANDN%=4 THEN 5210
5080 IF YES=10ANDNO>2ANDNO<5THEN5220.
5090 IF YES=10ANDNO>=5 AND NO<10 THEN 5230
5100 IF NO=10 AND YES<NOANDN%>1 THEN 5240
5110 IF NO=10ANDYES<NOANDN%=1THEN5250
5120 RETURN
5200 PRINT"YOU ARE DOING SO GOOD,WHY DON'T YOU INCREASE
     THE DIFFICULTY LEVEL"
5201 PRINT"OR CHANGE FUNCTIONS?{2 SPACEs}(F6)":RETURN
5210 PRINT"YOU ARE TOO GOOD FOR{2 SPACEs}ME. EITHER TRY
      ANOTHERFUNCTION OR LET SOME"
5211 PRINT"ONE ELSE HAVE A TURN":RETURN
5220 PRINT"YOU ARE DOING OK, BUT HAVE BEEN A LITTLE"
5221 PRINT"CARELESS. PLEASE TRY{2 SPACEs}HARDER.":RETUR
     N
5230 PRINT"YOU HAVE THE RIGHT{4 SPACEs}IDEA, BUT ARE MA
     KING{2 SPACEs}TOO MANY MISTAKES":RETURN
5240 PRINT"I DON'T BELIEVE YOU{3 SPACEs}ARE READY FOR T
     HIS{4 SPACEs}LEVEL OF DIFFICULTY."
5241 PRINT"PLEASE SELECT A LOWER LEVEL(F6).":RETURN
5250 PRINT"PLEASE ASK YOUR PARENTOR TEACHER FOR HELP":R
     ETURN
```


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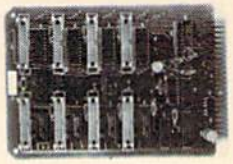

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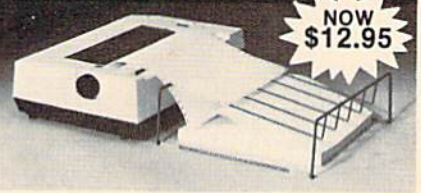


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If you couldn't care less about the items mentioned above and only want to get to the sound, then Total Music 64 was written for you.

But don't be surprised if you also end up learning a lot about SID; Total Music 64 lets you whistle while it works.

Type in the program as listed. (Be careful not to leave out any semicolons.) Save the program before you run it the first time.

Now run the program. The title page and some information about the program and how to use it will dance across the screen. Press the space bar to begin.

The next screen gives you a chance to select and define your own voice with: volume, waveform, attack/decay, sustain/release and duration of note. Press the return key and the program will default to preselected values that you can later experiment with, if you wish.

Next is the Practice screen. When you press A, the letter will appear on the screen, and you'll hear the musical note A (octave 4). When you press shift/A, you'll hear A# and both characters will appear on the screen. The same pattern holds true for A–G. All other keys are empty except P, the function keys (F1–F8), the INST/DEL key, the return key and the up-arrow key.

P is for pause; you won't hear any sound when it appears.

The up-arrow key erases the screen. (You can play with the whole screen display, but you should reserve the Practice screen for the area above the midline.)

The return key starts another line of practice notes.

INST/DEL erases each note, one at a time.

F3 exits the practice screen and puts you into Total Music. Everything on the screen will be erased except the notes in the practice area. A new menu, offering additional options, will be displayed.

F7 exits back to the screen where you select and define your own voice.

Play with the Practice screen for as long as you please. When you get a song or series of notes you like, press F3 and go to Print & Play.

### Print & Play

This is where all the fun and real work is done. The screen should now display:

```
F1 DATA ONLY    F2 TOTAL PRINT
F3 PRACTICE     F4 PRINT NOTES
F5 PLAY TUNE    F6 DURATION
F7 RESTART
P  PAUSE        (UP ARROW) ERASE ALL
```

The notes above the midline (from the Practice screen) should still be on the screen, and a little right-arrow symbol should race across the screen, erasing two lines below the midline.

You'll still hear the notes when you press them, but now they'll be displayed below the midline.

Your notes will be placed in an array, which was dimensioned in line 15 to be a maximum of 200 notes. The lower half of the screen can display about 200 notes. During this time, copy your practice notes or play something else.

If you want to start over, press the up-arrow key, and all the notes you've just played (except your notes in the practice area) will be erased. If you press F3 twice, you'll erase everything. If you press F3 once, you'll return to the Practice screen.

After you've arranged some notes on the screen into a tune, press F5, and your


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tune will be played as it would sound if it were in a program. (Note: C,C,C will sound the C note for three duration counts. If you want to hear the C note three distinct times, play C P C P C.)

**When It Works, It Plays**

When your tune sounds just right, press F2 (make sure your printer is ready). The program will print out a total program listing. To use it, all you need do is copy it into a program. Everything's there—every Poke, every Read, every For...Next loop and every piece of data.

However, you may have to make a change in copying the data. The program lists all the data on one line. If your tune requires more than one line of data, just add another data line number and continue.

F1 prints only the data needed for the tune. Later, you'll probably choose this most often.

F4 prints the actual notes/letters. (Total Music 64 uses octave 4.) By using these notes, you could look on page 152 of the *Commodore 64 User's Guide* and translate each note into high and low frequency for different octaves.

You're asked to name each tune that's printed. Then the printer takes over. When the printer finishes, it will also print out a total count of the data. You might need this if you're using other Read statements in a program.

F6 lets you choose another duration count for your tune without having to exit this mode. Note: INST/DEL was not included in Print & Play mode because the notes are placed in an array. If each note used only one character, then INST/DEL could have been included. But, for example, C# takes up two characters. Erasing would have thrown off the array count.

I hope you have fun with Total Music 64, and that it adds lots of sound to your programs.

Here are some tunes with which you can experiment:

Old MacDonald—FPFPFPCCPDPDPCC PAPAPGPGPFF

This Old Man—GEGPGEGPAPGPFPEP DPEPFPEFGPCPCPCPCPDE FGPG

After you become familiar with the program, try the same tunes using different waveforms, attack/decay, sustain/release and duration values.

I'll be glad to copy Total Music 64 for those of you who don't want to type in the listing. Just send me a formatted disk along with a self-addressed, stamped mailer and $3 to cover the expense of copying. R

*Listing 1. Total Music 64 program for the C-64.*

```
0 REM TOTAL MUSIC 64 ***
5 GOSUB 12000
10 CLR:{4 SPACEs}REM VOICE 1 NOTES
15 DIM HI(200),LO(200),LN$(200):REM TOTAL NUMBER OF NOT
     ES POSSIBLE IS 200
20 POKE53281,1:POKE53280,1:PRINTCHR$(144)CHR$(147)
30 UP$=CHR$(145):LF$=CHR$(157)
40 FORS=54272TO54296:POKES,0:NEXT
50 SV=54296:SH=54273:SL=54272:SA=54277:SS=54278:SW=5427
     6
100 PRINT"VOLUME [1-15]";CHR$(32)CHR$(32)"15"
101 PRINTUP$;:FORX=1TO13:PRINTCHR$(29);:NEXTX
102 INPUTV1$
105 V1=VAL(V1$)
110 IFV1<1ORV1>15THENGOSUB7000
114 IFV1<1ORV1>15THENPRINTUP$UP$UP$:GOTO100
125 FORX=1TO22:PRINTCHR$(32);:NEXT:PRINT
200 PRINT"WAVEFORM"
202 PRINTTAB(10)CHR$(18)"T";CHR$(146);"RIANGULAR"
204 PRINTTAB(10)CHR$(18)"S";CHR$(146);"AWTOOTH"
206 PRINTTAB(10)CHR$(18)"P";CHR$(146);"ULSE"
208 PRINTTAB(10)CHR$(18)"N";CHR$(146);"OISE";CHR$(32)CH
     R$(32)"T"
209 PRINTUP$;:FORX=1TO15:PRINTCHR$(29);:NEXT:INPUTW1$
210 IFW1$="T"THENW1=17:PRINT:GOTO300
212 IFW1$="S"THENW1=33:PRINT:GOTO300
214 IFW1$="P"THENW1=65:PRINT:GOTO300
216 IFW1$="N"THENW1=129:PRINT:GOTO300
220 IFW1$<>"N"THENGOSUB7000
226 IFW1$<>"N"THEN FORX=1TO6:PRINTUP$;:NEXT:PRINT:GOTO2
     00
300 PRINT"ATTACK/DECAY [0-240]";CHR$(32)CHR$(32)"0"
302 PRINTUP$;:FORX=1TO20:PRINTCHR$(29);:NEXTX:INPUTA1$
310 A1=VAL(A1$)
320 IFA1<0ORA1>240THENGOSUB7000
330 IFA1<0ORA1>240THENPRINTUP$UP$:GOTO300
400 PRINT"SUSTAIN/RELEASE [0-240]";CHR$(32)CHR$(32)"240
     "
402 PRINTUP$;:FORX=1TO23:PRINTCHR$(29);:NEXTX:INPUTS1$
410 S1=VAL(S1$)
420 IFS1<0ORS1>240THENGOSUB7000
430 IFS1<0ORS1>240THENPRINTUP$UP$:GOTO400
450 PRINT:PRINT"DURATION OF NOTE";CHR$(32)CHR$(32)"128"

451 PRINTUP$;:FORX=1TO16:PRINTCHR$(29);:NEXTX:INPUTD1$
452 IFLEFT$(D1$,1)<"0"ORLEFT$(D1$,1)>"9"THENGOSUB7000
454 IFLEFT$(D1$,1)<"0"ORLEFT$(D1$,1)>"9"THENPRINTUP$UP$
     UP$:GOTO450
456 D1=VAL(D1$):PRINT
458 FORX=1TO400:NEXTX
460 PRINTCHR$(147)CHR$(18)"F3"CHR$(146)" PRINT & PLAY";

461 PRINTTAB(24)CHR$(18)"F7"CHR$(146)" RESTART"
462 PRINTCHR$(18)" P"CHR$(146)" PAUSE";
463 PRINTSPC(12)CHR$(18)"RETURN"CHR$(146)" LINE FEED"
464 PRINTCHR$(18)" "CHR$(94)CHR$(146)" ERASE ALL";
465 PRINTSPC(6)CHR$(18)"INST/DEL"CHR$(146)" ERASE NOTE"
      :PRINT:PRINT
467 FORMD=0TO39:POKE1624+MD,67:POKE55896+MD,12:NEXTMD
480 GETA$:IFA$=""THEN480
499 REM **** A$ SELECTION FOR NOTES-{24 SPACEs}OCTAVE 4

500 IFA$=CHR$(65)THEN HI=28:LO=49:GOTO700:{2 SPACEs}REM
     {2 SPACEs}A
510 IFA$=CHR$(193)THEN HI=29:LO=223:A$="A#":GOTO700:REM
     {2 SPACEs}A#
520 IFA$=CHR$(66)THEN HI=15:LO=210:GOTO700: REM{2 SPACE
     s}B ** NOTE OCTAVE 3 NOT 4 ***
530 IFA$=CHR$(67)THEN HI=16:LO=195:GOTO700: REM{2 SPACE
     s}C
```

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*Listing 1 continued.*

```
540 IFA$=CHR$(195)THEN HI=17:LO=195:A$="C#":GOTO700:REM
    {2 SPACEs}C#
550 IFA$=CHR$(68)THEN HI=18:LO=209:GOTO700: REM{2 SPACE
    s}D
560 IFA$=CHR$(196)THEN HI=19:LO=239:A$="D#":GOTO700:REM
    {2 SPACEs}D#
570 IFA$=CHR$(69)THEN HI=21:LO=31:GOTO700:{2 SPACEs}REM
    {2 SPACEs}E
580 IFA$=CHR$(70)THEN HI=22:LO=96:GOTO700: REM{2 SPACEs
    }F
590 IFA$=CHR$(198)THEN HI=23:LO=181:A$="F#":GOTO700: RE
    M{2 SPACEs}F#
600 IFA$=CHR$(71)THEN HI=25:LO=30:GOTO700: REM{2 SPACEs
    }G
610 IFA$=CHR$(199)THEN HI=26:LO=156:A$="G#":GOTO700: RE
    M{2 SPACEs}G#
620 IFA$=CHR$(80)THEN HI=0:LO=0:A$="P":GOTO700: REM{2 S
    PACEs}PAUSE
635 IFA$=CHR$(134)THEN 9000:REM F3 GOTO{2 SPACEs}PUTTIN
    G DATA INTO ARRAYS
640 IFA$=CHR$(136)THEN10:REM F7 RESTART
645 IFA$=CHR$(13)THENPRINTUP$CHR$(13):GOTO480:REM RETUR
    N- LINE FEED
650 IFA$=CHR$(20)THENHI=0:LO=0:PRINTCHR$(157)CHR$(157)C
    HR$(32);:GOTO480
651 REM LINE650 -INST/DEL ERASE SINGLE NOTE
660 IFA$=CHR$(94)THENGOTO460:REM UP ARROW SYMBOL CLEAN
    UP SCREEN
690 IFA$<>CHR$(80)THENHI=0:LO=0:GOTO480
700 POKESH,HI:POKESL,LO:POKESA,A1:POKESS,S1:POKESW,W1:P
    OKESV,V1
740 FORX=1TOD1:NEXTX
750 PRINTA$;" ";:POKESV,16:POKESW,W1-1
```

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*Listing 1 continued.*

```
800 GOTO480
1999 *** REM PLAY THE TUNE ***
2000 IFN=0 THEN RETURN
2005 FORX=54272 TO 54296:POKES,0:NEXTX
2010 FORNN=0TON-1:POKESH,HI(NN):POKESL,LO(NN)
2020 POKESA,A1:POKESS,S1:POKESW,W1:POKESV,V1
2030 FORX=1TOD1:NEXTX
2040 NEXTNN:POKESV,16:POKESW,W1-1
2050 RETURN
2999 REM *** PRINT NOTES USING LETTERS ***************
     **********************
3000 PRINT
3002 QT$="NOTES BY LETTER":GOSUB10000:FORX=1TO500:NEXTX

3005 QT$="TURN PRINTER ON":GOSUB 10000:FORX=1TO500:NEXT
     X
3010 QT$="GIVE TUNE A NAME":GOSUB10000:PRINTUP$:PRINTTA
     B(16);:INPUTAW$
3020 OPEN1,4
3030 PRINT#1,AW$:PRINT#1
3040 FORNN=0TON-1:PRINT#1,LN$(NN);:PRINT#1," ";:NEXTNN
3050 PRINT#1:PRINT#1,"TOTAL NOTE COUNT=";NN;"PLUS -1,-1
     "
3090 PRINT#1:CLOSE1:GOTO9200
3095 PRINTUP$;:FORX=0TO39:PRINTCHR$(32);:NEXTX:PRINTUP$
     UP$UP$:PRINT
3100 QT$="FINISHED":GOSUB10000:GOTO9200
7000 QT$="NOT A LEGAL CHOICE":GOSUB10000:FORX=1TO50:NEX
     TX
7010 PRINTUP$:FORX=1TO30:PRINTCHR$(32);:FORY=1TO25:NEXT
     Y:NEXTX:RETURN
7999 REM *** DATA LINE ONLY PRINT ***
8000 PRINT
```

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*Listing 1 continued.*

```
8002 QT$="PRINT DATA ONLY":GOSUB10000:FORX=1TO500:NEXTX

8005 QT$="TURN PRINTER ON":GOSUB10000:FORX=1TO500:NEXTX

8010 QT$="GIVE TUNE A NAME":GOSUB10000:PRINTUP$:PRINTTA
     B(16);:INPUTAW$
8020 OPEN1,4
8030 PRINT#1,AW$:PRINT#1
8040 FORNN=0TON-1:PRINT#1,HI(NN);",";LO(NN);",";:NEXTNN
     :PRINT#1,"-1,-1"
8045 PRINT#1:PRINT#1,"TOTAL NOTE COUNT=";NN*2;"PLUS -1,
     -1"
8050 PRINT#1:CLOSE1:RETURN
8499 REM *** TOTAL PROGRAM PRINT ***
8500 PRINT
8510 QT$="PRINT ROUTINE":GOSUB10000:FORX=1TO500:NEXTX
8520 QT$="TURN PRINTER ON":GOSUB10000:FORX=1TO500:NEXTX

8530 QT$="GIVE TUNE A NAME":GOSUB10000:PRINTUP$:PRINTTA
     B(16);:INPUTAW$
8550 OPEN1,4
8560 PRINT#1,AW$
8565 PRINT#1
8570 PRINT#1,"100 FOR S=54272 TO 54296 : POKE S,0 : NEX
     T S"
8580 PRINT#1,"110 READ SH,SL"
8590 PRINT#1,"120 IF SH=-1 THEN 180"
8600 PRINT#1,"130 POKE 54273, SH : POKE 54272, SL"
8610 PRINT#1,"140 POKE 54277,";A1;": POKE 54278,";S1;":
      POKE 54276,";W1
8620 PRINT#1,"150 POKE 54296,";V1
8630 PRINT#1,"160 FOR X=1 TO ";D1;": NEXT X"
8640 PRINT#1,"170 GOTO 110"
8645 PRINT#1,"180 POKE 54296,0 : POKE 54276,";W1-1
8650 PRINT#1,"200 DATA ";
8660 FORNN=0TON-1:PRINT#1,HI(NN);",";LO(NN);",";:NEXTNN
     :PRINT#1,"-1,-1"
8690 PRINT#1:PRINT#1,"TOTAL NOTE COUNT=";NN*2;"PLUS -1,
     -1"
8700 PRINT#1:CLOSE1:GOTO9200:REM BACK FOR ANOTHER A$ **
     ************
8999 REM PUT DATA INTO ARRAYS
9000 PRINTCHR$(19);:FORX=0TO199:PRINTCHR$(32);:NEXTX
9005 PRINTCHR$(19);
9010 PRINTCHR$(18)"F1"CHR$(146)" DATA ONLY";
9011 PRINTTAB(15)CHR$(18)"F2"CHR$(146)" TOTAL PRINT"
9020 PRINTUP$;CHR$(18)"F3"CHR$(146)" PRATICE";
9022 PRINTSPC(5)CHR$(18)"F4"CHR$(146)" PRINT NOTES"
9025 PRINTCHR$(18)"F5"CHR$(146)" PLAY TUNE";
9030 PRINTTAB(15)CHR$(18)"F6"CHR$(146)" DURATION"
9031 PRINTUP$;CHR$(18)"F7"CHR$(146)" RESTART"
9032 PRINTCHR$(18)" P"CHR$(146)" PAUSE";
9035 PRINTSPC(7)CHR$(18)" "CHR$(94)CHR$(146)" ERASE ALL
     "
9040 PRINTCHR$(19):FORX=1TO11:PRINT:NEXTX:REM POSITION
     LINE ON GREY LINE
9100 PRINT"INPUT NOTES INTO ARRAY ROUTINE";UP$
9150 A$=CHR$(94):GOTO9345:REM GET SCREEN AND N SET UP P
     ROPERLY
9200 GETA$:IFA$=""THEN9200
9210 IFA$=CHR$(65)THEN HI(N)=28:LO(N)=49:GOTO9400:REM{2
      SPACEs}A
9220 IFA$=CHR$(193)THEN HI(N)=29:LO(N)=223:A$="A#":GOTO
     9400:REM{2 SPACEs}A#
9230 IFA$=CHR$(66)THEN HI(N)=15:LO(N)=210:GOTO9400:REM{
     2 SPACEs}B *NOTE OCTAVE 3 NOT 4*
9240 IFA$=CHR$(67)THEN HI(N)=16:LO(N)=195:GOTO9400:REM{
     2 SPACEs}C
9250 IFA$=CHR$(195)THEN HI(N)=17:LO(N)=195:A$="C#":GOTO
     9400:REM{2 SPACEs}C#
9260 IFA$=CHR$(68)THEN HI(N)=18:LO(N)=209:GOTO9400:REM{
     2 SPACEs}D
9270 IFA$=CHR$(196)THEN HI(N)=19:LO(N)=239:A$="D#":GOTO
     9400:REM{2 SPACEs}D#
9280 IFA$=CHR$(69)THEN HI(N)=21:LO(N)=31:GOTO9400:REM{2
      SPACEs}E
9290 IFA$=CHR$(70)THEN HI(N)=22:LO(N)=96:GOTO9400:REM{2
      SPACEs}F
9300 IFA$=CHR$(198)THEN HI(N)=23:LO(N)=181:A$="F#":GOTO
     9400:REM{2 SPACEs}F#
9310 IFA$=CHR$(71)THEN HI(N)=25:LO(N)=30:GOTO9400:REM{2
      SPACEs}G
9320 IFA$=CHR$(199)THEN HI(N)=26:LO(N)=156:A$="G#":GOTO
     9400:REM{2 SPACEs}G#
9330 IFA$=CHR$(80)THEN HI(N)=0:LO(N)=0:GOTO9400:REM{2 S
     PACEs}P{2 SPACEs}PAUSE
9335 IFA$=CHR$(133)THENGOSUB8000:GOTO9200:REM F1 PRINT
     DATA ONLY
9340 IFA$=CHR$(137)THENGOSUB8500:GOTO9200:REM F2 PRINT
     ROUTINE
9341 IFA$=CHR$(134)THENPRINTCHR$(147):N=0:GOTO458:REM F
     3 TO PRATICE PLAY
9342 IFA$=CHR$(135)ANDN=0THEN9200
9343 IFA$=CHR$(135)THENGOSUB2000:GOTO9200:REM F5 PLAY T
     HE TUNE
9344 IFA$=CHR$(136)THEN10:REM F7 START ALL OVER
9345 IFA$=CHR$(94)THEN10090
9346 IFA$=CHR$(138)THENGOTO3000:REM F4 - PRINT NOTES US
ING LETTERS
```

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*Listing 1 continued.*

```
 9347 IFA$=CHR$(139)THENPRINT:PRINT"DURATION";:INPUT D1:
      GOTO9200:REM F6 DURATION
 9350 IFA$<>CHR$(80)THEN GOTO9200
 9400 POKESH,HI(N):POKESL,LO(N):POKESA,A1:POKESS,S1:POKE
      SW,W1:POKESV,V1
 9410 FORX=1TOD1:NEXTX
 9420 PRINTA$;" ";:POKESV,16:POKESW,W1-1:LN$(N)=A$:REM P
      UT LN - LIST NOTES
 9440 N=N+1:GOTO9200 :REM INCREASE ARRAY COUNT & GO BACK
       FOR ANOTHER NOTE
 9999 REM *** THIS IS SCROLL TYPE ROUTINE***************
      ************************
10000 FORI=0TOLEN(QT$)
10010 POKESV,7:POKESH,126:POKESL,6:POKESA,120:POKESS,30
      :POKESW,33
10020 PRINTLEFT$(QT$,I+1):POKESV,0:POKESW,32
10030 PRINTUP$UP$:FORX=1TO40:NEXTX:NEXTI
10040 FORS=54272TO54296:POKES,0:NEXTS
10050 FORX=1TO100:NEXTX:RETURN
10089 REM *** CLEAN UP ARRAY SCREEN ********************
      ************************
10090 ER=N+79:REM ER = ERASE NOTES IN ARRAY
10100 FORMD=0TOER:POKE1664+MD,160:POKE1664+MD+1,62
10105 POKE55936+MD,1:POKE55936+MD+1,2:NEXTMD
10110 PRINTCHR$(19):FORX=1TO12:PRINT:NEXTX
10120 N=0:GOTO9200
11999 REM *** TITLE SCREEN ****************************
      ************************
12000 PRINTCHR$(147)CHR$(5):POKE53281,0:POKE53280,0
12002 FORS=54272TO54296:POKES,0:NEXT
12004 SV=54296:SH=54273:SL=54272:SA=54277:SS=54278:SW=5
      4276:UP$=CHR$(145)
12010 FORX=1TO5:PRINT:NEXTX
12020 PRINT"TOTAL MUSIC 64":PRINT
12030 QT$="1984":GOSUB10000:PRINT:PRINT
12040 QT$="BY GARY FIELDS":GOSUB10000:FORX=1TO500:NEXTX

12050 PRINTUP$UP$UP$:QT$="VOICE 1 / OCTAVE 4":GOSUB1000
      0:PRINT:PRINT
12060 QT$="THIS AID CONVERTS SOUND TO DATA":GOSUB10000:
      PRINT:PRINT
12065 QT$="F1- DATA ONLY PRINT":GOSUB10000:PRINT
12066 QT$="F2- TOTAL PROGRAM W/DATA":GOSUB10000:PRINT
12067 QT$="F4- CONVERTS DATA TO NOTES":GOSUB10000:PRINT

12070 FORX=1TO500:NEXTX
12080 PRINTCHR$(147)
12090 PRINTCHR$(18)" LETTER = NOTE{6 SPACEs}":PRINT
12100 PRINT"{6 SPACEs}A = A{3 SPACEs}"
12102 PRINT"{6 SPACEs}B = B{3 SPACEs}"
12104 PRINT"{6 SPACEs}C = C{3 SPACEs}"
12106 PRINT"SHIFT/C = C#{2 SPACEs}"
12108 PRINT"{6 SPACEs}D = D{3 SPACEs}"
12110 PRINT"SHIFT/D = D#{2 SPACEs}"
12112 PRINT"{6 SPACEs}E = E{3 SPACEs}"
12114 PRINT"{6 SPACEs}F = F{3 SPACEs}"
12116 PRINT"SHIFT/F = F#{2 SPACEs}"
12118 PRINT"{6 SPACEs}G = G{3 SPACEs}"
12120 PRINT"SHIFT/G = G#{2 SPACEs}"
12122 PRINT"{6 SPACEs}P = PAUSE":PRINT
12124 PRINTCHR$(18)"OTHER KEYS ARE EMPTY":FORX=0TO39:PR
      INTCHR$(45);:NEXTX
12125 PRINT"UP TO 200 NOTES CAN BE CONSTRUCTED"
12128 QT$="NOTES CAN BE ":GOSUB10000:PRINT
12129 QT$="PLAYED AS NOTES":GOSUB10000:FORX=1TO100:NEXT
      X
12132 QT$="PRINTED AS DATA":GOSUB10000:FORX=1TO100:NEXT
      X
12134 QT$="LISTED AS NOTES":GOSUB10000:FORX=1TO100:NEXT
      X
12136 QT$="PRINTED AS A PROGRAM INCLUDING DATA":GOSUB10
      000:PRINT
12200 PRINT"<ANY KEY> TO BEGIN":
12210 GET A$:IFA$=""THEN12210
12500 RETURN:REM ** BACK TO MAIN PROGRAM **************
      ************************
```

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# Relatively Speaking

**Part 2 of this continuing article on the ins and outs of relative files shows you techniques for dealing with apparent bugs in the Commodore system.**

**By David R. Brooks**

**RUN It Right**

VIC-20 or C-64
1541 disk drive

*Address author correspondence to David R. Brooks, 805 Cockletown Road, Yorktown, VA 23692.*

In Part 1 of this article (*RUN*, April 1984), I explained how to write a simple record-keeping program that allows you to read, add and change information on Commodore relative files. However, you may meet difficulties if you make substantial changes to the disk-handling parts of that program.

So this time I'm going to show you some things you can and cannot do when implementing relative files in your own programs. Some of these details qualify as bugs in the Commodore system. (Nothing I'm going to deal with here is adequately documented in the 1541 disk drive user's manual.)

I'm going to ask you to copy and save a short program for reading and writing records on a relative file. Then I'll take you through a series of changes, and we'll look at the results of running the program after each change. So it's important that you make the changes in the order I give them.

When we're done, you'll have seen for yourself some of the peculiarities of Commodore relative files. Some of the changes are intended to produce errors, so before you run any of the programs, you should load and run the C-64 or VIC-20 Wedge from your 1541 Test/Demo disk. After any disk error, you should always regain control by typing @I[RETURN] before doing anything else.

### A Stripped-Down Relative File Program

First, create a file called Test Data, with five data records of 100 characters each. (You did save my program Open Rel File from Part 1, didn't you?) Then let's go through the lines of the new program Test Rel File (see Listing), with some discussions of what they do.

*Line 20*: Opens the command and data files. Remember to do error-checking after every disk command.

*Line 30*: Sets the pointer parameters for the first byte of the appropriate channel number.

*Line 40*: Initializes four string variables to null strings.

*Line 50*: Defines four strings of 22 characters each. Is the choice of 22 characters arbitrary? Just wait...

*Line 60*: Gets ready to access the five data records.

*Line 70*: Positions to the ith record.

*Line 80*: Writes 89 characters on each record. The 89th character is a Return, put there by the Print# command. You can't "see" it on the record, but in a minute I'll show you that it's really there.

*Line 90*: Repositions the file pointer back to the start of the record I just wrote.

*Line 100*: Reads the contents of the record into a single variable, D$.

*Line 120*: Closes the file.

*Lines 900–910*: Comprise the disk error-checking subroutine.

*Line 930*: This subroutine positions the disk file allocated to channel R0.

Now save this program and then run it. You should see the pattern of Ws, Xs, Ys and Zs duplicated five times on the screen. Now add

```
55 Z$=Z$+"Z"
```

and run the program again. Everything OK? No. From now on, whenever the program doesn't work properly, the red disk drive light will stay on or blink. Remember to clear the disk drive by typing @I[RETURN].

The String Too Long message occurs whenever you try to Input# from a record of more than 88 data characters. This limitation is imposed by Commodore's Basic. With the addition of statement 55, there are 89 data characters on each record. Using Print# with them isn't a problem, but the inability of the system to read them with Input# qualifies as a bug; you should be able to read up to 254 characters into a string variable.



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Note that this error appears not as a disk error, but as a system error, even though a disk error is also detected (the red light is blinking). You can look at the disk error message by typing @[RETURN] before clearing the disk.

Maybe the bug can be fixed by breaking up the record into more than one data field, with field separators. Try this:

```
55  (Delete it)
80  SN=80:S$=",":PRINT#2,W$;S$;X$;S$;
    Y$;S$;Z$:GOSUB900
100 SN=100:INPUT#2,W1$,X1$,Y1$,Z1$:
    GOSUB900
110 PRINT W1$:PRINTX1$:PRINTY1$:
    PRINTZ1$:NEXT
```

Note that you have to write the field separator on the record just like any other character. Run it. No, it still won't work, because there are 91 (88+3) data characters on the record. However, change line 50 to 50 FOR I=1 TO 21...(leave the rest of the statement as is). Run it again. See? Now there are only 87 characters, and everything works fine.

This is a good place to try changing the field separator to a Return:

```
80 ...S$=CHR$(13)...
```

Run it. The 1541 user's manual says you can use a semicolon, too (p. 21):

```
80 ...S$=";"...
```

Run it. No, a semicolon is recognized not as a field separator, but as part of the data field. You can see that W1$ contains *all* the characters, including the semicolons. The other string variables (X1$, Y1$ and Z1$) are blank.

There's one more thing to try:

```
80 ...S$=":" ...
```

Run it. In this case, Input# doesn't get past the colon, which acts like an end-of-record mark, and X1$, Y1$ and Z1$ are left blank again. The role of commas as field separators and of colons as end-of-record marks explains why using punctuation as part of data fields is such a problem. When you use Input#, there's no way for the system to recognize whether or not you intend a comma or colon to be part of a data field. However, there's another way to read data records that can overcome this problem.

First, make some changes that won't work with Input#:

```
50 FOR I=1 TO 22...
80 ...S$=","...
```

You can run it again now to make sure it doesn't work. Then make these additional changes:

```
70  R1=I:R3=1:SN=70:GOSUB920
92  D$=""
95  FOR J=1 TO 91
100 SN=100:GET#2,J$:GOSUB900
105 D$=D$+J$:NEXT
110 PRINT D$:NEXT
```

Run the program. It should work OK again, but it's very slow. The Get# command reads characters one at a time from the record, starting at byte R3. You can see that it treats a comma just like any other character. Note that D$ has to be initialized to a null character every time you start to read a record; otherwise, it keeps adding characters to itself until it overflows. (You could try taking out line 92 and running it again, just to see.)

Look at the R3=1 in line 70. Why is it there if it has already been defined in statement 30? The Get# command moves along from byte to byte, and when it's done, it doesn't reset the byte pointer. Try taking out the R3=1 and running it again. See? It reads one record, but at the next Print# the disk tries to write data on the record starting at the end—just where it was after the last Get# command.

Now let's see what the effects of other punctuations are:

```
80 ...S$=";"...
```

Run it. This should behave the same as the comma, with all the characters strung out together. Colons will work the same way. Try

```
80 ...S$=CHR$(13)...
```

Run it. Now you can see the effect of the Return: Ws on the first line, Xs on the second line, etc. I mentioned before that Print# automatically writes a Return at the end of your data characters. On this record, that should be the 92nd character. So, try

```
95 FOR J=1 TO 92...
```

Run it. You can see the extra blank line resulting from the presence of the Return. If, right after this program is done, you type PRINT LEN(D$), you'll see that D$ is 92 characters long, even though you can "see" only 88 of them. The other four are Returns.

With Get#, it's possible to read right past the end of the record into the next one. Try

```
95 FOR J=1 TO 100...
```

Run it. The extra Ws—there are eight of them—come in each case from the be-

```
10 REM PROGRAM TEST REL FILE
15 REM DAVID R. BROOKS
20 OPEN1,8,15:SN=20:OPEN2,8,2,"TEST DATA":GOSUB900
30 R0=2:R3=1
40 W$="":X$="":Y$="":Z$=""
50 FORI=1TO22:W$=W$+"W":X$=X$+"X":Y$=Y$+"Y":Z$=Z$+"Z":N
   EXT
60 FORI=2TO6
70 R1=I:SN=70:GOSUB920
80 SN=80:PRINT#2,W$;X$;Y$;Z$:GOSUB900
90 R1=I:SN=90:GOSUB920
100 SN=100:INPUT#2,D$:GOSUB900
110 PRINTD$:NEXT
120 SN=120:CLOSE2:GOSUB900:CLOSE1:END
900 INPUT#1,ER,ER$,E1,E2:IFER<20THENRETURN
905 IFER<>50THENPRINT"ERROR FROM STATEMENT";SN:PRINTER;
    ER$:CLOSE2:CLOSE1:STOP
910 RETURN
920 REM POSITION DISK DRIVE
930 PRINT#1,"P"CHR$(R0)CHR$(R1)CHR$(R2)CHR$(R3):GOSUB90
    0:RETURN
```

*Listing of the Test Rel File program.*

| Read file with | Time to write/read 100 records (min:sec) |
|---|---|
| INPUT#2,D$ | 2:05 |
| GET#2,J$ | 13:30 (one character at a time) |
| GET#2A$,...,V$ | 3:00 (22 characters at a time) |
| INPUT#2,D$ | 3:30 (start with only 1 blank data record) |

*Table. Write/read times for 100 records.*

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ginning of the next record, which has already been written to during previous runs of the program. At the end of the program, the Get# looks into the seventh record and finds the characters END, which were originally put on the file when it was created in Open Rel File. Now try

80 ...PRINT#2...Z$;...
(Just add a semicolon after Z$.)

Run it. The semicolon suppresses the writing of a Return on the record. Now there are nine Ws strung on the end of D$. So, you see, the Return really is treated just like any other character.

### Further Features

I promised in Part 1 last month that I'd show you how to "decode" records. There are many different ways to do this, depending on your needs. I'll just use some Basic string functions to form two new string variables: a string of characters that no longer includes the Returns in D$, and the string WXYZ:

```
95  FOR J=1 TO 91
110 PRINT D$:D1$=LEFT$(D$,22)+MID$
    (D$,24,22)+MID$(D$,47,22)+RIGHT$
    (D$,22)
111 D2$=LEFT$(D$,1)+MID$(D$,14,1)+
    MID$(D$,47,1)+RIGHT$(D$,1)
115 PRINT D1$:PRINT D2$:NEXT
```

Run it. You'll see for yourself the effects of these statements.

You may have noticed that Get#s are pretty slow. You can speed things up by using the Get# command for more than one character at a time. In this case, you can do the following:

```
95  FOR J=1 TO 4...
100 SN=100:GET#2,A$,B$,C$,E$,F$,G$,H$,
    I$,J$,K$,L$,M$,N$,O$,P$,Q$,R$,S$,T$,
    U$,V$,V1$:GOSUB900
105 D$=D$+A$+B$+C$+E$+F$+G$+
    H$+I$+J$+K$+L$+M$+N$+O$+
    P$+Q$+R$+S$+T$+U$+V$+V1$
106 NEXT
110 PRINT D$: NEXT
111 (Delete it.)
115 (Delete it.)
```

There are still more features of relative files I'd like to show you. Make sure you've saved the original version of Test Rel File. Type NEW and load the program Open Rel File. Create a new file just like Test Data, but call it Test2. Now type NEW, reload Test Rel File and add

25 SN=25: OPEN 3,8,3,"TEST2": GOSUB900

Run it. Despite implications to the contrary in the 1541 user's manual, you can't have more than one relative file open at once. I consider this another bug in the system. In Part 3, I'll discuss a record-managing program that will show you what's necessary in order to use two relative files in the same program.

There's one last demonstration you might want to try. Scratch the Test Data file (@S:TEST DATA) and recreate it with only one data record. Run a working version of Test Rel File. You'll see that the end of the new file is simply overwritten by the extra records; you can't even tell it happened. This demonstrates a point I made in Part 1, to the effect that you don't have to know ahead of time how many records you will ultimately put on a given file. As long as there's room on the disk, the Disk Operating System will find space for you.

Finally, it's not necessarily true that disk drives are particularly fast devices, as you've no doubt noticed. I've run a few timing tests with various versions of Test Rel File. In each case I wrote and read 100 88-character records. In all cases but one, I've started with a file containing 100 data records, generated with Open Rel File. The accompanying table shows how long it takes on my C-64.

The lessons from this exercise seem clear. Use Input# whenever you can. Using the Get# command one character at a time is *really* slow. So, never do it in an applications program if you can possibly avoid it. However, using Get# several characters at a time isn't so bad, if you don't mind using up lots of variable names. Remember, also, about creating blank records—it really does speed up subsequent writing of data on the records.

### In Conclusion...

I'd justify this rather nit-picking tour of relative files on the basis of their usefulness, the dismal state of the current documentation about them and the frustration level they generate when there are so many traps for the unwary. If you've gotten this far in this article, you deserve, and may even get, bug-free relative file programs.

In Part 3 of this series, I'll introduce the concept of linked lists and show you how to write a program for managing bank accounts. It'll tie together all the techniques I've described so far, and provide you with what I hope will be a useful and interesting program that you can adapt to your own needs. R


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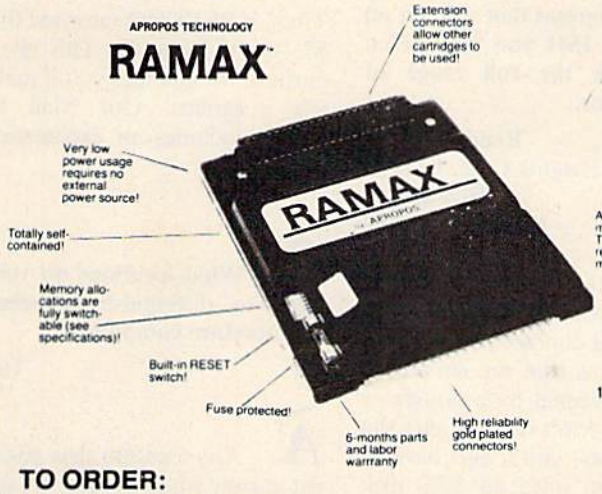

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## Commodore Clinic

*(from p. 12)*

are some simple message systems around for the 64, but nothing to compare with the standard PET BBS systems around the country, especially not using the 1541. A good BBS requires a large and fast disk, which eliminates the 1541 on both counts.

However, if you're willing to buy an IEEE disk, call the original PET BBS at 416-624-5431 (evenings) to order Steve Punter's new 64 version of the standard PET BBS.

**Q: Why won't two of my VIC cartridges work when plugged into a HEScard 20E401 expansion port? A 16K and 8K RAM pack are also plugged in. Leaving only the game button on, and pushing the reset key will show part game and part Basic. Then it will fall back to Basic. Will Quick Brown Fox give me the same problems?**

**Thomas Killeen**
**Milford, MA**

**A:** Probably not, although some users report Quick Brown Fox is incompatible with their expansion boards unless shielded with aluminum foil (be careful not to let the foil touch any electrical connections). Your problem is more likely the result of your added memory. Some cartridge games insist on being the only add-on in place when running. Try removing the added memory, and see if that helps.

**Q: I have a C-64 and a Quick Brown Fox cartridge. If I press certain keys, I am able to break out of the program, but I end up in a continuous loop of some kind. Could you tell me how I could bypass this cartridge without unplugging it?**

**Lyle D. Henderson**
**Bremerton, WA**

**A:** Cardco's CB-5 expansion motherboard should work, and it allows you to switch any or all of up to five cartridges in or out independently. Most cartridges modify Basic's workspace so much that only a full reset of the computer will allow Basic to work properly afterwards. That you were able to get out of Quick Brown Fox at all may be a bug in their program.

**Q: How can I patch CP/M to make A my 1541 drive and B a second drive at device 9? And what can I do about the fact that Commodore's CP/M is 40 column, not 80?**

**Peter Shackleford**
**Hartford, CT**

**A:** According to Keith Peterson, who finished CP/M for the C-64, there's nothing you can do in either case. On the other hand, Commodore's IEEE-488 interface for the 64 allows A to be drive 0 and B to be drive 1 on an IEEE-488 dual drive. Similarly, at least two companies offer 80 column CP/M for the 64, but I've not tested either.

**Q: I have seen five ads for computer-assisted income tax preparation. Can you shed some light on their performance?**

**Donald Salas**
**Easton, CT**

**A:** Unless you prepare taxes for others, tax packages tend to be foolish purchases. Each new year brings changes in the tax laws that keep you from reusing last year's package, and most packages I've seen on the market cost more than paying a commercial firm to prepare an equivalent return.

**Q: I request information/brochures on any programs that will run on the 64 with both 1541 and 8050 disks. I'm interested in the full range of church applications.**

**Kendall Taylor**
**Olympia Heights U.M. Church**
**Box 650306**
**Miami, FL 33165**

**A:** I've included your full address, in hopes commercial readers with suitable programs will contact you. Briefly, you need programs that are either unprotected, or protected by a dongle or cartridge, so you don't have to alter the disk. In most cases, you'll also have to copy the program onto an 8050 disk yourself, using a program like Jim Butterfield's Copy-all, which should be on your 1541 system disk.

For church use, your first priority should be a word processor. Paper Clip is a good one that's protected by a dongle.

Next, you need a good mail list; our Mail Disk (see below) was adapted especially for church use, and is unprotected. For database management, you need something with huge records and relative files. Delphi's Oracle is suitable, and uses a dongle. For financial planning, Commodore's Easy Calc comes on a cartridge. For accounting, Southern Solutions offers an optional dongled version of The Businessman.

Companies like to use DOS protection on programs for the 64 because it's so cheap to provide, but as the 64 is used for more and more serious applications, your problem will become increasingly common.

### Programming

**Q: What are the necessary Pokes to force subsequent (larger) program parts to load completely when the Load command is used within a program?**

**Richard Nelson**
**Roy, UT**

**A:** First, load the largest program module from immediate mode, not from within another program. Then find its approximate size by Peeking location 46 and writing down the result. Finally, add this line to the start of your first program module, replacing the number 128 with the number that is two more than the number you Peeked in location 46.

```
10 POKE 45,0:POKE 46,128:CLR
```

Thus, if PEEK(46) returned the number 87, you'd Poke 89. This gives a small cushion for changes you'll make later in the programs. Our Mail Disk (see below) includes an explanation of the topic.

**Q: What locations do you have to Peek to distinguish between various Commodore computers?**

**Herb Gross**
**Elgin, IL**

**A:** Any location that gives a different answer when Peeked on each different model will do. Here is the location we use, and its Peek values in decimal (and hexadecimal). Location 61654 ($F0D6) contains 82 ($52) on the C-64, 145 ($91) on the VIC, 32 ($20) in PET Basic 4.0, 169 ($A9) in PET Upgrade Basic 2.0, and 240 ($F0) in Original Basic 1.0 PETs.



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**Q: How do I Poke out the List command on my VIC when a program is run? I need to make passwords. I also have to know how to Poke back the List command.**

**W. Jake Kozlowski**
**N. Tonawanda, NY**

**A:** Poking out List won't help much, unless you type RUN before letting others use the program. But you can do it on either a VIC or 64 with a POKE 774,X, where X is most anything other than what is in that location already. You can examine the location with Y = PEEK(774). To restore normal operation, type POKE 774,Y, where Y is the value you Peeked before making the change.

A better approach may be to hide pieces of the password around the program, and use the most advanced Basic functions you know to build it. Then only those who know Basic as well as you do can break it, which they could have done anyway, even after your Poke.

**Q: Is there any well-documented information on how to create, add and delete records for file processing on the C-64? I find both the reference manual and user's guide incomplete on this subject. Perhaps you can write a series of articles on the matter.**

**Jim Landstrom**
**Vermillion, SD**

**A:** I already have—a 6-part series titled, "It's All Relative," which ran in *Micro* magazine, from Dec. '82 through Aug. '83. The programs developed there, and a disk copy of the article are on our Mail Disk, available from me for $15.

**Q: I know the VIC screen is divided into pixels and I understand what they are and how they work. On the C-64, though, sprites are used instead. Are sprites in some ways different from pixels?**

**David Bier**
**Fresno, CA**

**A:** Yes, sprites are different. First, the 64 has three different kinds of graphics. It has and uses pixel graphics very much like your VIC does. Both computers also have and use programmable characters that are easier to manipulate (via cursor control characters) than other pixel graphics.

Sprites are very much like programmable characters, only larger and smarter. Instead of easily moving only a single character around the screen, you may, on the 64, move a very large blob around the screen with equal ease. Better yet, the blob is smart enough to sense when it collides with either another blob or something in the background. Blobs can also cross over each other without interference. The blobs are called sprites, and are a major advance in graphics.

**Q: Must I know machine language to know where to use the SYS command, or is there some way I can use SYS calls without learning machine language?**

**Jonathan Jackson**
**Riverside, RI**

**A:** It isn't necessary to know machine language to use SYS calls that others have discovered, but it certainly helps in understanding what's going on after the call. Until you feel like investigating machine language, just be very careful you type the numbers in published SYS calls exactly as written. (A mistake normally won't hurt the machine, but you might have to turn it off and start over.)

**Q: An idea mentioned in your book, *PET Personal Computer Guide*, intrigues me. It speaks of accessing program files as though they were data files. Could you explain how this is done?**

**Roger Harper**
**Chicago, IL**

**A:** Doing this is very simple; making sense of it is more difficult. Briefly, open the program as though it were a sequential file, but replace the S in the Open statement with a P. Then you may read in the program byte (character) by byte via Get# statements.

The only problem will be zero bytes. CHR$(0), when read in via Get#, is treated as an empty character. Therefore, empty characters will have to be replaced with CHR$(0) after each Get#. The file status variable ST will tell you when the file has all been read. Watch for it to become non-zero. A value of 64 means the end of file has been reached. Anything else means an error has occurred.

Turning this around and writing a program file byte by byte is a bit simpler. Again, replace the S in the Open with a P. Then write out each byte with a Print#, ending each statement with a semicolon (;). No need to modify CHR$(0) this time. After everything has been sent, close as usual.

Also note that the first two bytes read or written are not part of the program as such; they are its load address—where it is to go in memory when loaded normally.

Other complexities you'll face in fooling with program files include the two-byte-each link pointer and line number that precede each line of a program, the CHR$(0) that ends a line, and the zero link pointer that indicates the end of a program, plus the token values that stand for each Basic word within the program lines. These are explained in the chapter "Inside and Beyond Basic" in our book.

Here's a simple program that reads a program and rewrites it unchanged under a new name.

```
110 OPEN 1,8,2,"0:NAME,P,R"
130 OPEN 2,8,3,"0:NEWNAME,P,W"
150 GET#1,A$
160 IF A$=" " THEN A$=CHR$(0)
170 IF ST< >0 THEN 200
180 PRINT#2,A$;
190 GOTO 150
200 CLOSE 2
210 CLOSE 1
220 END
```

It lacks any disk error-checking, so watch for disk errors yourself (indicated by flashing lights on the drive).

By the way, here's another line that does precisely the same thing, but without reading the file. Do you recognize the Basic command?

```
OPEN 1,8,15,"C0:NEWNAME=0:NAME
```

**Q: Do you know where DOS 5.1 for the C-64 is stored in memory? I would also like to know if it's possible to change its commands.**

**Robert Spangler**
**Norco, CA**

**A:** DOS 5.1 occupies hex addresses $CC00 through $CF58 in memory. Its commands can be changed if you have its source code, which is available from some user groups. To change it, you'll also need Commodore's assembler, available from most dealers.

**Q: I have been writing a program for the C-64 that I planned on putting into a cartridge. However, my 64 just hung. Where do I put the entry point**

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**for my program on the cartridge?**

**Joe St. Lucas**
**San Diego, CA**

**A:** When the 64 is turned on or reset, it first checks for the presence of a cartridge. It does this by checking to see if locations $8004 and following contain the characters CBM80. If so, the 64 does a JMP Indirect to the 2-byte address contained in locations $8000 and 8001. Locations $8000–3 should contain the address to be JMPed to if the user generates an NMI (presses Stop plus Restore).

If you are using the MAE assembler, you can allow for this as follows:

```
0100 .ba $8000 ;begin assembly
0110 .wo rst ;2-byte address
0120 .wo nmi ;low, then high byte
0130 .by $c3 $c2 $cd $38 $30
0140rst nop ;here on cold.start
0150nmi nop ;here on warm.start
```

Other good assemblers use similar commands.

**Q: When I examine color memory, I get strange numbers outside the expected 0–15 range. The screen displays the correct colors. What's happening?**

**Ronald Berry**
**Virginia Beach, VA**

**A:** The color information is contained in the low four bits (nybble) of each eight-bit byte in color memory. The high bits don't matter, but are responsible for the strange values you get. If a color Peek is in variable X, you can strip off the unwanted bits by typing this line: X = X AND 15.

**Q: What is the source for Commodore schematics on drives, tape decks and so on? My local dealer is K Mart, and the employees know almost as much about ROMs as they do about locomotive repairing.**

**(Also, you'll be sorry to have indicated you'll send personal replies, I'll wager. I suggest you assess a $1 charge if a personal reply is desired.)**

**Richard Colvin**
**Alamogordo, NM**

**A:** Normally I'd tell you to try your dealer, but in your case, try Howard Sams publishers, Indianapolis, IN, for schematics. Actually, even the mass merchants like K Mart usually have someone who handles their repairs, and that person or company may be able to get you the schematics you need.

I only reply to those who include a SASE for each question, but your dollar allowed me to send answers to a few foreign readers who forgot about international postal reply coupons. Thanks.

**Q: Can you list a cartridge out of a C-64?**

**Tony Kim**
**Los Angeles, CA**

**A:** Only a few cartridges for the 64, notably HESWriter and Turtle Graphics, are even written in Basic. Most are written in machine language, normally making the List command useless for cartridges.

The equivalent of a listing for a machine language program is called a disassembly. If you have an extended monitor (from your user group), you may be able to disassemble some cartridges by using the switches on an expansion motherboard to keep them from auto-starting.

**Q: Is there a program that will allow me to blink selected program lines on my display, so warnings and titles will stand out?**

**Howard Sirois**
**Huntington, CT**

**A:** I do this through a three-stage method. First, to position a message anywhere on the screen, I define a string of one cursor home, followed by 24 cursor downs, calling it PO$. Next, I define the message or title to be blinked as ME$. Finally, I GOSUB to the following subroutine, after setting Y = the line on the screen (0–24), X = the column (0–39) and NO = the number of blinks needed (at least 1):

```
1100 REM BLINK MESSAGE S/R
1110 JI=30:REM JIFFIES PER BLINK
1120 BL=0:REM FIRST BLINK IS 'ON'
1130 FOR I=1 TO NO
1140 :  ?  LEFT$(PO$,Y+1);TAB(X);CHR$
(18+ABS(128*BL));ME$;
1150 :TT=TI+JI
1160 : BL=BL=0:REM TOGGLE SWITCH
1170 : IF TI<TT THEN 1170
1180 NEXT
1190 RETURN
```

You may use this subroutine in any Basic program.


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# Coming Next Month

**The 91st Day**—Where do you go to get your broken Commodore 64 or VIC-20 serviced? Read about the travail one frustrated owner goes through to get his inexpensive computer fixed—after the 90-day warranty had expired.

**The Joy of Modems**—Computer bulletin boards are springing up everywhere, making computer-to-computer communications easily accessible and changing the way we live our lives. To join the fun of instant information exchange, all you need are a modem, computer and telephone. It's as easy as making a phone call.

**Computer Bulletin Board Services**—With your modem connected to your VIC-20 or C-64, you're ready to access the many Commodore-related bulletin boards that offer news, information and programs of interest to Commodore owners. This article takes a look at the available bulletin boards and the services provided.

**The Incredible Jeremy Landers**—Computer enthusiasts who operate bulletin boards are called SYSOPs (system operators). You'll meet one of the youngest in the business—12-year-old Jeremy Landers, who's put aside his baseball glove and ten-speed bicycle for a VIC-20, VICModem and Datassette.

**Disk-O 64**—A useful disk utility program that adds 13 new disk-related commands to your C-64.

**64 Doodle**—This program lets you use your joystick to draw and color in various shapes on your Commodore 64. You'll be able to save your works of art on disk or tape.

**Basic String Selection**—Tutorial for the beginning programmer on what strings are and how to use them.

**Music Teacher**—VIC-20 educational game to help new music students identify the letters of musical notes.

**Bunch-O-Bugs**—A pre-schoolers' counting game for the unexpanded VIC-20.

**And More**—The June issue will also bring you regular columns, features and reviews to help you get the most enjoyment and use out of your Commodore system.


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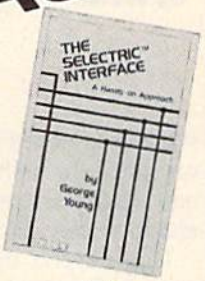


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(from p. 16)

# Magic

system has locked up. To check if the operation is still going on, press the shift/Commodore combination a few times and watch the screen. If the characters shift between upper- and lowercase, the operation is still going on.

Don't expect the shift to occur every time, as the computer is working with the disk *and* reading the keyboard. But if the shift doesn't occur after several tries, you can assume the disk is locked up and you should restart your system.

**Jonathan Entner**
**Malvern, PA**

**$57** Disk Wedge tip—With the Wedge utility for the C-64 or VIC, typing @$ will list the entire disk directory. If you are only interested in the disk's name and/or the number of blocks free, try typing @$$—it will give you only the first and last lines of the directory. Using this technique more than once can give a DRIVE NOT READY error, which can be easily corrected by using @$ one time.

**Paul F. McDonald**
**Nashua, NH**

**$58** Video tip—When typing in programs, try turning down the color control on your color TV. The black and white display is easier to read and easier on your eyes.

**Michael Crowther**
**Framingham, MA**

**$59** Another video tip—Depending on your TV set or monitor, the initial video display of the C-64 can be made sharper by changing the background and cursor colors. Try this:

[CTRL 2] POKE 53280,0 : POKE 53281,0 [Return]

**Long Kha**
**San Diego, CA**

**$5A** Printer substitute—Do you lack a printer to review a Basic listing or network session? If you own a VCR, tape your material and review it at slow speed or in Freeze Frame mode. If you press CTRL while listing the program, you'll get a better video recording by slowing down things at the computer's end.

**Steve Cunningham**
**Lynwood, CA**

**$5B** Alphacom printer fix—The paper on the small Alphacom 40-column printer has a troublesome tendency to feed back into the paper compartment, leading to paper jamming in the print-feed mechanism. You can avoid the problem by placing a small piece of tape over the cover slot and onto the rear of the printer base. If you place the tape correctly, it won't interfere with opening and closing the lid.

**Mark W. McCann**
**Montrose, MI**

**$5C** Ribbon rejuvenation—When the ribbon in your VIC 1525 printer begins to run out of ink, you can revive it with stamp-pad ink. Of the two capsules through which the ribbon runs, one lets the ribbon pass more freely. Pry that one open with a small knife. The foam rubber cylinder is the ink holder. Dab ink all around the top of it with the brush from the ink bottle. After you reload it, run the printer awhile to even out the ink distribution.

Another option is to buy a new, identical ribbon at Radio Shack. Catalog #26-1424, for the TRS-80 Line Printer VII, fits the Commodore 1525 exactly, and is easier to come by than the same product under the Commodore label. It bears a manufacturer's product number 10A1, and may be available under other labels.

**Gregory Warnusz**
**St. Louis, MO**

**$5D** Printer paper alignment—The following little program will verify that the printer is properly aligned on the first line of print on a page.

```
10 REM ALIGN PRINTER
20 OPEN 4,4 : B$="****"
30 FOR I=1 TO 66
40 PRINT#4,I;B$
50 NEXT
60 CLOSE 4
```

On the VIC-1525 printer, place the top of the black plastic printer tab just above the bottom of the last hole on a page and run the program. Run it again if necessary until proper line alignment is obtained.

**Jorge R. Gonzalez**
**Miami, FL**

**$5E** Printer hint—The usual single-spaced program listing doesn't leave much room for notes and additions on the printout. A double-spaced listing would often be preferred, and is very easy to get with the VIC or C-64. Just use a file number greater than 127 in the Open statement for your printer, and the computer will send an extra line feed after every carriage return. For example:

```
OPEN 128,4 : CMD 4 : LIST
```

will give the listing, then

```
PRINT#128 : CLOSE 128
```

will unlisten the printer and close the file.

**David Ratliff**
**Magee, MI**

**$5F** VIC typewriter hint—Commodore's Home Calculation cassette package includes a popular word processor that allows backward movement only one line at a time. Trying to back up to material on a previous page is time consuming at best, and maddeningly frustrating at worst.

But there *is* a tricky way to get back to any text line number you desire. Just exit the program using the stop and restore keys, then type L=n [RETURN], where n is twenty less than the line you want to see at the top of your screen.



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Then type GOTO 43 [RETURN] to reenter the program without losing your text.

**Howard M. Mesick**
**Hartly, DE**

**$60** C-64 buzzer—It's easy to signal an incorrect user response by jogging the volume control on and off with:

```
10 FORA=1TO20:POKE54296,15:FORT=1TO3:NEXT:POKE
54296,0: FORT=1TO3:NEXT:NEXT
```

**James G. Cooper**
**New Albany, IN**

**$61** Backward 64 sound—If you use a 1701/1702 monitor with a 5-pin DIN to 4-RCA cable plugged into the back of it, one of the RCA plugs is dangling free. You can use it as an audio *input* to your computer.

By using a patch cord to connect it to a radio or recorder output jack, and typing POKE 54296,15 (max. volume), you can play the radio through the 1701/1702's speaker, under computer control! The computer can filter and control the volume of the radio sound.

To be safe, you should consult p. 472 of the *Commodore Programmer's Reference Guide*, to find the acceptable characteristics of the signal you want to send to EXT IN.

**David H. Kornhauser**
**Honolulu, HI**

**$62** REM trick—(This is a really good one!) You can make your listings do very unusual things by incorporating color changes, RVS on, cursor movements and so on into REM statements.

Enter your remark, including the control characters and any text, as if it were a character string in a Print statement, but leave off the closing quote. Then press the return key and use the cursor keys to position the cursor over the first character in the string. Insert a shifted return character by pressing

[RVS on][insert][shift M][Return]

The shifted return will appear as a reversed shifted M or reversed backslash. Now, when the line is listed, all the control characters after the shifted M will be executed, just as though they were in a Print statement!

You can't edit this special REM from a listing, so to test it, list it by itself while the original line you typed is on the screen. Try the following to see what we mean.

```
10 REM"[wht][RVS on]WHITE MAGIC!
```

Type it in, then insert the shifted return as described above. List 10, then try some of your own.

**Carl Onsgard**
**Green Bay, WI**

**$63** Highlighting REMs—Many people use asterisk-filled REM lines before and after their program remarks to make the remarks stand out in program listings. Typing all those asterisks can be tedious, but there's a simpler way. Simply type REM" and hold your finger on one of the cursor keys.

The quote mark after the REM puts Quote mode graphics symbols on the screen in place of cursor movements, and the repeating feature of the cursor keys eliminates having to type each character individually. All you do is remove your finger before the end of the line is reached. Incidentally, if you indent your remarks, let the repeat feature of the space bar indent, too.

**Glenn Zuch**
**N. Tonawanda, NY**

**$64** REMless remarks—As soon as the Basic interpreter encounters a REM statement, it skips to the following line. Here,

```
10 X=1 : REM MOVE MISSILE : GOTO 100
```

the GOTO will never be executed, since it follows a REM statement.

However, there are many cases where you can omit the REM statement! As long as the Basic interpreter does not try to execute your comments, you are safe. If line 50000 is never executed, you may say:

```
50000 SET X=1 TO MOVE THE MISSILE
```

You can also get away with:

```
10 X=1 : GOTO 100 : MOVE MISSILE
```

**Westmoreland Commodore Newsletter**

**$65** One-line wallpaper store—255 lovely patterns to choose from, in the privacy of your own home. This version is for the C-64; for the VIC, change the 1040 to 528, and leave out the unique C-64 colors. For either machine, you can change the length and makeup of A$, giving an entirely new selection of patterns.

```
1 A$="[wht][red][cyn][pur][grn][blu][yel][gray 1][brown][blk]":
N=N+1:FORJ=1TO1040:R=JANDN:?MID$(A$,R+1,1)"[RVS on]
[space]";: NEXT:GOTO1
```

**Marion Maddocks**
**Glenwood, IA**

**$66** SINful one-liner—Run the following and function as a transcendental meditator.

```
10 POKE 646,RND(0)*8:PRINTTAB(SIN(X)*8+10)"[RVS on][4
space]":
X=X+0.3:GOTO10
```

It's better on the C-64 if you change both 8s to 16s, change the 10 to an 18 and add an extra space after the RVS.

**David Lonard**
**Edinburg, TX**

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# RUN Amok

*Item*: In The Straight A Program (February 1984, p. 114), there is a glitch in the Statistics subroutine of the program listing. The following lines should replace the original line 3177:

```
3176 IF I$(V)<>"1"THEN3179
3177 DV=DV+((U(V)-MN)↑2)
3179 NEXT
```

*Item*: In Listing 1 (Part 1) of the program for Baja 1000 (March 1984, p. 68), a colon was inadvertently omitted from line 518. The colon belongs before the first POKE. It should read: . . .BOMBS":POKE631. . . .

*Item*: The price for the Automodem as advertised by Compu-Soft in its Feb. 1984 ad (p. 126) was incorrectly listed. It should have read $131.00.

*Item*: In our listings of the programs for the article Fancy Fingering on the Function Keys (February 1984, p. 70), the data statement lines (9000–9060) were altered so that some end-of-line checksums or data statements were moved to the following or previous line. If all data statements are typed in exactly, the programs will run all right, but if there is an error, it may be in the line *before* the one indicated by the error message. Following are the lines in question (for the VIC-20, top, and C-64, bottom) as they should appear:

```
9000 DATA120,165,2,141,21,3,165,1,24,105,21,144,3,238,21,3,141,20,3,1341
9010 DATA88,96,165,198,208,92,165,254,240,9,169,0,133,254,164,253,24,144,56,2712
9020 DATA162,3,169,63,137,197,240,13,56,233,8,202,16,246,169,255,141,128,2,2500
9030 DATA48,58,134,253,162,0,173,141,2,201,1,208,2,162,4,201,2,208,2,1962
9040 DATA162,8,138,24,101,253,205,128,2,240,30,141,128,2,168,177,251,168,162,248
8
9050 DATA0,177,251,240,17,157,119,2,200,232,134,198,224,9,208,241,132,253,169,29
63
9060 DATA1,133,254,76,191,234,889


9000 DATA120,165,250,141,21,3,165,249,24,105,21,144,3,238,21,3,141,20,3,1837
9010 DATA88,96,165,198,208,92,165,254,240,91,169,0,133,254,164,253,24,144,56,279
4
9020 DATA201,6,240,17,202,201,5,240,12,202,201,4,240,7,169,255,141,128,2,2473
9030 DATA48,58,134,253,162,0,173,141,2,201,1,208,2,162,4,201,2,208,2,1962
9040 DATA162,8,138,24,101,253,205,128,2,240,30,141,128,2,168,177,251,168,162,248
8
9050 DATA0,177,251,240,17,157,119,2,200,232,134,198,224,9,208,241,132,253,169,29
63
9060 DATA1,133,254,76,49,234,162,3,165,197,201,3,240,187,202,24,144,162,2437
```

There is one other problem in the Function Keys article. The article states correctly that, after pressing the run/stop and restore keys, you restart the *VIC-20* program by entering SYS 0. It neglected to say that the *C-64* program is reactivated instead by entering SYS 248.

*Item*: There was a problem in the program listing for the C-64 version of Draw, published in the RUN Amok section of the March issue. The problem is corrected by inserting the following line:

```
335 IF D(F1,1)=0 THEN DELTA=0
```

# Clubs

## Central Pennsylvania

The Commodore 64 user's group for members living within a 50-mile radius of Harrisburg is 812. Club meetings are held on the last Tuesday of the month at Messiah College (Grantham, PA) in Kline Hall, at 6:30 PM.

The group has special interest groups for everything from Beginning Programming to Text Adventurers to Machine Language. The club is in touch with computer clubs across the state and is jointly developing a Pennsylvania Commodore user's conference to be held during autumn.

For more information, write to Eight Squared, PO Box 76, Mt. Holly Springs, PA 17065, or call 717-776-3469 for membership information.

## Western Slope of Colorado

The Commodore User Group offers free information and public domain software; they'll be setting up a CBBN (computer bulletin board network) soon. The group meets on the first Monday of each month.

For more information, write to Ray Brooks (president), Box 377, Aspen, CO 81612.

## Delaware

If you are interested in the Commodore 64 and live in the areas of Delaware, southeastern Pennsylvania and southern New Jersey, then join the Tri-State User's Group by contacting Russell J. Prince, 2312 Carpenter Road, Wilmington, DE 19810.

## Atlanta, GA

Write to the Atlanta Commodore 64 User's Group at 1767 Big Valley Lane, Stone Mountain, GA 30083, or contact Ronald Lisoski (president) at 404-981-4253.

The club's monthly listings are announced in their newsletter, which contains hardware and software reviews, club activities and programmers' tips. Meetings generally have tutorials, software and hardware demonstrations and general club business. Public domain


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software is available at a nominal charge.

### New York City

The New York City VIC-20/C-64 User Group runs a local BBS called VTUG and is setting up a large CP/M public domain library of over 100 disks.

For more information, write to NYCUG at 436 East 69th St., New York, NY 10021.

### Software Exchange

Those interested in exchanging programs (only ones that you have written), send your name, address, phone number and a copy of your programs to David Morell, 404 Brookside Drive, Chapel Hill, NC 27514.

### Conference in May

The third annual TPUG (Toronto Pet User's Group) will be held on Saturday and Sunday, May 26 and 27, from 10 AM to 5 PM, at the Constellation Hotel, 900 Dixon Road (adjacent to airport).

For more information, write to Chris Bennett, TPUG Business Office, 1912A Avenue Road, Toronto, Ontario, Canada M5M 4A1 (416-782-9252).

### Shoals Commodore User's Group

SCUG meets the second and fourth Tuesday of each month. The group is for C-64 and VIC-20 users. Write to George Taylor (secretary) at 209 Lakeshore Drive, Muscle Shoals, AL 35661.

### For Commodore 64

Learn about C-64 Diversity user's group by writing to Jill Johnston, 18204-67th Ave., NE, Arlington, WA 98223.

### Join the PACC

The Prescott Area Commodore Club welcomes new members who are interested in Commodore computers. For more information, write to the group at PO Box 26532, Prescott Valley, AZ 86312.

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# Book Gallery

**Compiled by Shawn Laflamme**

## Sprite Graphics for the Commodore 64

**Sally Greenwood Larsen**
**Prentice-Hall, Inc.**
**Englewood Cliffs, NJ 07632**
**Softcover, 184 pp., $15.95**

In her introduction, Ms. Larsen states that she put everything in her new book that she wished she had known when she started using sprite graphics. Programmers who want to use this graphics capacity of the Commodore 64 will be delighted by her choices.

The book covers each of the topics involved in programming sprites in short, easy-to-read chapters. Illustrations are clear and easy to follow. Example programs are readable and short. Each program is accompanied by a commentary explaining how it works.

*Sprite Graphics* is designed for the beginning programmer who has enough experience to write simple Basic programs. The book does not cover programming techniques other than the specifics of programming sprites. Beginners will bless her for her clarity as she covers a complex process step by step.

For example, sprite registers are on the C-64's video chip, and begin with memory location 53248. Larsen suggests storing this location in a variable, V, at the beginning of each program. Each of the sprite registers can then be located as V+ (a number). V+39 for the color register for sprite #0 is easier to remember than memory location 53287.

Larsen also offers the beginner a solution to the mystery of how to set and check individual bits in a memory register. Her illustrations and examples make this mechanism, which is used in several sprite control functions, crystal clear.

A chapter on binary math and Boolean logical operators is near the end of the book, where it won't intimidate novices. She advises the reader who doesn't understand these essentials to study that chapter the first time she explains using bit operations.

As with all good books on programming, Larsen starts the reader at the keyboard. Her examples are meant to be keyed in so the user can *see* how each operation works. These examples begin with the basics of designing and defining sprites, giving them color and placing them on the screen.

With sprites on the screen, the reader finds out how to pass one in front of another, stretch them out lengthwise and crosswise, and use them in Multicolor mode. The principles of animating, moving the defined figures and detecting collisions between sprites emerge in steps so simple that the complex process is easy to follow.

The chapter entitled "Incorporating Sprites into Your Programs" is the longest in the book. More than 20 programs, some of which are fairly long, illustrate each previously discussed sprite characteristic in turn. The reader who keys in all of them, taking the time to study each one, should have a good grasp of sprite mechanics when he finishes the section.

In a final chapter of questions and answers, Larsen addresses some miscellaneous information, such as saving sprite data for use in more than one program, and rotating and inverting sprites on the screen. The book ends with a few pages that summarize information about the C-64 sprite registers.

Anyone who wants to play with sprites can benefit from this book. The factors involved in manipulating sprites are broken down into manageable portions, clarifying the process for both the beginner and experienced programmer. The book is useful as a text covering the entire subject, or as a reference for dealing with any aspect of sprite graphics.

**Annette Hinshaw**
**Tulsa, OK**

## The Commodore 64 Music Book: A Guide to Programming Music and Sound

**James Vogel and Nevin Scrimshaw**
**Birkhauser Boston, Inc.**
**380 Green St.**
**Cambridge, MA 02139**
**Softcover, 130 pp., $14.95**

*The Commodore 64 Music Book* is a well-written introduction to programming sound effects and simple music on the Commodore 64.

Authors Vogel and Scrimshaw have organized the book into six sections. Each section is further subdivided into several brief chapters.

The first section is an overview of electronic music and the most basic features of the Sound Interface Device (SID). The six chapters in this section introduce the reader to a few fundamental principles of music and describe how each principle is related to the SID chip. Each principle is illustrated with one or more simple programs.

Section II is an introduction to programming the SID chip to produce sounds. This section begins with a chapter on the use of the Poke statement to change individual bits in a sound chip register. This fundamental programming technique is used in chapters on the frequency registers, waveforms, attack, decay, sustain, and release parameters and the volume control. This section concludes with a brief chapter on controlling the amount of

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time that sound is produced by using either a For...Next loop or the Commodore 64 "jiffy clock."

In Section III, the authors discuss programming techniques based on the Basic Read and Data statements. While the previous section emphasized SID chip programming, manipulation of the data needed to control the SID chip to produce music is the theme here. The Basic statements Read, Data and Restore are discussed in detail, and programming tips on how to control the flow of data with flags and counters are given. By the time you arrive at the end of the last chapter in this section, you should be able to program simple songs in three-part harmony.

Sound effects and the use of modulation, synchronization and filters are discussed in Section IV. Each chapter consists of programming tips, one or two example programs and a little bit of theory (just enough to explain the main principles of each new technique).

The use of arrays is the featured programming technique in Section V. The techniques discussed in this section are slightly more advanced than those in Section III. Likewise, the music that may be programmed with these techniques is somewhat more sophisticated than the tunes used in the example programs of the previous chapters.

Section VI contains three useful charts: the SID chip control register chart, a table of note values (to be Poked into the frequency registers), and a figure which relates the CHR$ codes to the Commodore 64 keyboard. The control register chart was first introduced in Chapter 7 (the chapter on Pokes), plus there are small charts for each control register in the chapters that introduce those registers.

The most outstanding features of *The Commodore 64 Music Book* are its attention to fundamentals and the example programs.

This is a book that can be enjoyed by readers with no previous programming experience. For most of the example programs, the authors have written explanations of how the programs work. For some programs, most notably the longer programs in Section V, there is a line-by-line description of what each program does.

The book is filled with example programs. Some are brief programs to illustrate a specific technique. Others are modifications of programs from previous chapters that add a new feature. None of the programs are excessively long, and all that I tried were easy to type into the computer.

Beginning programmers with an interest in music or the sound features of the Commodore 64 will love *The Commodore 64 Music Book*. This is the kind of book that you need if you have just taken the computer out of the box and are saying to yourself, "Let's make music," or "Let's make insect speech," which is a cute program in Chapter 26. You will be able to make music, and you'll learn some useful programming skills, too.

An errata sheet came with the book that I reviewed, but there were a few errors in the text that were not listed on the errata sheet. None of the errors that I found were in program listings.

As an intermediate programmer with a strong interest in Commodore 64 music and sound, I was especially interested in how the authors would treat the more advanced techniques of filtering and modulation. I had also hoped for some sharp programming tips that I could apply to my music programs. While I didn't find any programming techniques that I want to incorporate directly into my programs, I did find lots of interesting things that I will want to explore further. Vogel and Scrimshaw end one chapter in Section IV with some advice that seems directed to the more experienced programmer—experiment.

*The Commodore 64 Music Book* gets a strong recommendation from me, especially as a book for those who are just starting to explore the sound and music capabilities of the Commodore 64.

**David Scott Saari**
**Elkhart, IN**

## Commodore 64 Computing

**Ian Sinclair**
**Prentice-Hall, Inc.**
**Englewood Cliffs, NJ 07632**
**Softcover, 133 pp., $12.95**

*Commodore 64 Computing* is a meat-and-potatoes book, with no excursions into unusual programming. The targeted audience is business people, many of whom are beginners in Basic programming.

The book serves as an introduction to Basic. Sinclair covers the most-used Basic commands, with numerous short and to-the-point example programs. The reader who keys them in will undoubtedly learn the concepts under discussion. There are no memory maps, and no discussion of machine coding.

The chapter on sprite graphics is quite good, giving you step-by-step instructions for building and coding sprites. Sinclair uses a business logo as an example.

The chapter entitled Function Keys and the Sound Generator is disappointing. The function keys cover less than a page. They require machine code to program, which is beyond the scope of the book. Sinclair seems to feel that the sound function is an unnecessary frill, only good for games, and of little value to business. Consequently, he talks about waveforms and the use of a warning buzz for error routines. He does not address music at all.

Other aspects of computing, such as operating peripherals and using software, are given little space.

This book is worthy, but not exciting. The author moves quickly, perhaps too quickly for novices, over some essential commands. The book's coverage of arrays and subroutines may be a bit too advanced for novices, but his introduction to using the complicated Commodore screen graphics is very helpful. Someone who is frustrated with the quality of the user's manual may find that this book will give him the firm footing that he needs. However, the aspiring game programmer will need another source to meet his specific needs.

**Annette Hinshaw**
**Tulsa, OK**

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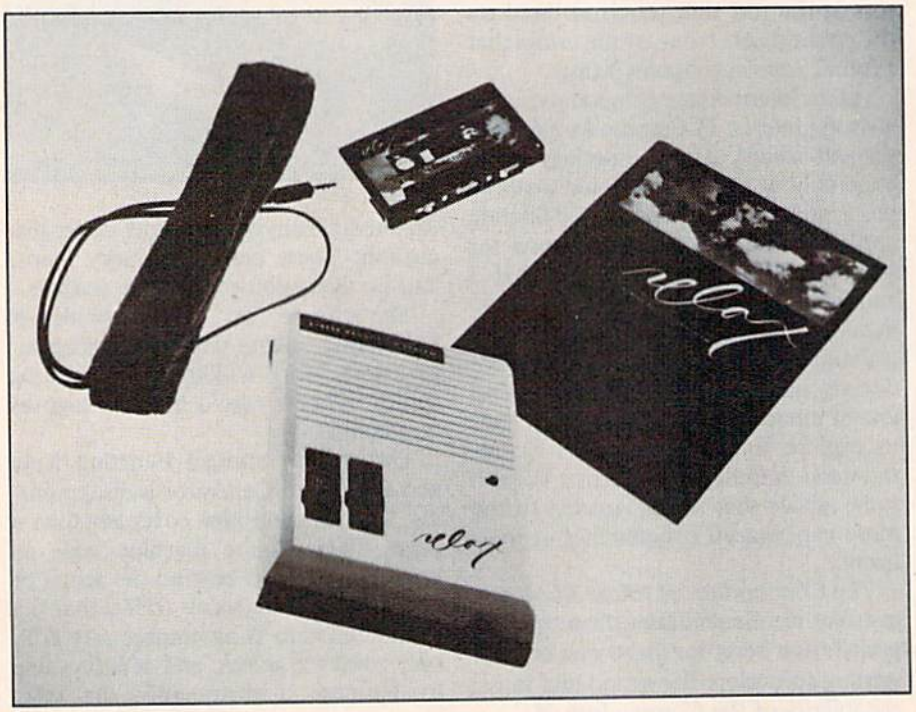
# New Products RUNdown

**Compiled by Shawn Laflamme**



## Relax!

Synapse Software (5221 Central Ave., Richmond, CA 94804) has introduced Relax, a stress-reduction system for the Commodore 64.

Relax allows you to monitor your stress levels by representing muscle tension graphically on your computer monitor. The workbook helps you to understand your reactions to stress and provides suggestions for managing and reversing those reactions.

An audio tape guides you into deep relaxation. You can also enter subliminal messages that will reinforce your relaxation response.

The Relax hardware/software package includes the program on disk or cassette, sensor headband, control unit, audio tape and workbook. It is available for $99.95.

Check Reader Service number 405.

## All's Clear

Computer Associates, Inc. (PO Box 683, West Fargo, ND 58103) has introduced the Video*Clear interference rejection cable.

The cable is designed to reduce or eliminate radio frequency interference in television sets that are being used as monitors for microcomputers. It requires no modifications to either the computer or television, and comes with all adapters needed to interface with a variety of televisions.

The Video*Clear cable is compatible with the C-64 and the VIC-20. It costs $14.95.

Check Reader Service number 435.

## Master the Keyboard

Commodore 64 users can learn typing skills in a video game format with MasterType, from Scarborough Systems, Inc. (25 North Broadway, Tarrytown, NY 10591).

MasterType challenges you to protect your Command Ship against enemy word stations that appear on your screen. As they hurl letters, and then increasingly complex words, at the Command Ship, you must type the same letters or words and then press the space bar to fire a lethal laser at the attacking symbols. The program has 18 increasingly complex skill levels.

MasterType is available on disk and cartridge for $39.95.

Check Reader Service number 410.

A similar version of MasterType is available on cartridge for the VIC-20 from Broderbund Software, Inc. (17 Paul Drive, San Rafael, CA 94903). It costs $39.95.

Check Reader Service number 411.

## Need a Pal?

Programmer's Aids & Logs (PAL) is a collection of programming aids, worksheets and logs designed to reduce the time and effort necessary to write good programs.

PAL uses simplified reference sheets, cut-out aids, specialized design gridsheets, programming forms, worksheets and information logs to help you organize your programming efforts.

The PAL package is available in separate versions for the C-64 and the VIC-20. They are available for $9.95 each. Pacifica Micro Products, 4455 Torrance Blvd., Suite 177, Torrance, CA 90503.

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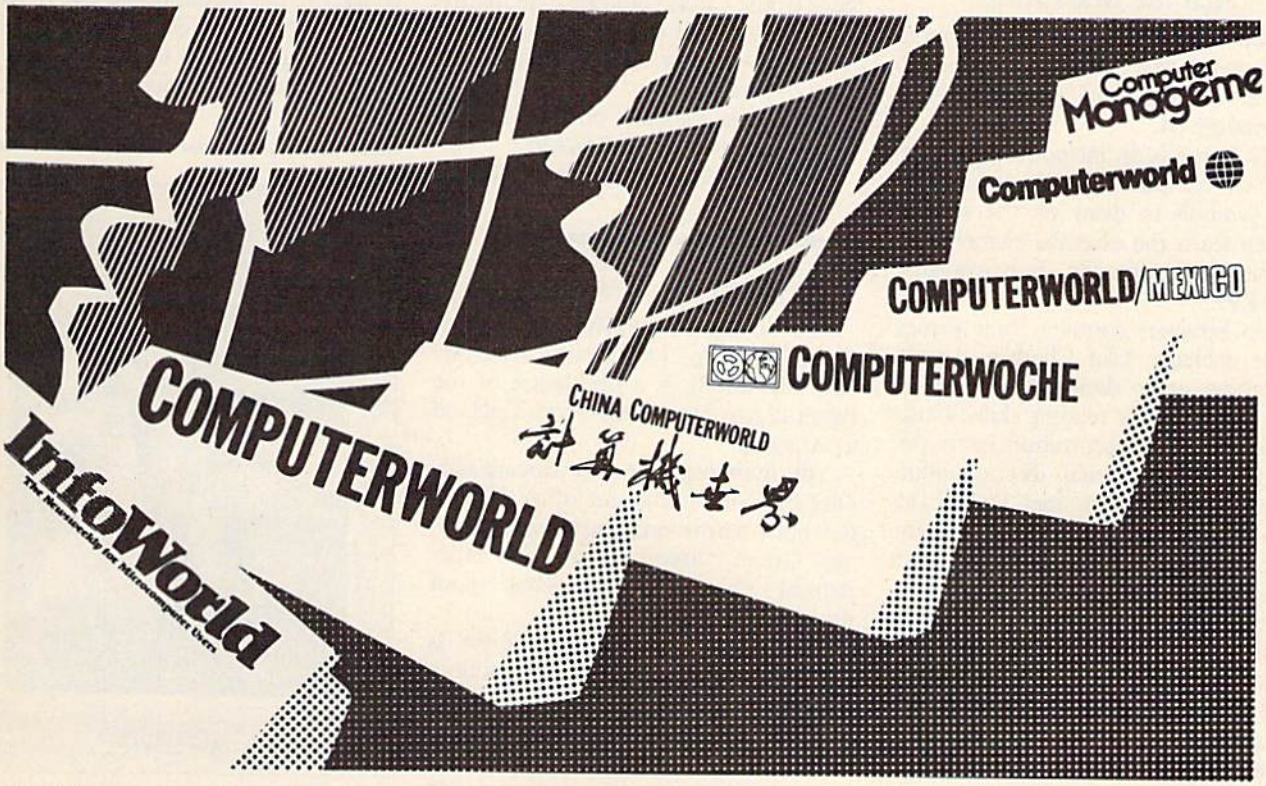


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## Catch the Brass Ring!

Carousel Software, Inc. (877 Beacon St., Boston, MA 02215) has released three new educational games for the Commodore 64.

Telly Turtle is an introduction to the world of computer programming. By using symbols to draw on the screen, children learn the essential elements of computer programming. It is available for $34.95.

Brain Strainers contains three games in one package: Clef Climber, a note recognition game designed to develop auditory and music reading skills; Finders Keepers, a concentration game designed to teach visual discrimination and improve memory; and Follow the Leader, a music and graphics pattern recognition game. The Brain Strainers package is available for $29.95.

Simulated Computer is an animated simulation of a computer in operation. It costs $29.95.

All three games are available on disk or cassette.

Check Reader Service number 400.

## Peter and the Wolf

Educational Audio Visual, Inc. (17 Marble Ave., Pleasantville, NY 10570) has introduced Peter and the Wolf for the Commodore 64.

Based on Prokofiev's classic tale, this game provides three levels of play—from a simple theme-recognition game suitable for young children to a challenging contest in which Peter and the Wolf are pitted against each other in an effort to capture the other characters.

The documentation includes suggestions for experimentation in programming music and graphics.

Peter and the Wolf is available on disk for $39.95.

Check Reader Service number 431.

## Adventure in the Mystic Arts

Infocom, Inc. (55 Wheeler St., Cambridge, MA 02138) has released Sorcerer, the second game in Infocom's Enchanter series of adventures in the mystic arts.

In Sorcerer, a follow-up to Enchanter, you're a member of the Circle of Enchanters. Belboz the Necromancer is your friend, mentor, and the most powerful of all Enchanters. He has vanished, and he may be in thrall to evil sorcery.

The freedom of the land and the existence of the Circle could be in jeopardy. You must rescue the kingdom and locate your mentor in the treacherous mists of time.

Sorcerer is available on disk for the Commodore 64. It costs $49.95.

Check Reader Service number 429.

## Sail to the New World

The Voyage of the Mayflower, from Cadmean Corp. (309 Koch, Ann Arbor, MI 48103), is a simulation of the Pilgrims' voyage of 1620 from England to America.

You must organize and allocate supplies of food, drink and other necessities both before and during your voyage. Ocean currents, storms and other natural phenomena challenge your navigational skills.

The Voyage of the Mayflower is available on disk for the Commodore 64. It costs $29.

Check Reader Service number 418.

## Manage Your Legal Affairs

Computa-Law is a series of programs designed to help laymen and business persons manage their legal affairs.

The Computa-Law programs give you access to forms and jargon used in the legal profession. Some of the programs available are: Simple Will, Agreement of Sale-Real Estate, Lease-Residential, Employment Contract, Promissory Note, Partnership Agreement and Pre-Nuptial Agreement.

The Computa-Law programs are compatible with most popular printers. They are available for the Commodore 64 and the VIC-20 (16K expansion). Each program costs $24.95 on disk and $19.95 on cassette. LegalByte Software, PO Box 579, Gwynedd Valley, PA 19437.

Check Reader Service number 421.

## Perilous Odyssey

In Aegean Voyage, you are the captain of a Greek sailing vessel in search of the treasures of the gods, hidden on islands scattered throughout the Aegean Sea.

In addition to treasures, such as the Golden Apples of Hesperides and Apollo's Sun Chariot, the islands are also home to many of the beasts of Greek mythology. Instead of finding Theseus' Sword, you might encounter the evil Medusa and lose your ship.

Aegean Voyage is available on cartridge for the Commodore 64. It costs $39.95. Spinnaker Software, 215 First St., Cambridge, MA 02142.

Check Reader Service number 424.

## Graf 64

Handic Software, Inc. (5090 Central Highway, Suite 7, Pennsauken, NJ 08110) has released Graf 64 for the Commodore 64.

With Graf 64, you can study complicated mathematical functions in graph formats. Any function can also be defined and plotted into high-resolution graph form within an x-axis range.

Graf 64 is available on cartridge for $29.95.

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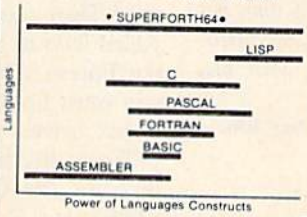


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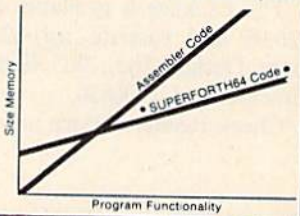


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## SuperCord II

SuperCord II is a computer interface accessory that enables you to use an electronic typewriter as a letter-quality printer. It is compatible with the C-64 and the VIC-20, and with many models of electronic typewriters, including Adler, Brother, Royal, Smith-Corona and Silver-Reed.

SuperCord II is available in a variety of combinations to enable its attachment to specific computer and typewriter models. It costs $369. Cord Ltd., 1548 Brookhollow Drive, Santa Ana, CA 92705.

Check Reader Service number 433.

## Educational Software from PDI

Story Builder/Word Master, for the Commodore 64, is an educational software package designed to teach and reinforce grammar, spelling, vocabulary and reasoning skills.

Story Builder is a series of three programs that provide practice in basic grammar skills. The first program reviews nouns, adjectives and verbs. In the next two programs, students must use their knowledge of grammar to supply words to the computer.

In Word Master, the student must use logic and language skills to guess a three-letter word chosen by the computer.

The package is available on disk for $26.95 and cassette for $21.95. Program Design, Inc., 305 East 24th St., Greenwich, CT 06830.

Check Reader Service number 406.

## Learn to Program Your C-64

Basic, A Tutorial, is an introduction to programming the Commodore 64.

The program gives you on-screen lessons with step-by-step instruction in the fundamental elements of Basic. The manual allows you to set your own pace as you learn to use Basic keywords and statements. Descriptions of Basic programming techniques are followed by short example programs.

Basic, A Tutorial, is available on disk for $59.95. Orbyte Software, PO Box 948, Waterbury, CT 06720.

Check Reader Service number 419.

## BusCard II

Batteries Included (186 Queen St. West, Toronto, Ontario, Canada M5V 1Z1) has introduced BusCard II, an interfacing device for the Commodore 64.

BusCard II allows you to mix and match peripherals with no fear of software incompatibility. You can use an IEEE disk drive for high speed and a 1525 serial printer for inexpensive hard copy. It is both hardware and software invisible.

BusCard gives you the added power of extended Basic, as well as selectable conversion of Commodore code to standard ASCII. It comes with a full machine language monitor including assemble/disassemble commands. It is available for $199.95.

Check Reader Service number 434.

## Blitzkrieg!

Tigers in the Snow, from Strategic Simulations, Inc. (883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043) allows you to recreate the famous Battle of the Bulge.

You can assume command of either the Allied or German forces. As the German Commander, you must use your Tiger tanks to break through the Allied lines in the snow-covered Ardennes Forest. As the Allied Commander, you must hold on until your reinforcements arrive.

Tigers in the Snow is available on disk for the Commodore 64. It costs $39.95.

Check Reader Service number 438.

## Prepare for the SAT

MicroLab (2699 Skokie Valley Road, Highland Park, IL 60035) has introduced SAT English I and SAT Math I for the Commodore 64.

The two programs are designed to help students prepare for the Scholastic Aptitude Test. Both programs have a test mode as well as an instruction mode that gives you explanations for the answers to each test question.

SAT English I tests and tutors you in grammar, antonyms, analogies, reading comprehension and sentence completion. SAT Math I covers the following areas: arithmetic, algebra, plane geometry, probabilities, exponents, square root, fractions, quantitative comparisons, ratios, negative numbers, least common multiplier and graphs.

The programs are available on disk for $30 each.

Check Reader Service number 409.

## Group Participation Programs

SEI Enterprises, Inc. (17 Serpi Road, Highland Mills, NY 10930) has released three new interactive group participation programs for the C-64 and the VIC-20.

In Acti-Truth, players privately enter a major truth about themselves into the computer. Each of the players is then challenged to determine which player entered each of the truths.

In Acti-Tale, each player must tell a tale about himself. The other players must determine whether the tales are true or false.

Acti-Fun, for ages 5 to 11, is an activity coordination program. Players enter ideas for activities into the computer. Each player selects activities in which he would like to participate.

Each of the three programs is available on cassette for the Commodore 64 and the VIC-20 (8K expansion). They cost $19.95 each.

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## Computer-Controlled Scanner Radio

Electra Company (300 East County Line Road, Cumberland, IN 46229) has recently introduced the Bearcat CompuScan 2100 computer-controlled scanner radio.

The CompuScan 2100 allows you to monitor police and fire calls, emergency and amateur radio transmissions, Coast Guard rescues and aircraft communications.

The CompuScan 2100 is compatible with the Commodore 64. The CompuScan package includes hardware and software (on disk or cassette) and is available for $499.95.

Check Reader Service number 437.

## Sharpen Your Reading Skills

Speed Reader II, for the Commodore 64, is designed to increase your reading speed while maintaining or improving your comprehension.

The program contains six reading activities designed to replace poor reading habits with good ones; each activity builds upon the previous one. The Editor function allows the user or teacher to enter additional reading material.

Speed Reader II is suitable for high school and college students as well as adults; additional data disks are available for students in grades 4 through 8.

The package contains two disks and costs $69.95. Davidson & Associates, 6069 Groveoak Place #12, Rancho Palos Verdes, CA 90274.

Check Reader Service number 403.

## Menu, Please...

MenuWriter is the newest release in a series of automatic code design programs from Dynatech MicroSoftware, Inc. (7847 N. Caldwell Ave., Niles, IL 60648).

By touching a single key, you can load and run programs from menus generated by MenuWriter. The program can create up to 20 different menus, each showing up to 15 directory entries.

MenuWriter allows non-programmers to gain control over application and utility programs. The program translates English instructions and writes the computer language code that does the work in the computer.

Designed to be used with Dynatech's CodeWriter, MenuWriter is available on disk for the C-64. It costs $29.95.

Check Reader Service number 414.

## Casino Pac

Advanced Microware (1701A Park Glen Circle, PO Box 6143, Santa Ana, CA 92706) has introduced Casino Pac for the Commodore 64.

Casino Pac includes four games: Blackjack, Poker, Keno and Slot Machine. Each game is a simulation of the new video gaming machines being used in Las Vegas, Reno and Atlantic City.

Casino Pac is available on disk or cassette for $39.

Check Reader Service number 430.

## Smart Telecommunications Program

Quick Brown Fox (536 Broadway, New York, NY 10012) has released QuickLink, a smart-terminal telecommunications program for the Commodore 64.

QuickLink allows you to access and edit information via the telephone from databases such as CompuServe, The Source and Dow Jones Services. It also lets you transmit electronic messages between microcomputers through word processing programs.

QuickLink is fully compatible with Quick Brown Fox word processing. It can be used with Commodore's 1600 VICmodem or 1650 Automodem, and it can be interfaced with Data 20's 80-column Video Pak cartridge.

QuickLink is available on disk for $49.95.

Check Reader Service number 408.

## Advanced Report Generator

Mirage Concepts, Inc. (2519 W. Shaw #106, Fresno, CA 93711) has released the Advanced Report Generator for the Commodore 64.

This accessory program uses the data files created by Mirage Concepts' Database Manager to produce special application forms and reports for home, school and business environments. It allows you to develop custom labels, invoices, inventory lists, insurance forms and sales reports.

The Advanced Report Generator is available on disk for $49.95. It can only be used in conjunction with Mirage Concepts' Database Manager.

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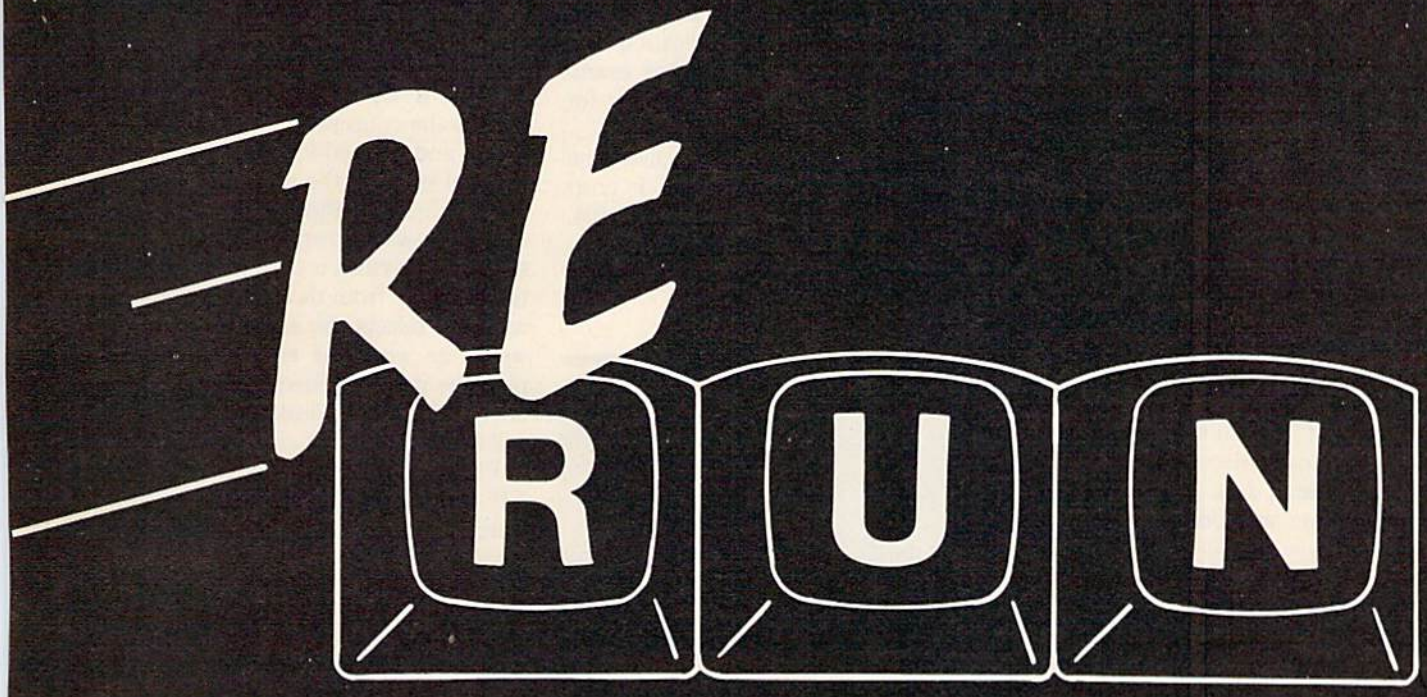


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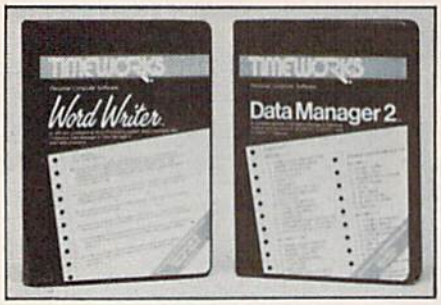


## Two New Programs From Timeworks

Timeworks, Inc. (PO Box 321, Deerfield, IL 60015) has introduced Word Writer and Data Manager 2 for the Commodore 64.

Word Writer is a word processing system that allows you to compile letters, reports, forms or memos and accompanying numerical data. The program can be used by itself or interfaced with Timeworks' Data Manager or Data Manager 2.

Data Manager 2 is a menu-driven program that lets you store information on a variety of subjects such as mailing lists and research data. It will also calculate and store any corresponding numerical data.

Word Writer is available on disk for $59.95; Data Manager 2 is available on disk for $49.95.

Check Reader Service number 412.

## Order in the Court!

Jury Trial II is a courtroom strategy game for the Commodore 64.

Players choose between the roles of prosecutor and defense attorney. The trial is decided by the skill and tactics of the competing attorneys. The computer acts as judge.

Case evidence is developed by interviewing the onerous County Sheriff. Other personalities include Mr. Wallbanger (the town drunk) and the voluptuous Linda LaVerne (a flirtatious night club dancer).

Players are challenged with a different case each time the game is played.

Jury Trial II is available on disk for $49. Navic Software, PO Box 14727, North Palm Beach, FL 33408.

Check Reader Service number 432.

## Math Tutoring Package

MathWiz is a math tutoring package for classroom or home use. It is designed for students in grades 5 through 8.

The Mixed Number Addition and Mixed Number Subtraction programs cover concepts such as borrowing from a whole number, finding a common factor between numerator and denominator, and reducing fractions with common factors.

Menu selections include drills on addition, subtraction, multiplication and division. Simulated blackboard examples illustrate the steps necessary for overcoming concept errors.

The MathWiz package is available on disk for the Commodore 64. It costs $100. Merritt Software, PO Box 1504, Fayetteville, AR 72702.

Check Reader Service number 416.

## Check Your Spelling

Totl Software, Inc. (1555 Third Ave., Walnut Creek, CA 94596) has released Totl.Speller 3.6 for the Commodore 64.

Totl.Speller, a companion to Totl's word processing program, Totl.Text, is a spelling checker with a built-in dictionary. The program checks and corrects spelling in any document created with Totl.Text.

Totl.Speller is available on disk for $35.

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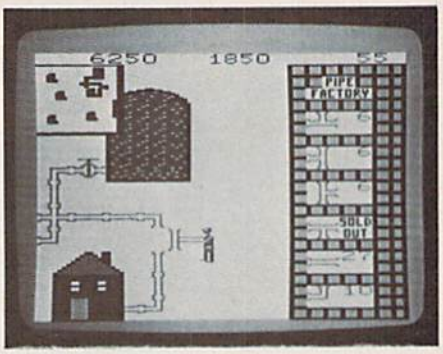


## Pipes

Pipes is an educational game that teaches the concepts of spatial relationships and economics. It is geared for children between the ages of 6 and 14.

The object of Pipes is to connect all of the houses in town to the main water supply. A joystick is used to direct Arlo the Plumber from the factory where he carefully selects the right pipe, to the work site where he attaches it. If the pipes are not connected and sealed properly, there will be leaks and the game will end.

Pipes is available on cartridge for the VIC-20. It costs $39.95. Creative Software, 230 East Caribbean Drive, Sunnyvale, CA 94086.

Check Reader Service number 425.

## Beyond the Basics

Limbic Systems, Inc. (560 San Antonio Road, Suite 202, Palo Alto, CA 94306) has introduced the Pascal Compiler for the Commodore 64.

The Pascal Compiler generates native code for the Commodore microprocessor, resulting in fast-executing programs demanded in business and scientific environments.

The following utilities are provided as an aid to programming development: a linker (which allows for combining assembler code into programs), debugging facilities and an editor. The documentation provides a tutorial on Pascal program development through the compilation process.

The Pascal Compiler is available on disk for approximately $50.

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## Computer Bridge Game

Computer Management Corp. (2424 Exbourne Court, Walnut Creek, CA 94596) has released BridgePro for the Commodore 64.

The program allows you to play bridge alone or with a friend. BridgePro will shuffle, deal, bid and play the other hands.

BridgePro is available on disk for $35.

Check Reader Service number 427.

## Spelling Tutorial

Computer Technology Co. (PO Box 7000-309, Redondo Beach, CA 90277) has released The Spelling Teacher, a spelling tutorial program for the Commodore 64.

Twenty-five spelling words are presented to the child during each session. Misspelled words are presented during the next session.

The program contains four word files, each of which contains 100 spelling words. Each word file represents a different skill level. Parents can change any word in the word files.

The Spelling Teacher is available on disk for $39.95.

Check Reader Service number 420.

## The Whole Bit

Applied Technologies, Inc. (Computer Products Division, Lyndon Way, Kittery, ME 03904) has released The Whole Bit, a word processing program for the Commodore 64.

The Whole Bit is a menu-driven program; only the spacebar and the return key are needed to select options. It has an on-line Help function that explains the control keys.

File copies can be printed in any sequence. An 80-column view screen is available to examine your text prior to printing. The program supports major printers by menu selection.

The Whole Bit is available on disk for $49.95.

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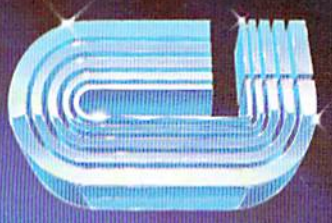

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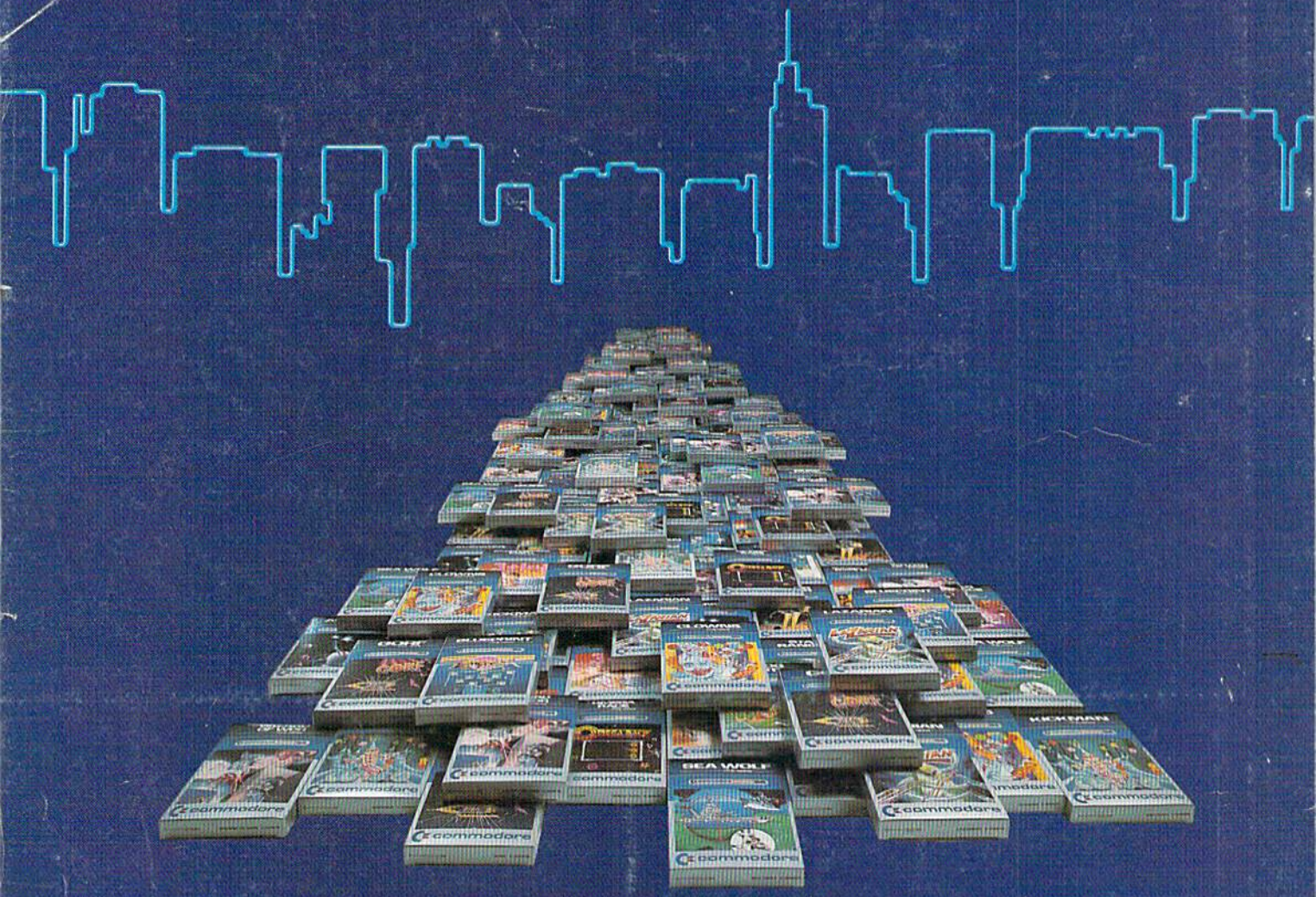


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