The Winter Consumer Electronics Show

# COMPUTE!'s GAZETTE

$2.50
April 1984
Issue 10 Vol. 2, No. 4
02220 £1.95 UK $3.25 Canada

For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

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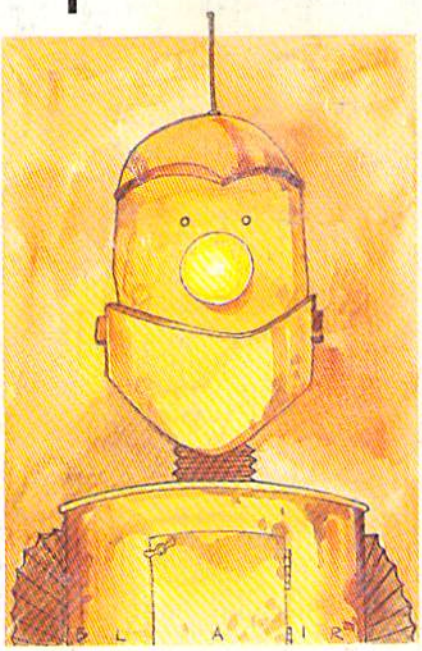
Robots on the market and in the home. An inside look at what they do, what they cost, and what to look for in the years ahead.



## Power BASIC: Numeric Keypad

Turn your VIC or 64 keyboard into an efficient numeric keypad with this short machine language program.

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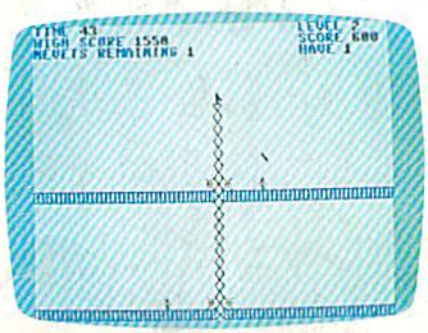


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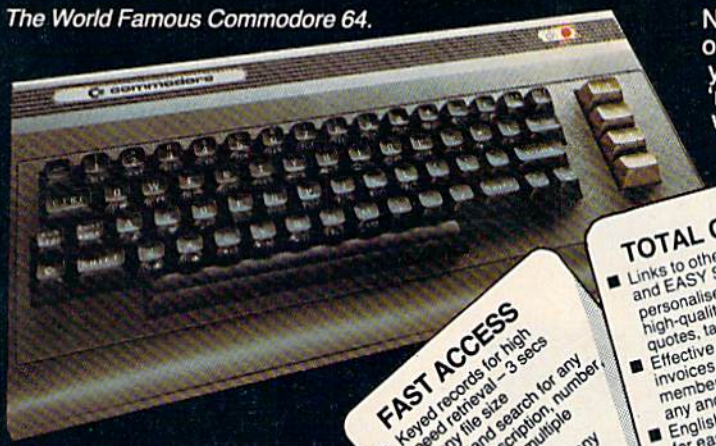

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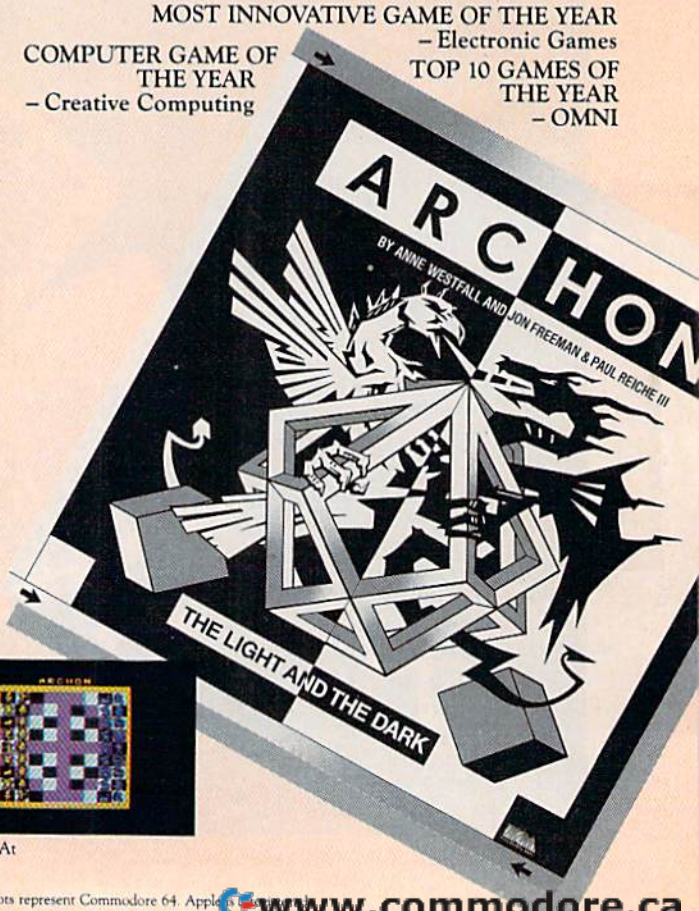




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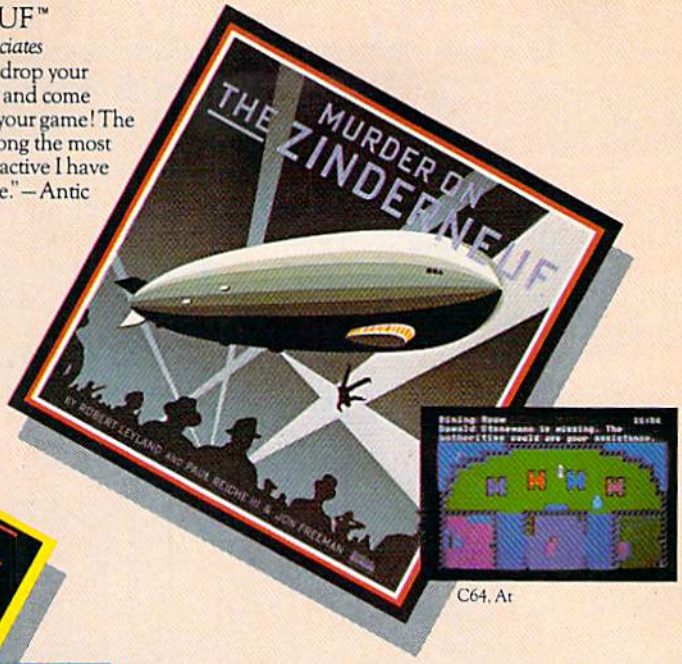


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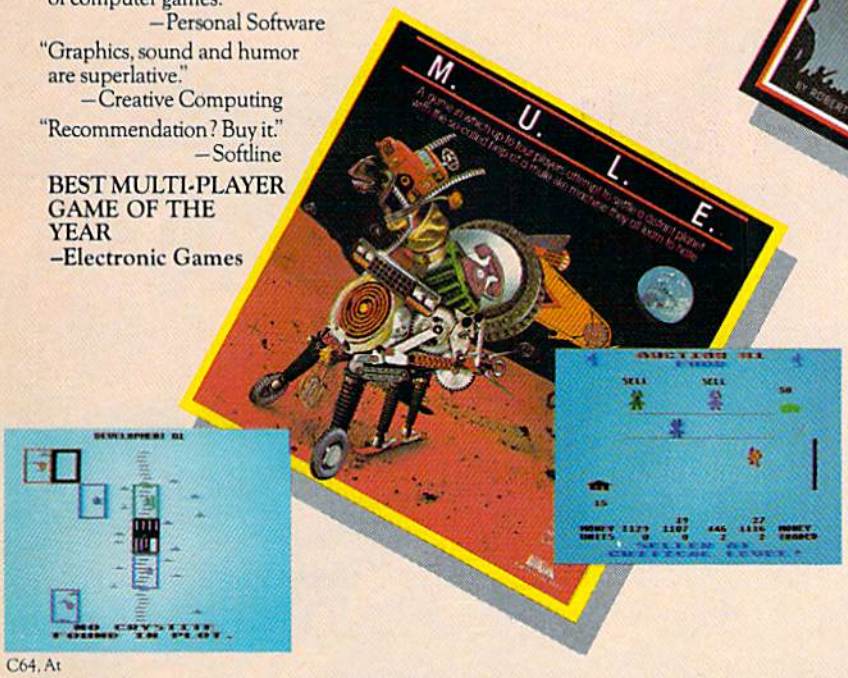


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**MOST ORIGINAL GAME OF THE YEAR**
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# ELECTRONIC ARTS

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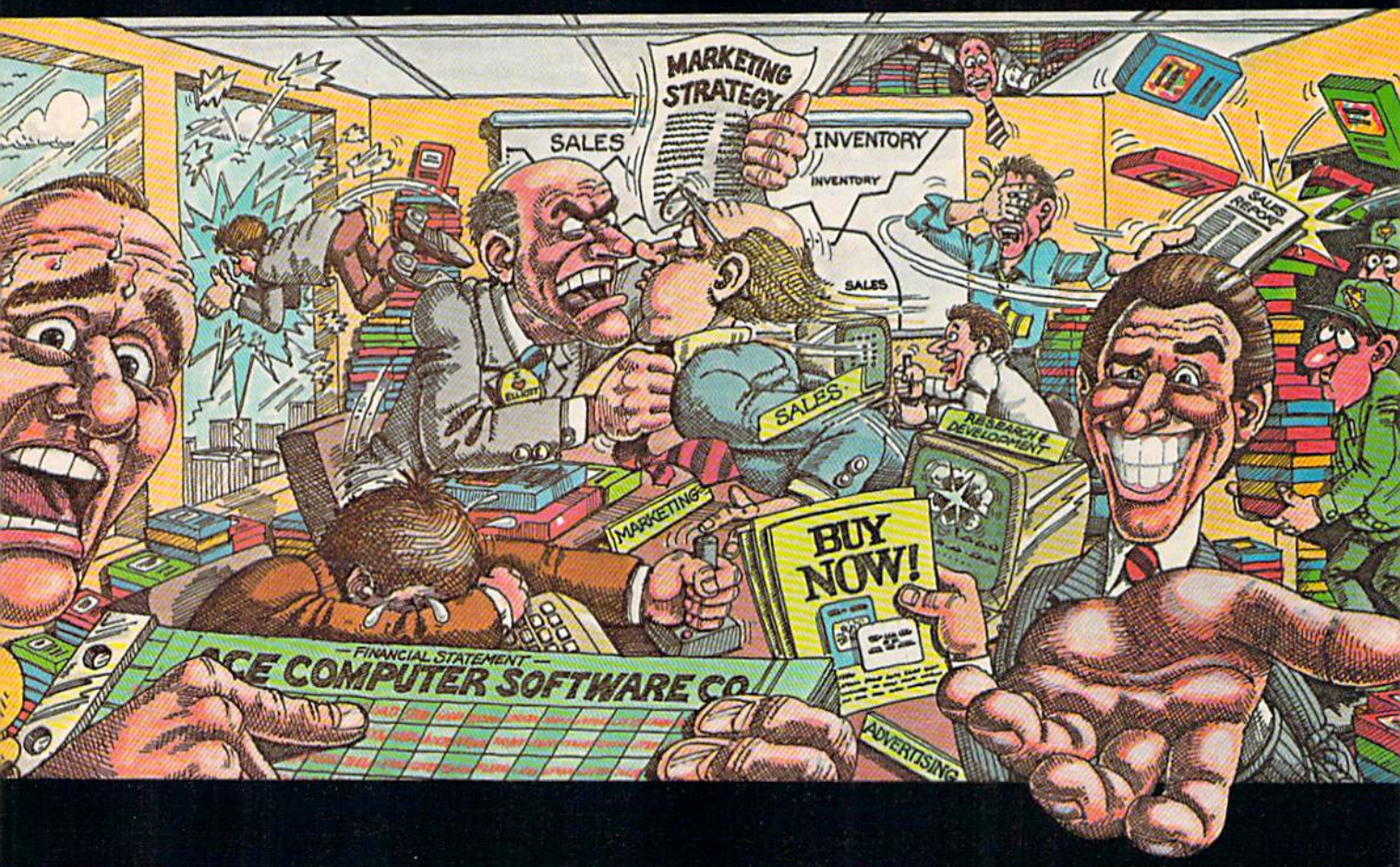


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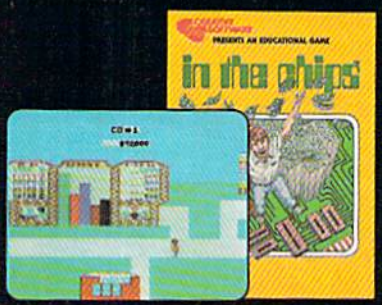


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**C R E A T I V E  S O F T W A R E**

April 1984 Vol. 2, No. 4

# FEATURES



# GAMES



# REVIEWS



# EDUCATION/HOME APPLICATIONS



# PROGRAMMING



# DEPARTMENTS



# PROGRAM LISTINGS



*=General, **V**=VIC-20, **64**=Commodore 64.

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# THE EDITOR'S *notes*

I had originally planned to write about Jack Tramiel's recent resignation from Commodore. He was its president, chief executive officer, and, not least, its founder. After starting the company 25 years ago, he has been a critical force in shaping this entire industry. Recent events, however, dictated that I pull that editorial and replace it with this one.

We all have visions of this industry of ours and where it's going. One of mine has always been to disseminate all types of interesting, useful software through a magazine. We've done that, done it well. And we've grown rapidly in the few years since this industry began and our company began—with your continued readership, support, and contributions of feedback, programs, articles, etc.

For a long time we've been looking ahead, asking how we can help. That's a collective *we*. How can we move to a new plateau? Knowing that we wanted to be able to move further in our goal of efficient dissemination of software, we started the first of what I hope will become several disk magazines. We chose the GAZETTE to start with because it was the easiest to transfer onto the new medium. The logistics are, nevertheless, incredible.

The final decision was to price our disk version of the magazine at a "mass-market" price, not at an incredible markup. Those of you who have been readers of our publications for some time are well aware that hundreds of dollars worth of software is found within the pages of our magazines. Sometimes in a single issue. Our decision was to carry this thinking, this philosophy, and these goals forward into the new disk magazine.

The response has been excellent, with one exception. Beginning several weeks ago, and with increasing frequency, we're getting calls from individuals and user groups inquiring if the disk will be copy protected.

Our thinking was that we could price the disk magazine (for the first time in the industry) at a price only slightly higher than a blank disk costs in many retail stores. We expected to be able to do this without adding protection. We wouldn't need to build in a giant profit margin to cover theft, we decided; we'd simply make the pricing *very* reasonable. We're wondering if that thinking is correct.

Many of our authors spend dozens, sometimes hundreds, of hours developing the programs that we print in this magazine each month. In return, they're paid for their work. They'll earn additional royalties on diskette subscriptions—except for diskettes that are shared among dozens of users. Our in-house staff spends a comparable amount of time rewriting, testing, and translating programs to work on various computers. And they're paid for their work as well. We truly do not understand the mentality which advocates a "sharing" that, in effect, reduces the wages of these authors.

I assume that most of us would resent this sort of theft if it happened to us personally. Few of us would take the result of our efforts, something we produced for wages, and give it to a user group or a group of friends, saying, "This is a portion of my livelihood. Use it freely, knowing that every time you share it you are reducing my salary by an equivalent percentage."

If our expectations were off the mark, we should be charging $25 for each disk instead of less than $6.

I would welcome some feedback on this. Please address your comments, thoughts, or arguments to me, Personal and Confidential, at the address below. I'll read them all and respond to them in a future issue. Please indicate whether your letter (or parts of it) may be printed in the magazine.

It's not my intention to create a stir, but I think that as a group of intelligent, active, interested users we should start a discussion on this. Unfortunately, we're probably going to have to protect the disks for now. And the reason for this editorial, the reason for my chagrin, is that we're fundamentally opposed to such protection. We had decided we would be able to approach it all differently.

I'm looking forward to hearing from you.

Robert Lock

Editor In Chief

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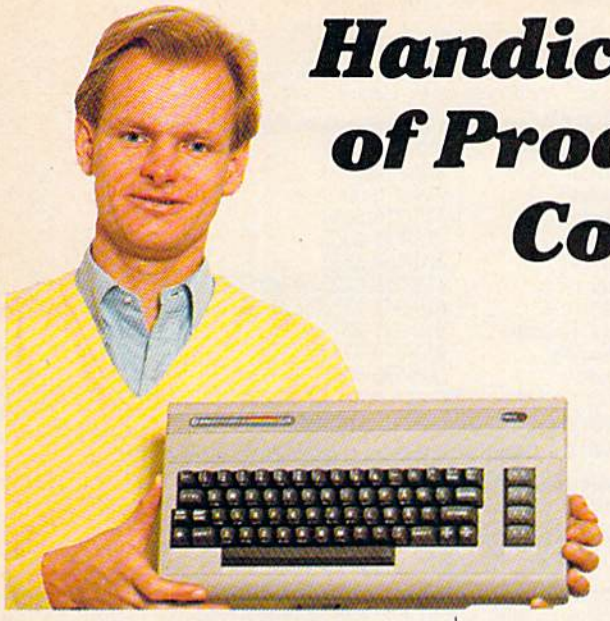
# Handic—A Complete Line of Products to Keep Your Commodore 64 Busy—Everyday!



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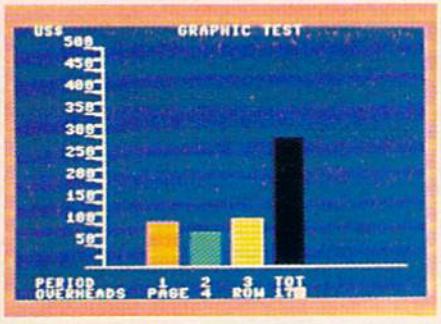


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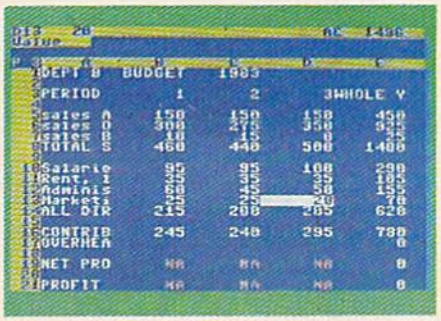


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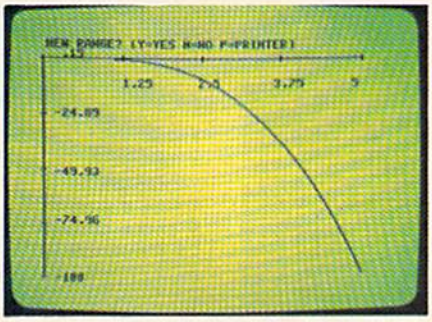


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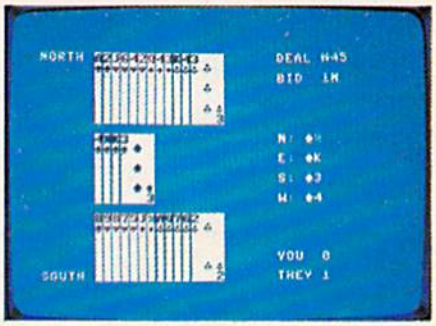


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**Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.**

## The Datassette Mystery Ground Wire

I own a Commodore 64 and recently encountered a problem that I thought should be passed on to you.

The ground braid wire (the silver-colored bare wire) attached to the Commodore Datassette plug accidentally came in contact with a metal tab in the user I/O port and permanently damaged a few chips in the computer. I had to take the 64 to a service center to be repaired. Even though the computer was only five weeks old, the damage was not covered by the warranty. I had to pay for the repairs myself.

In the instruction manual supplied with the Datassette, there is no mention made of either the uses for this wire or the aforementioned dangers.

What is this ground wire to be used for, and is it needed?

Frank Harris

*A Commodore representative informed us that the ground braid wire is not needed on the Commodore 64 or the VIC-20, nor is there any place to attach it. If the wire touches the metal tabs in the I/O port, it can indeed do damage.*

*The easiest way to prevent this is to wind the braided wire around the cassette's cord and then tape it in place.*

*You could simply cut it off, but consider this: The ground wire is required for use with Commodore business computers. If the Datassette might be used with one of Commodore's business computers, leave it on—it's required by FCC (Federal Communications Commission) regulations. A Datassette connected to one of their commercial computers without the ground braid also connected can cause serious television or radio interference.*

*If your Datassette will be used only with a VIC or a 64, then cutting it off is a solution. It won't harm the Datassette or the computer.*

## Programming On The 64

In the memory map included in the *Commodore 64 Programmer's Reference Guide*, locations 124–138 ($7C–$8A) are not shown. What are these locations for? Can they be used in machine language programs?

Is it possible to write programs on the 64 that will run automatically when they are loaded? If so, how is it done?

How can I change the name of a disk with programs on it without destroying or erasing the programs?

John W. Pitkin

*Bytes 124–138 are mentioned in the reference guide on page 313. This area of zero-page memory is part of the very important CHRGET subroutine, located at addresses 115 to 138.*

*The CHRGET routine gets the next byte of BASIC text. When you run a BASIC program, this routine scans the BASIC program lines looking for such things as command tokens, commas in DATA statements, etc. When they are found, they are processed by the BASIC interpreter, the commands are executed, and CHRGET scans for the next token.*

*Because this routine is essential to BASIC, you should not POKE this area or use it for machine language. If you're a machine language programmer, this is a good place for a "wedge." For instance, if you want to change some of the BASIC commands, you can look for your character or token with the CHRGET routine and process it accordingly.*

*To see just how important this small 24-byte subroutine is, enter and RUN this short BASIC program:*

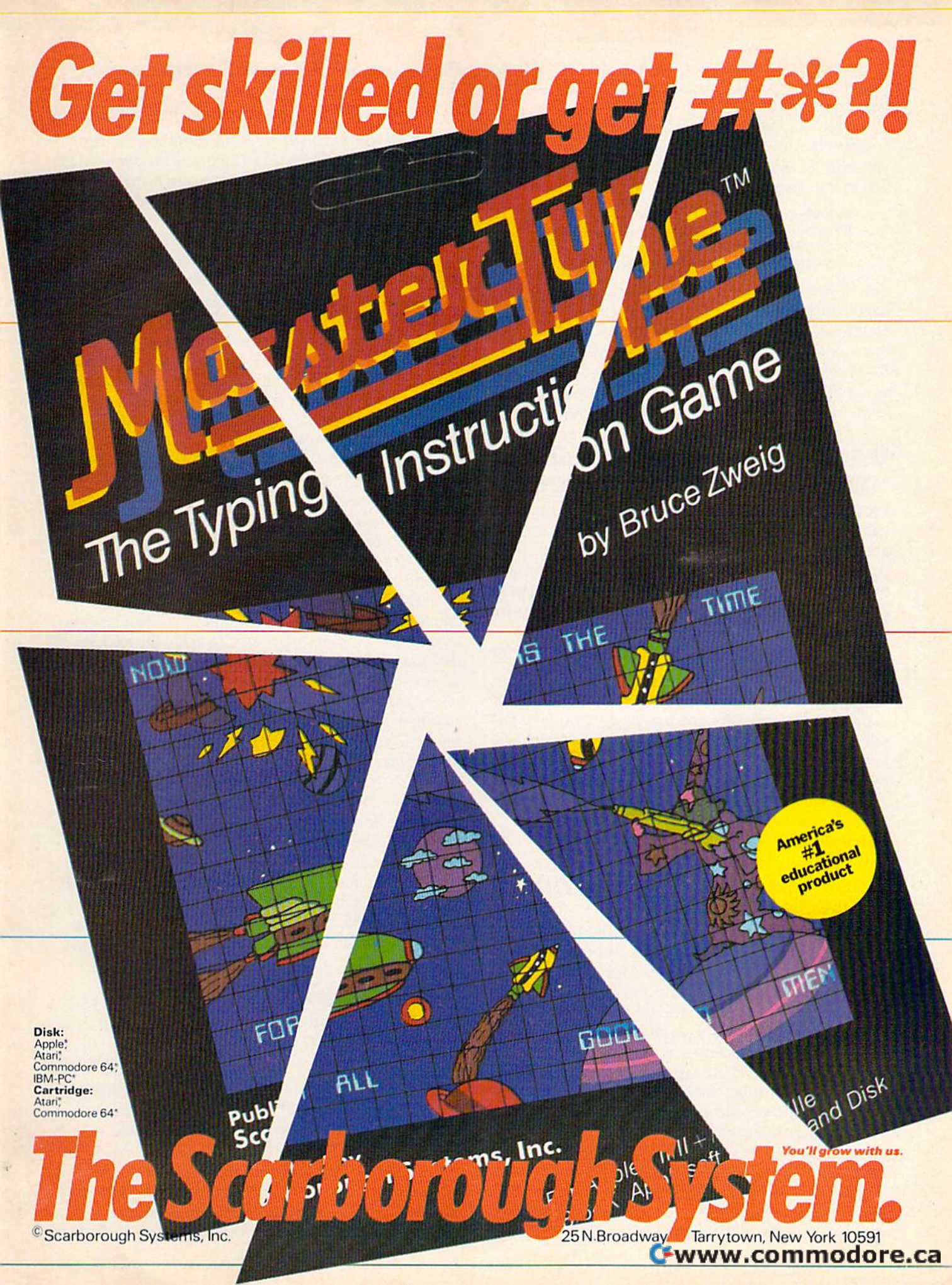
```
10 FOR A=115 TO 138: POKE A,0: NEXT
```

*After RUNning, try typing something from the keyboard, then press RETURN. As you can see, the 64 is unusable. Even RUN/STOP—RESTORE won't help.*

*However, these locations should be OK to use in pure machine language programs that never access BASIC.*

*To answer your second question, yes, it is possible to LOAD and RUN a program automatically without pressing the SHIFT/RUN keys.*

# Get skilled or get #*?!

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*Changing the name (or* header*) of a diskette after it contains programs is tricky—and dangerous—business, but it can be done.*

*Track 18, sector 0 of the Commodore diskettes contains the directory information (what you see when you enter LOAD "$",8:LIST) and the diskette header. The partial layout looks like this:*

| | |
|---|---|
| **Bytes 0–1** | **Pointer to directory** |
| **Bytes 4–143** | **Block Availability Map (BAM)** |
| **Bytes 144–161** | **Name of diskette** |
| **Bytes 162–163** | **Diskette's two-character ID** |

*The 18-byte area (144–161) that is used for the diskette name contains the name plus shifted spaces (CHR$ 160) to fill the 18 bytes. It is possible to change these bytes on the diskette, but if it is done incorrectly the BAM could be altered, and you might not be able to access the programs on the diskette. It's safer to simply format a new diskette with the desired name.*

## Using The Super Expander With "The Automatic Proofreader"

I recently purchased a VIC-20 Super Expander cartridge, and have discovered something discouraging about it. When "The Automatic Proofreader" is running and I try to use the KEY command or any of the function keys, the computer won't cooperate and sometimes crashes. What would cause this to happen, and what can I do about it?

William O'Connor

*There is nothing wrong with your Super Expander cartridge. "The Automatic Proofreader" should not be used with the Super Expander cartridge plugged in. Both the cartridge and The Automatic Proofreader* wedge *a machine language program into the same area of the VIC's memory. This conflict causes your VIC to crash.*

*Although the Super Expander is incompatible with The Automatic Proofreader, other memory expansion cartridges will work fine.*

## Can I Use A VICmodem With A Speaker Phone?

I belong to several user groups and communicate with members on the telephone about specific problems and programs. I have found that having a telephone beside my computer is very helpful, because I can work with the computer while talking to someone about a problem. I just purchased the VICmodem, and now want to purchase a telephone that can stay in my work area.

A speaker telephone would be great because both my hands could be free for the computer. The speaker telephone that I am interested in has a plug on the rear of the unit (to plug in a regular handset telephone). If I purchase a short telephone extension cord, can I plug one end of the cord in the modem and the other end into the modular plug on the rear of the speaker telephone? Will the modem function properly with this type of hookup?

Jim Kohlenberg

*Connectors for modular telephone cords come in two sizes: one size on the cord that connects the phone to the wall plug, and a smaller size on the cord between the phone body and handset. The VICmodem takes the smaller, handset connector.*

*Another modem, of the auto-answer/auto-dial type, takes the larger connector and plugs into the wall outlet. This type of modem works without a telephone.*

*Remember that the VICmodem is designed to connect to a standard desk phone (with either a dial or Touch-Tone buttons). You use the telephone to dial, and to make the connection with the other computer's phone, then you remove the cord from the handset and plug it into the modem. At this point your terminal software should send a signal to the other computer that you are ready to communicate.*

*If that plug on your speaker phone is of the smaller size designed to take an extension handset, you should be able to connect the VICmodem directly to the speaker phone, using a handset-to-phone cord.*

*However, if the plug on your speaker phone is meant to hook up an extension telephone, you cannot directly connect the modem.*

*You should also consider that, while a speaker phone might have advantages for voice communications, it can cause problems when you're using the modem. If the speaker is activated at the same time as the modem, chances are good that sounds picked up by the microphone will garble the modem transmissions. Also, incoming signals will be broadcast over the speaker. This might be interesting at first, but it will wear on your nerves after a while.*

*Also, a wide variety of telephone models are available, and many have special features which make them incompatible with direct-connect modems like the VICmodem. Before you purchase any phone (except the standard desk set) for use with a modem, you should make certain that the two are compatible. Discuss your intended application with a technician at the phone store, and, if possible, talk to someone who is already using your brand of modem with the phone model you want to buy.*

## Cold Starting

Is there any way to reset the VIC-20 without turning it off?

Edward Wiebe

*Yes, there is. If you enter SYS 64802 then press RETURN, the VIC-20 will go through most of the same reset routines that are performed when you first turn it on. This SYS will reset the BASIC pointers, reset the VIC chip, etc. The corresponding SYS address on the Commodore 64 is 64738. This technique is often called a* cold start. *When you turn on your computer with the power switch, you are also performing a* cold start.

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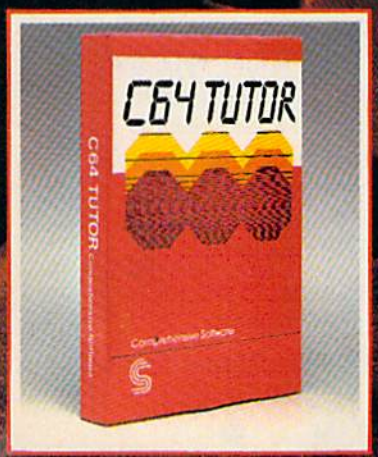


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# Transferring Data From BASIC To Machine Language

If there is a numeric constant (2, for example) that you want to pass to a machine language program, you can do so with the USR command. But how can you transfer numbers from BASIC to a machine language subroutine without using the USR command?

Heimo Ponnath

*Using the POKE statement for passing parameters (data) to a machine language (ML) routine from BASIC is probably easier than using the USR command.*

*Before you SYS (transfer control) to your ML subroutine, POKE a byte or bytes with the data you want to transfer, then pick it up in the ML program with either the LDA, LDX, or LDY commands. Here's an example.*

*In BASIC:*

```
300 A=57
310 POKE 251,A
320 SYS 4096
```

*In machine language:*

```
$1000 CLC
$1001 LDA $FB
  (load the accumulator with the transferred data)
$1003 ADC #$05
$1005 etc.....
```

*Here it is in reverse (transferring data back to BASIC).*

*In machine language:*

```
$1C49 STA $FB
  (store value of data in the accumulator into byte
number 251)
$1C4B RTS
```

*In BASIC:*

```
500 A=PEEK(251)
510 continue BASIC program...
```

*With the single POKE you can transfer values of 0–255 back and forth. If you want to transfer values larger than 255, you can use the following formula.*

*Where N = number to be stored:*

```
NN=INT(N/256):POKE byte1,N-(NN*256):POKE
  byte2,NN
```

*This method will automatically store a number from 0 to 65535 using the standard LBHB (low byte, high byte) format. That is, it will POKE byte 1 with the least significant value, and byte 2 with the most significant. You can then branch to your ML routine and process your values as you wish.*

*Some good areas on the VIC for temporary data storage while doing the transfer are:*

```
bytes 828–1019  cassette buffer
bytes 251–254  free zero-page locations
```

*On the Commodore 64, you can use the above, plus:*

```
bytes 679–767  unused
bytes 49152–53247  free RAM
```

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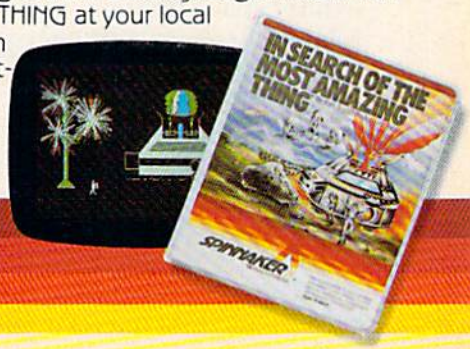


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# Commodore's New Computer Family:

## News From The Winter Consumer Electronics Show

Selby Bateman, Assistant Editor

**A new line of Commodore computers with built-in software options—the 264 family—created the biggest stir among computer industry retailers and distributors at the 1984 Winter Consumer Electronics Show (CES). Commodore also displayed a growing collection of 64 and VIC-20 software, a faster disk drive, and a new video monitor. Here's a report on the new products and the new choices facing owners and users of Commodore computers.**

Approximately 90,000 people crowded their way into the Winter Consumer Electronics Show, a breathtaking array of almost every conceivable electronic audio, video, computer, appliance, and peripheral product that manufacturers hope to sell during 1984.

Over one-fourth of the 725,000 square feet of exhibit space this year was devoted to computer-related displays, and nearly 300 of the more than 1300 exhibitors represented computer products—a record on both counts.

Among the hundreds of exhibition booths at CES, none seemed to attract more activity and curiosity than Commodore's large gray and blue display on the floor of the Las Vegas Convention Center.

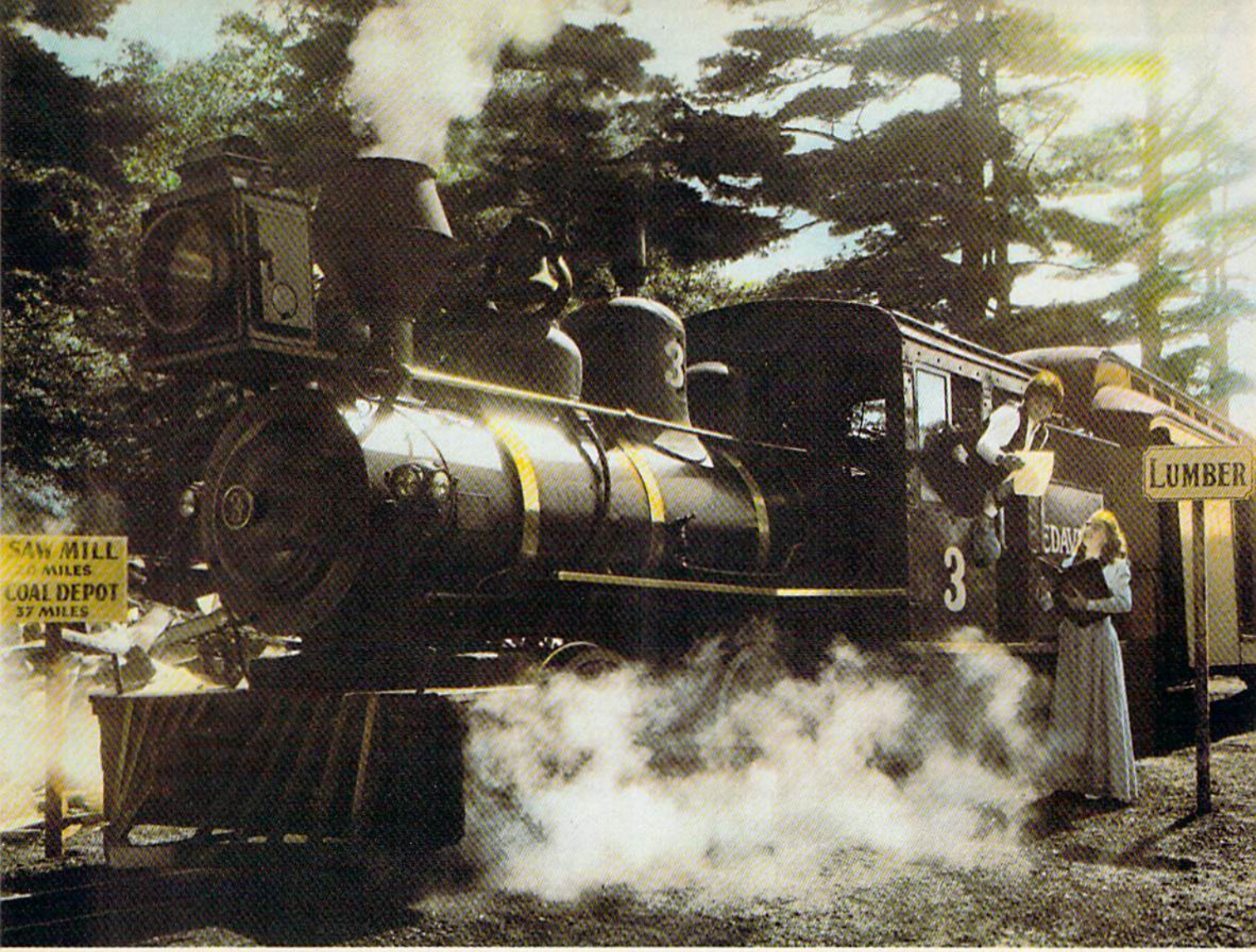
The company announced that during 1983 it became the first microcomputer firm to top the $1 billion mark in sales, more than doubling its $458 million 1982 sales figures. Commodore officials said that all four of its microcomputer models—64, VIC-20, PET, and CBM—achieved record sales levels during 1983.

But the biggest news was the announcement of the new 264 family of Commodore computers, which will contain a consumer-selectable choice of built-in software; a stronger BASIC language, with 60K available for BASIC programming (the Commodore 64 has less than 40K of usable BASIC RAM) and more than 75 BASIC commands; a new keyboard that includes a HELP key, four separate cursor keys, and other programmable function keys; screen windowing capability; and a built-in machine language monitor with 12 commands.

A company representative says the 264 should be available by April 1. Customers will be able to purchase the 264 with one of several application program options built into ROM, such as a word processor, spreadsheet, or data base manager. The consumer may have a choice of additional software on plug-in ROM chips, but details of the various options were still being developed during CES. Although Commodore announced no price for the 264, company representatives indicate the retail price will be under $500.

What the new 264 series does *not* have is almost as interesting as what it does. The Commodore 64's versatile SID (Sound Interface Device) chip, which features three independent voices over nine octaves, had been replaced by two tone generators. That will mean a reduction in sound and music capability. And the 64's eight programmable, independently moveable sprites have not been included in the 264.

Although Commodore says that virtually all of the VIC-20 and 64 peripherals are compatible with the 264, the software is not. Internally the 264 is significantly different than older Commodores because of its new operating system and

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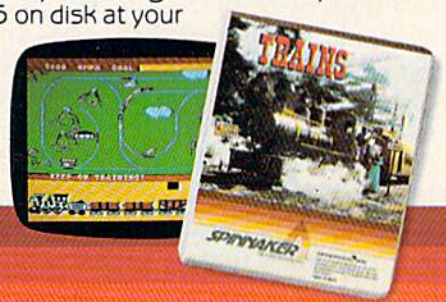


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BASIC. Even the cassette buffer has been slightly relocated in memory. Also, the central processing unit (CPU) is not the 6502/6510 chip found in the VIC and 64; it is a new chip called the 7501. Luckily, the 7501 appears to be largely compatible with the 6500-series chips, sharing the same instruction set.

*Commodore's new 264 computer, showing the four separate cursor keys (lower right) and the four programmable function keys (at left above keyboard). The Commodore 364 will have a similar console, but with a 19-key numeric keypad above the cursor keys.*

What does all this mean? BASIC programs written for the VIC and 64 which do not rely heavily on PEEKs, POKEs, sound, or sprite graphics probably will work with very little modification on the 264-series computers. But machine language programs—and BASIC programs which manipulate memory with PEEKs and POKEs—will need much more translating before they'll work on the 264. Almost all commercial software falls into the latter category. Commodore estimates that 80 to 90 percent of VIC and 64 programs should be adaptable to the 264.

Commodore emphasizes that the new family of computers in no way indicates a lessening of support by Commodore for the 64, the VIC-20, or the company's other microcomputers. As one Commodore official says, the 264 is not directed at the same set of consumers as are the other products, especially the top-selling Commodore 64. The 264 offers built-in software for word processing, spreadsheet analysis, data base management, or other small business applications, notes Myrddin Jones, Commodore's vice president for marketing (see interview elsewhere in this issue). The 64 is more oriented toward music, sprites, and gaming, he adds.

Commodore is counting on the 264 family to complement the 64, VIC-20, and the others, rather than to compete with them, Jones says.

The new Commodore hardware products and options include the following:

- Commodore 264—In addition to the features mentioned above, the 264 has 128 colors (16 colors with 8 luminance levels); eight volume levels; a newly designed 67-key keyboard with four reprogrammable function keys; input/output (I/O) ports compatible with 64 and VIC-20 peripherals; and display, resolution, and character features similar to the 64.
- Commodore 364—Based on the 264, the 364 has built-in speech capability with a 250-plus word capacity (additional vocabulary can be loaded from optional cartridges or disks); 48K ROM, including operating system, BASIC interpreter, and speech operating system (up to 48K additional ROM can be added with various built-in software options); and an 86-key full-stroke keyboard with a 19-key numeric keypad. No suggested price was announced. One Commodore representative said the 364 is expected to be available by the end of the summer.
- SX64 Portable Computer—Formerly introduced as the SX-100 and later the Executive 64, the SX64 is a portable 64 rather than a 264-based machine. The SX64 has a built-in 5-inch color monitor, a 170K built-in 5¼-inch floppy disk drive (second drive optional), plus other features identical to the Commodore 64. The retail price is $995.
- 1703 Color Monitor—Housed in a charcoal gray box, the new Commodore monitor is similar in other ways to the earlier 1702 and 1701. The 1703 has a 13-inch diagonal screen and is compatible with the 264 line as well as with the 64, VIC-20, and SX64.
- SFS 481 Fast Disk Drive—The new 5¼-inch Commodore disk drive, for use with the 264 and 364 only, is reportedly five times faster than the 1541 drive.
- 1542 Disk Drive—An upgraded version of the 1541. Further details will be announced by Commodore.
- Commodore TouchScreen—A plastic overlay that can be fitted over the front of a television set or a video monitor, the new TouchScreen allows the user to bypass the keyboard completely in order to operate such programs as Commodore's Magic Desk or to create graphics with the touch of a finger. No word yet on availability or price.
- Commodore Light Pen—A pressure-sensitive mechanism near the point of this light pen allows you to draw and to move objects on the screen and to control programs such as Magic Desk.
- Magic Voice Speech Module—The speech module plugs into the User Port of the Commodore 64, and contains an additional port into which other cartridges can be inserted. The module has a built-in vocabulary of 235 words, spoken by what sounds like a female voice. Words can be user-defined for various speeds and programmed

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directly from BASIC and/or machine language. Commodore promises that more words and different voices will be available in the future on disk and cartridge. The speech module has a suggested price of $59.95 and can be plugged into the SX64 portable computer as well.

The introduction of the 264 line meant that Commodore was one of the few computer companies to introduce a new machine at the four-day CES show, a far cry from last summer's CES in Chicago. Seventeen new microcomputers were introduced at that time.

Atari, Inc. introduced no new computers at the winter CES. Apple showed up for the first time in three years, but chose not to unveil its MacIntosh at the show. IBM had no exhibit at all. Coleco introduced some new peripherals for its Adam computer, including an add-on tape drive, a disk drive, 1200-baud modem, and a 64K memory expander. Spectravideo announced two new computers, and a British company exhibited prototypes of a new machine which might reach the U.S. later this year. But none of these booths were as consistently crowded as Commodore's.

Commodore is continuing to expand its software line and announced a variety of personal productivity and game offerings.

For the Commodore 264, Sig Hartmann, president of Commodore Software, says that the company plans to have more than 30 software products available on cartridge, disk, and tape when the 264 goes on sale. "The key area we're emphasizing in software for the Commodore 264 is productivity, covering such areas as household management, word processing, calculation, business accounting, and education," says Hartmann.

Commodore is continuing to encourage third-party software development for its computers, and introduced a number of new packages which were created for it by such companies as Data 20, Digital Research, Infocom, Island Graphics, and others. For example, Data 20 Corporation of Laguna Hills, California, created word processing, spreadsheet, and graph software on ROM chips for the new 264 computer line, some of which will be built-in and some of which will be cartridge add-ons.

Of the more than 200 Commodore-brand software products now in distribution, more than half were produced by outside developers, a company official notes.

Among the new products are seven personal productivity packages, which are scheduled to be available by late spring on cartridge or disk for the Commodore 64 and 264. Several of the programs are planned as built-in software options for the 264 as well. The packages are:

- *Magic Desk II*—Based on the *Magic Desk I—Type and File* cartridge introduced last year, this is an enhanced program with an integrated text-editor, spreadsheet, file manager, and calculator for beginning computer users. Help screens are built-in, and the menu system uses icons, or picture-symbols, rather than words to convey the different functions (similar to Apple's more complex business-oriented Lisa).


MusiCalc I *from Waveform Corporation turns a Commodore 64 into a musical instrument.*

- *Commodore 3-Plus-1*—This integrated software package includes a word processor, file manager, spreadsheet, and business graphics. Through windowing, the word processor and the spreadsheet may be used simultaneously on the screen.
- *SuperScript 264*—A multifunction word processor designed for both beginner and expert users, the package includes text editing, number calculations, mail-list functions, and a cut-and-paste feature for on-screen text editing.
- *EasyCalc 64* and *EasyCalc 264*—These are spreadsheet programs with color selection and graphics. Both packages are sold on cartridge, which Commodore says leaves more workspace in the computer than comparable disk-based spreadsheets.
- *Commodore B/Graph*—A business graphics and statistics package, *B/Graph* computes and converts financial and statistical results into three-dimensional color charts, graphs, pie charts, histograms, and other graphics.
- *Financial Advisor*—A financial aid program, *Financial Advisor* computes loan, mortgage, and investment formulas, and is available on cartridge.
- *Teligraphics*—This is videotext and graphics software for use with Commodore telecommunications modems. It allows transmission of pictures, text, and business graphics over the telephone and between computers. The package also allows users to upload and download data through telecomputing services such as CompuServe.

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Commodore announced its intention to provide 100 different application templates for its *Manager 64* data base system used by the Commodore 64. The templates will include five to ten specific applications per disk which, when used with *Manager 64*, will allow the user to computerize home budgets, index recipes, keep track of sports statistics, track business accounts, and carry out other functions.

Among the other software packages announced at CES by Commodore are:

- Ten new educational software products, including the *Milliken Edufun* (VIC-20 and Commodore 64) series, the *Kinder Koncepts* (Commodore 64) series, and two new programs featuring the animated "Commodore Kids," *Math Facts* and *Numbers Galore*.
- *Commodore Logo* programming language for the 64 and 264 computers, with 170K of available disk storage.
- *International Soccer*, the first in a series of advanced games with three-dimensional color animation which Commodore is calling the Gold Medallion games. Suggested retail price is $34.95, and the game should be available by the time you read this.
- Other entertainment programs introduced include *Viduzzles*, a series of video puzzles for children; *Jack Attack*, an animated strategy game; and *Solar Fox*, a converted Bally Midway adventure game. Initial deliveries are scheduled for this spring.
- Four new "talking" software products for use with Commodore's new Magic Voice speech module in the 64 and 264 computers. Two of the programs are Bally Midway games—*Gorf* and *Wizard of Wor*—and two are alphabet and number educational packages for young children—*A Bee C's* and *Counting Bee*. Prices for the games should be in the $30–$40 range, Commodore announced.
- *Micro Illustrator* for the Commodore 64 and 264 computers, a popular "paint" system for creation of color graphics. The package uses a menu of icons and either a joystick or light pen. The Commodore 64 version will use all 16 of its colors and was scheduled for February release, while the 264 version will have a range of 128 colors and is set for an April release.
- *Micro Cookbook* for the Commodore 64, a household management program providing cookbook and recipe management. Features include meal planning (plus help with leftovers), a glossary of cooking terms, calorie and nutritional information, and 155 recipes with space for 100 more. Initial sales were scheduled for early February at under $40 each.
- *Silent Butler*, a record-keeping and financial management package on disk, which is designed to require little or no instructions, setup process, or previous computer experience. The program will manage personal finances and records, balance checkbooks, pay bills, provide a tax summary, and serve as an appointment or special date reminder. The *Silent Butler* comes with a plastic form with pockets in which the user can place personal checks for printing on a 1525, 1526, or MPS-801 printer.

Independent companies continue to develop and market a growing number of hardware and software products for the Commodore microcomputers.

Chalk Board, Inc., developer of the PowerPad touch tablet, announced six new software packages scheduled for release in the first quarter of 1984. They include *Leo's 'Lectric Graphics*, a graphics system which allows users to do finger painting, multiple-contact drawing, or a fine, point-to-point drawing; *Leonardo's Logo*, a turtle graphics program which employs push-button symbolic graphics in place of keyboard entry; *Leonardo's Philharmonic*, a music composition package; *Boolean Blueprints*, an advanced BASIC tutor for the novice; *Runway*, an aircraft navigation and piloting simulation program based on geometric principles; and *Borderline*, an international relations simulation game.

AtariSoft, the third-party software publishing division of Atari, announced conversions of seven hit arcade titles for the Commodore 64 and VIC-20. The games are *Joust*, *Battlezone*, *Pole Position*, *Ms. Pac-Man*, *Moon Patrol*, *Galaxian*, and *Jungle Hunt*. Suggested prices for each game are $34.95 on disk and $44.95 on cartridge.

Waveform Corp. introduced *MusiCalc I*, a software package designed to transform the Commodore 64 into a three-voice synthesizer with realtime sequencing, slide controls, modulators, and transposers. The program allows users to play along with preprogrammed melodies, or create and store their own melodies for later playback. The suggested price is $74.95.

Broderbund Software has converted its popular word processing program, *Bank Street Writer*, to disk format for the Commodore 64. Previously available for Apple and Atari computers, *Bank Street Writer* displays all functions and commands at the top of the screen in order to eliminate the need for memorizing codes or command words. Suggested retail price is $69.95.

Human Engineered Software (HesWare), the largest single-source supplier of software for the Commodore 64, announced seven new educational and productivity programs for the 64. *Turtle Toyland Jr.*, produced for HesWare by ChildWare Corporation of Menlo Park, California, operates

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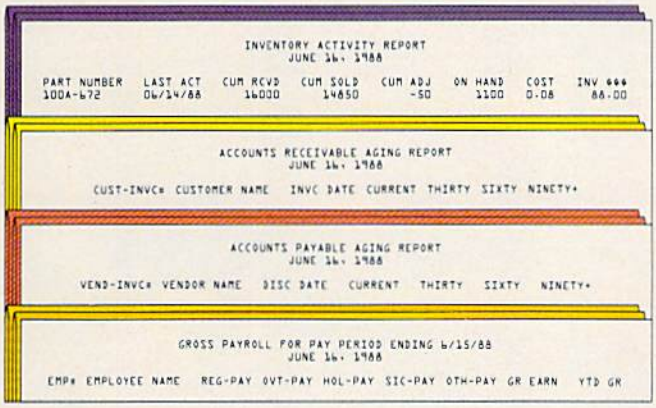


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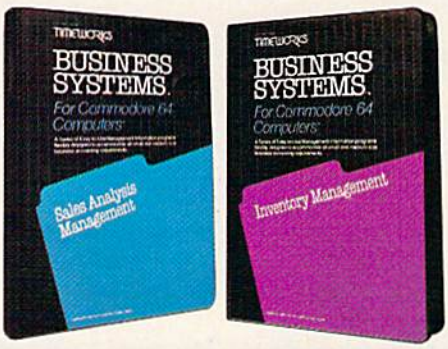


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with a joystick and teaches turtle graphics and programming concepts to children. HesWare also announced three new educational titles from Sunburst Software—*Factory*, for those eight years or older, places the user in the role of a design engineer who must create geometric products on an assembly line; *M-ss-ng L-nks*, ages ten and above, is a language puzzle designed to improve spelling, grammar, comprehension skills, and writing; and *Tri-Math*, ages 6–12 years, uses an alien space intruder, a dinosaur, and a mysterious mansion as a part of a math skills program.

Creative Software, of Sunnyvale, California, introduced seven software programs for the Commodore 64. Three of them—*Joe's Writer*, *Fred's Filer*, and *Jack's Calc*—are components of an integrated personal productivity series the company calls the *People's Choice*. Designed for older children and adults, the series features a word processor, a file manager, and a spreadsheet. Each program will be sold separately at a suggested price of $49.95.

Also introduced by Creative Software were *Crisis Mountain*, an action game on cartridge; *In The Chips* (see a review of this game elsewhere in this issue), a popular VIC-20 program now available on cartridge for the 64, that teaches the player the economics of business by pitting him against a rival computer software company; *I Am The C-64*, two three-program disks (sold separately) that teach the user about 64 programming, graphics, and sound; and *Bumblebee*, an educational cartridge-based program for children six years and older, which introduces the concepts of computer programming. Each of the programs sells for $34.95.

Program Design, Inc. (PDI), of Greenwich, Connecticut, announced the availability of ten new program translations for the Commodore 64. The programs include *Analogies*, *Vocabulary Builder 1* and *2*, *Reading Comprehension: What's Different?*, *Preschool IQ Builder 1*, *Memory Builder: Concentration*, *Story Builder/Word Master*, *Code Breaker*, *Number Series*, and *Shaft Raider*.

PDI President John Victor no doubt spoke for quite a few software firms when he stated, "We have decided to translate many of our titles into the Commodore 64 format...based on its growing popularity in the marketplace."

Victor's comment is a good indication of what Commodore 64 owners and, to a slightly lesser degree, VIC-20 users will be finding during 1984—improved and more plentiful software in all areas of computing. The Winter CES not only introduced a new line of Commodore computers, it revealed more clearly that the company's growing installed base of 64s and VIC-20s is fertile ground for software producers.

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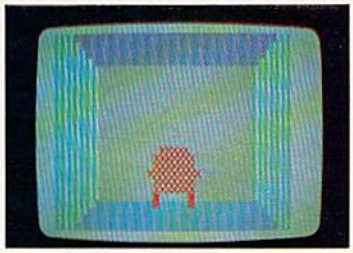

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# Robots: The New Mobile Computers

Selby Bateman, Assistant Editor, Features

**The robot, one of the most popular of science fiction subjects, is now appearing on store shelves as a personal, programmable microcomputer on wheels. Although personal robots haven't achieved the mass popularity of home computers, they are finding an eager audience as a combination computer toy and tinkerer's playground.**

B.O.B., Jenus, HERO I, RB5X, Shakey, Freddy, Epistle, Topo, F.R.E.D.

The names aren't as famous as the fictional R2D2 or C3PO, yet these are the real pioneers that later generations of robots may someday view as venerable ancestors. They are contributing to what one American company now calls the Age of Robotics.

Several new robots are being introduced this spring and others that were marketed in 1983 are also available, with prices ranging from about $350 up to $5000.

This generation of personal robots can speak, sing, deliver messages or trays of hors d'oeuvres, wake you up in the morning, answer phone calls, and play games—all under strictly limited conditions. Their shapes are closer to fire hydrants on wheels than to humans, but manufacturers are working to make them, as one industry leader says, "charming."

This year may well be remembered as the one in which personal robots first began to capture the public's fancy.

It is no coincidence that the first International Personal Robot Congress (IPRC) is set for this year. Between 3000 and 5000 people are expected to attend the three-day event, April 13–15 in Albuquerque. A potpourri of commercial exhibits, seminars, amateur robotics competitions, demonstrations, and lectures by leading robotics experts is planned. And the first Golden Droid Awards will be presented to the best amateur robot builders in several categories.

The idea for the IPRC began with Joseph Bosworth, president of RB Robot Corporation in Golden, Colorado. RB Robot, maker of the RB5X personal robot, is one of the three major personal robot companies in the U.S. The other two are Androbot, Inc., of San Jose, California, producer of Topo, B.O.B., and a couple of other robots; and the Heath Company of Benton Harbor, Michigan, creator of the HERO I robot.

Bosworth talked over his idea for the congress with executives from Androbot and Heath. He found them interested. "In keeping with what all three of these companies are doing in pioneering the industry, there really needed to be some kind of industry kickoff," says Bosworth. "It's exciting and it's been a lot of fun to plan. Albuquerque is going to be one crazy town that weekend."

Appropriately, the keynote speaker for the event will be Isaac Asimov, whose prolific literary output has included three novels and more than two dozen stories with robots as central figures.

Asimov essentially redefined the way science fiction writers portrayed robots. His fictional robots are machines of intelligence and rational thought, programmed to follow Asimov's classic Three Laws of Robotics:

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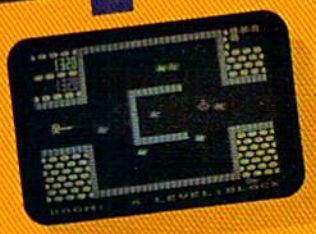

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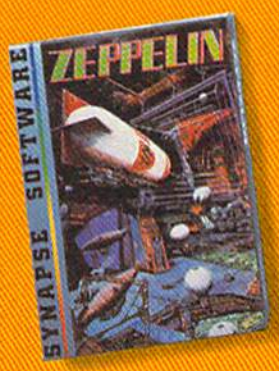


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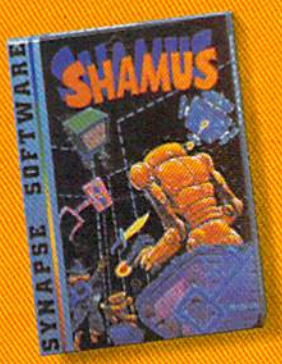



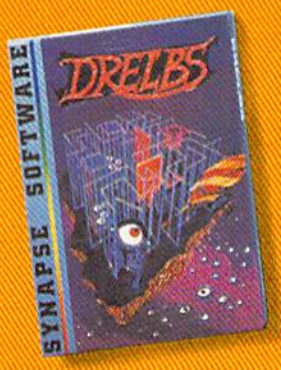


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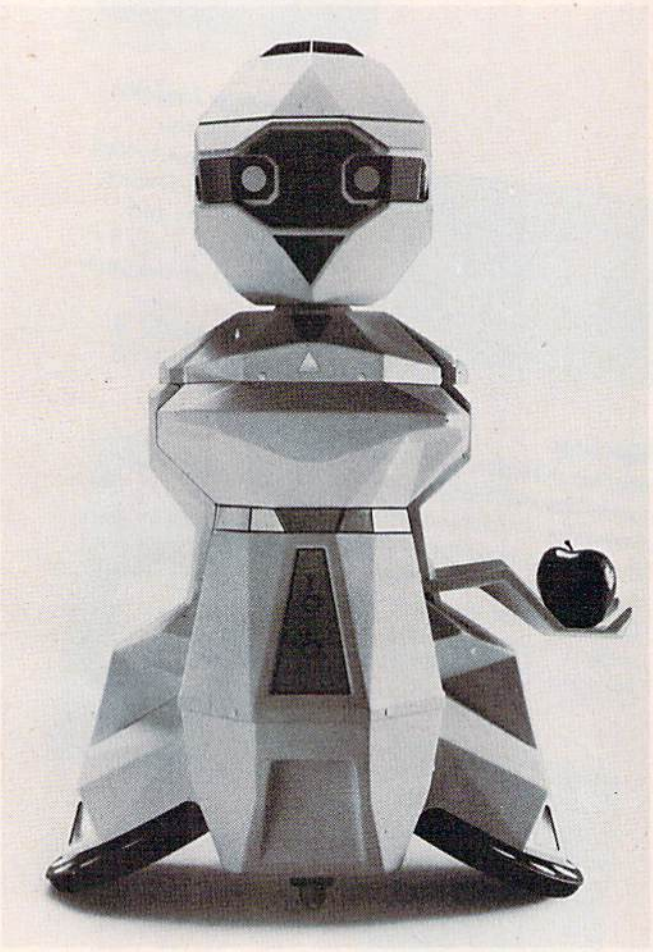

*Androbot's Topo, a three-foot-tall computer-peripheral robot, will be available this year for Commodore, Apple, and IBM computers. Base price is $1595.*

Popular interest in robots has not been limited to our own time. History is full of examples of our fascination with automatons, the precursors of robots which could move by themselves and be directed to perform predetermined motions. The ancient Egyptians constructed complicated water clocks. The Greeks and the Chinese built water-driven figures which performed a variety of movements.

One of the most famous automatons, The Scribe, was created in the eighteenth century by Swiss craftsmen. This lifelike figure of a child seated at a drawing table writes with a quill pen and dips the pen into an ink well. Even the doll's eyes are animated; they follow the pen as it moves across a sheet of paper. The mechanism that drives The Scribe, and a similar automaton called The Draughtsman, is an intricate clocklike machine with a complex series of disks, springs, and cams. Both of these early robotic forms are still functional. (Mary Shelley reportedly visited an exhibit of these renowned automatons just a year before her book, *Frankenstein*, appeared.)

The word *robot* comes from the Czech word for worker, *robota* (or the closely allied word, *robotit*, meaning "to drudge"). It was first used in a 1921 play by Karel Capek, *R.U.R. (Rossum's Universal Robots)*, in which robots destroy the human race. It was this negative view of robots as soulless machines bent on destroying their makers from which Asimov departed.

Since Capek, science fiction writers by the hundreds have vested robots with a wide variety of abilities and personality traits. Movies have given us a clear, if fantastic, image of robots, ranging from the evil human impersonator in Fritz Lang's *Metropolis* (1926) to the droids in George Lucas's *Star Wars* trilogy, which possess the full range of human characteristics.

While science fiction has aided us in visualizing what we want in a personal robot, industrial robotics research has provided much of the hardware development. American industry uses robots in auto assembly lines, oil drilling operations, coal mines, and hundreds of other places. There are robotic mail carriers that roll through corporate offices, automated tractors that deliver and pick up parts, and welding machines that exhibit tireless accuracy. Robots tend machines, paint, handle parts, and inspect assembly of products.

Approximately 7000 industrial robots operate in the United States, about 9000 in Europe, and Japan may have as many as 30,000. The Japanese have made robot development a national goal, with full government backing and a multimillion dollar investment.

The Robot Institute of America, an industry support association with 255 corporate members, estimates that by 1991 there will be more than 100,000 robots installed and operating in U.S. plants. Joseph Engelberger, considered the father of robotics, says that within ten years the robot industry will be a $3 billion a year enterprise.

This June the largest industrial robotics show of its kind, Robots 8, is expected to draw more than 20,000 people to Detroit. Another industry support group, Robotics International of the Society of Manufacturing Engineers, has a membership of more than 10,000 engineers, educators, and consultants. It is planning a conference and

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trade show, Robots West, for next November in Anaheim, California, that may attract as many as 15,000 participants.

1984's robots are a far cry from the multi-talented, two-legged science fiction versions. Yet, robotics technology has come a long way in a very short time. It has been the computer, with its tiny chips and integrated circuits, that has made those gains possible.

*F.R.E.D. (Friendly Robotic Educational Device), a 12-inch, $349 robot that speaks, moves, and draws, and can be directed by an infrared signal from the remote control device at right.*

During the late 1960s, scientists at Stanford Research Institute (SRI) International created a forerunner of the present group of personal robots. It was aptly named Shakey. Mounted on the robot were an arm, a television camera, and grippers. Shakey was programmed to roll around in a small, five-room environment, shifting and stacking boxes on command.

In the 1970s, a robot named Freddy was developed at Edinburgh University. Freddy was a large suspended arm with a gripper, similar in form to some assembly-line industrial robots of today. Freddy's job was to choose appropriate parts from a pile in order to make toys.

These and other early experiments in robotics demonstrated to engineers the enormous complexity involved in creating robots which could make decisions in even the simplest fashion. How could someone tell Shakey all of the possible decisions to be made in finding a particular box and moving it next to another box? And what if neither box was in the room occupied by Shakey? The computer program which drove Shakey had to work out each step of the desired action from a limited number of movements at its disposal. The number of Shakey's potential decisions quickly produced a mathematical explosion of options.

Freddy's job was no easier. The robot had to be shown each step of a successful operation and then it repeated the process. If its limited sensing mechanism couldn't find the correct shape of a toy part from the pile of parts at its disposal, it would pick through the pile. But if stymied, Freddy would smash its arm into the pile of parts, trying to break them into something it could recognize.

Robots are getting smarter, however. Jenus, a robot created by Robotics International Corporation, rolls under its own power. When its batteries weaken, it locates an electrical outlet and plugs in. IBM is reportedly working on a robot called Epistle that will read the mail and then pick out the more important letters by looking for certain phrases or words previously embedded in its memory.

Robotics pioneer David Heiserman, a consultant and author of *How To Design and Build Your Own Custom Robot* and four other books on robotics, believes there are many people who want robots but can't justify the expense. Unlike the microcomputer, a robot cannot yet be called a utility item for the home of the individual.

"I'm very optimistic about how it's going to turn out," says Heiserman. "But the people who are manufacturing these commercial hobby robots will go through a difficult period. They have to put a lot of money into product development and support for the robot without any return for a while."

That's not the view that the manufacturers are taking. Rick Gibson, marketing manager for Androbot, says that initial response to the company's product has been overwhelming. He believes that sales of robots in 1984 will be brisk among dedicated computer hackers and hobbyists.

The real challenge for Androbot and other robot producers will follow this first burst of enthusiasm among those already fascinated with robotics. "Right now we're trying to increase the robots' capabilities so that after the initial market of instantly interested people is satisfied, we'll have robots that are more productive and can do some things," says Gibson. "By the end of 1984, we'll be able to offer the options that will interest the next phase of the marketplace."

Androbot introduced a prototype version of its robot, Topo, in the spring of 1983. The 33-pound,

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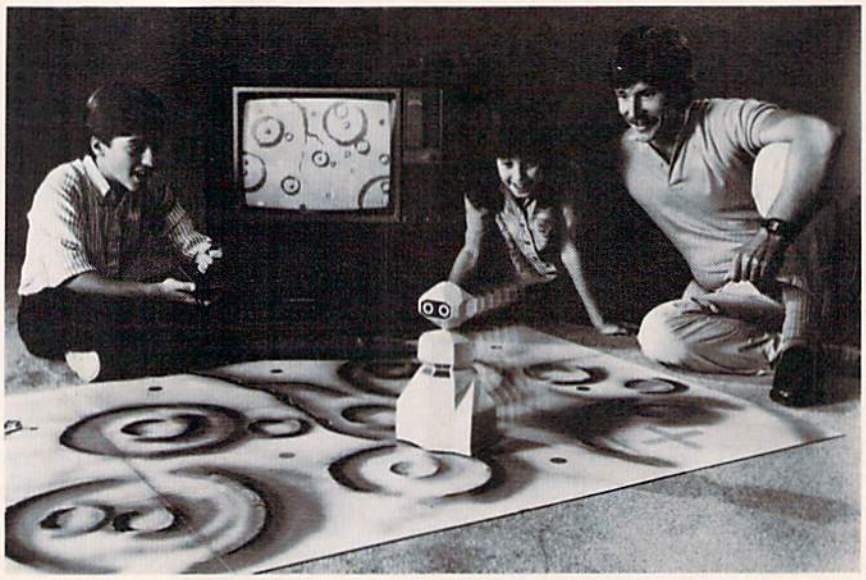
three-foot-tall robot was a wheeled computer peripheral that could be programmed through the keyboard of a microcomputer. All 650 of the prototypes sold at a price of $495 each.

At the Comdex show in Las Vegas last November, Androbot introduced a new digital Topo. Although it shares the name and physical appearance of the earlier prototype, the new Topo is a much more sophisticated robot. Topo can be programmed to talk in two different ways. It has a text-speech capability that allows the user to type in what to say,



*Androman, a 12-inch-tall computer-peripheral robot that plays games.*

# Obstacles In Robot Development

Major advances have been made in the sophistication and adaptability of robots. There are significant problem areas, however.

**Discriminating Vision:** A robot's visual sensor is usually a television camera. The camera translates what it sees into picture elements (pixels). Each of the many pixels is then given a numerical value based on the varying levels of light. The number patterns are analyzed by the computer, which matches these patterns to corresponding values previously embedded in memory. In this way, for example, a robot can find a particular item it has been programmed to seek, such as parts of a machine it is building.

In the past, a computer's ability to process visual images has been relatively unsophisticated and slow. Scientists are now working to perfect a pattern-finding function which will allow the computer to discriminate swiftly among images and even to add new information to its visual senses.

**Bipedal Locomotion:** Do you want your robot to climb stairs, go up a ladder, or step over a curb? That's not yet possible. Why do you think most robots roll along like R2D2 rather than walk as does C3PO? Even a toddler can outwalk a robot. But that will change.

Robotics engineers at places like Carnegie-Mellon's Robotics Institute are making great strides in this area of research. There are already prototypes that walk with the multi-legged style of a spider and that bounce from place to place like a pogo stick.

**An Adaptable Hand:** Robotic hands are developed to the point that they can hold almost anything a human hand can. What hasn't been perfected is a robot's hand with the adaptability of our four fingers and opposable thumb. For a robot to hold a paint sprayer takes one type of gripper. The same robot needs a different mechanism to hold a can. And yet a third robotic hand might be required to grasp a vacuum cleaner nozzle.

**A Natural Language:** To communicate with your Commodore 64 or VIC-20 requires a language such as BASIC, which will translate human ideas into numbers the computer can understand. But there are tremendous problems involved in telling a robot to carry out what may appear at first to be even the simplest function. Computer-driven robots cannot become popular and useful until there is a way for humans to communicate with them without having to learn a complex programming language.

This is a central concern of artificial intelligence research (AI), one of the most intriguing and controversial aspects of computer science and robotics. For over 25 years AI researchers have worked to improve the way in which humans communicate with computers. LISP (List Processing), SHRDLU, and other experimental natural languages have been developed to help solve this fundamental problem. The search continues.

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press the return key, and have Topo speak. The other method is a phoneme system that allows Topo to sing, to speak in foreign languages, and to make sound effects. This second form allows the user to control the pitch, speed, and volume of Topo's voice.

The base price for the new Topo is $1595. The robot is controlled by an infrared link housed in a transceiver (base communicator) that plugs into an Apple computer. During the second half of 1984, Androbot has plans to introduce a Topo version for Commodore and IBM PC computers.


*Heath's HERO I robot, a programmable computer on wheels that sells for a base price of $2500 assembled ($1500 in full kit form).*

Topo can move at a speed of about two feet per second, contains three 8031 microprocessors (two on-board and one in the base communicator), and has eight card slots (two already in use for motion control and communication/speech control). Also available are a number of educational and instructional software programs and an attachable Androwagon that carries up to 20 pounds. Topo is upgradable and takes commands from the keyboard or through a joystick.

Androbot, a company established by Atari founder Nolan Bushnell, is currently introducing two more personal robots. B.O.B. (brains-on-board), as its name implies, is the most sophisticated of the robots being created by the company. In addition to its two Intel 8086 microprocessors, B.O.B. has three megabytes of memory. It can be programmed to navigate through an area, remember those patterns, speak, and choose from over 100 stored words and phrases.

"Initially B.O.B. will be a robot for programmers, hobbyists, and computer buffs," says Rick Gibson. "Through additional software in the future, B.O.B. will develop into a highly sophisticated robot, ultimately evolving over the years into a personal servant. It has the equivalent capabilities of an IBM PC on-board, and programs can be written either on an IBM PC or an Apple II with a modem."

The base price for B.O.B. will be approximately $2000. With accessories, the price can go as high as $5000.

Androbot is also introducing *F.R.E.D.* (Friendly Robotic Educational Device). Aimed at the educational field, F.R.E.D. has an infrared controller which can be used to make it talk, move, or control a drawing pen mechanism. F.R.E.D. is 12 inches high, weighs two and a half pounds, and costs $349.

F.R.E.D. comes with a utility wagon and a pen activation arm that will accept future accessories. The robot has a 45-word vocabulary and is expandable. Androbot plans to make F.R.E.D. compatible with almost all personal computers, although the infrared controller means that the computer is not essential. Like the other robots, F.R.E.D. can detect a void around it and thus protect itself from rolling off the edge of a surface.

Finally, Androbot has created Androman, a 12-inch tall game robot for use with an Atari VCS 2600 or VCS-compatible machines. This game robot comes with a joystick controller that works via a remote infrared signal, a game cartridge, a transmitter, a game-playing field, a set of game pieces imprinted with coded information, and an instruction manual. Play involves shifts between the computer monitor and the playing field.

The HERO I (Heath Educational RObot) was introduced a little over a year ago by the Heath Company, which so far has sold several thousand of them at about $1500 in kit form and $2500 factory-assembled. Without the optional arm and voice capability, the kit sells for about $1000.

"It's been an extremely good seller for us," says Douglas Bonham, director of Heathkit/Zenith Educational Systems. "The Heath robot incorporates all of the basic systems found on modern industrial robots, plus a few that are still in the experimental stage of industrial application."

At 20 inches tall and 39 pounds, HERO I looks something like the robot R2D2 of *Star Wars* fame. The turret-like head rotates up to 350 degrees and carries an arm mechanism, programming

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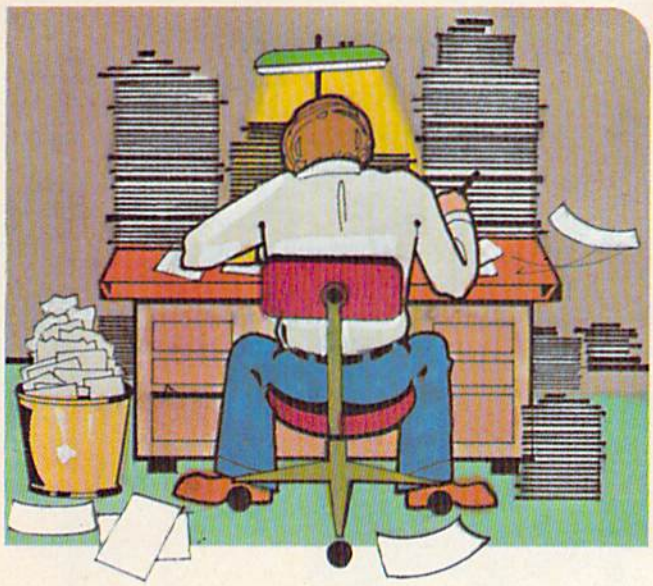

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keyboard, and experimental circuit board.

HERO I has its own on-board programmable computer and contains electronic sensors to detect light, sound, motion, and obstructions. The robot is advertised with Heath's robotics education course, which reflects their goal to market HERO I as an instructional tool.

The unit uses a 6808 microprocessor, has a hexadecimal keyboard with multifunction keys, and includes a synthesized phoneme-based speech system that generates 64 different basic sounds to simulate human speech or sound effects.

The RB5X, marketed by RB Robot Corporation, stands about 23 inches tall without the optional arm which can be mounted between the robot's dome and the body. Cartridge slots are included for later expansion.

Optional add-ons include a 10-key number pad, a compass, and even a fire extinguisher nozzle. It is programmable in BASIC on any computer using the RS-232 interface.

The unexpanded unit sells for $1795. An optional arm is priced at $595 and a voice capability is available for $195.

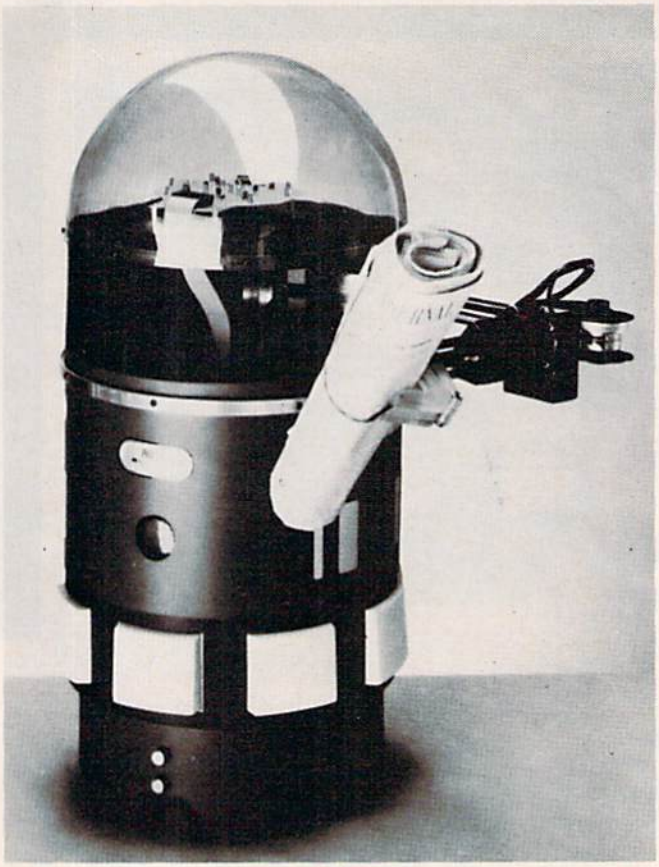
"We think the personal robot industry will follow the kind of explosive growth that we've had over the past six years in the personal computer field," says RB Robot's Bosworth. "The horizon is more like 5 to 10 years and not 10 to 15 years."

For the future, advances in robotics technology will be affected by improvements in several crucial areas of research. Large-scale integration of computer systems will bring greater productivity and adaptability to entire factories of robots. More sophisticated hierarchies in robot control systems will mean that sensory devices will be more effectively used.

Artificial intelligence (AI) research, the attempt to simulate human thought processes and experiential learning in computers, may hold even greater solutions in the field of robotics. Some AI scientists envision that in the early years of the twenty-first century there will be few areas of human thought that computers will not be able to duplicate.

Although the AI field is as controversial as it is complex, it has already brought advances in computer languages, robotic sensory-control coordination, problem-solving structure, and a host of human thought-related subjects.

Personal robots may not yet have all the advanced abilities we popularly associate with robots. But the HEROs, B.O.B.s, and RB5Xs that may roll through your house this year are the first steps in making this science fiction staple a popular, affordable science fact.



*The RB5X, produced by RB Robot corporation, is a 23-inch-tall programmable robot, which can be plugged into a computer for instructions. Preprogrammed EPROM cartridges can also be used to direct the RB5X.*

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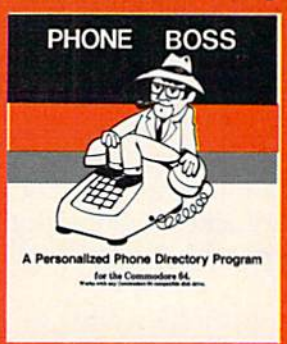


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# How To Start A User Group

Kathy Yakal, Editorial Assistant

**A user group is a good resource for programming tips, free software, and new ideas on how to use your computer. If you can't find a group that meets near you, then why not start your own? Here are some suggestions.**

When the first Commodore PETs were imported into Canada about five years ago, Mike Bonnycastle bought one. He was looking for a micro that he could use in his business and hadn't been pleased with other machines available at that time. "Up to then, there wasn't a viable machine," he says. "That 8K PET was about a hundred times better than I thought it would be."

But there were some things about the PET that Bonnycastle didn't understand. He went back to the Commodore dealer. "I don't know how to do that either," the dealer said, "but you might try calling a guy named Jim Butterfield."

Bonnycastle looked up Butterfield in the Toronto phone book and called him. "Why don't you come over this afternoon?" Butterfield said. Bonnycastle arrived at the house and found another Commodore owner, Lyman Duggan, also waiting to talk to Butterfield. The three of them sat down and talked Commodore. As they parted, one of them said, "Why don't we do this again sometime?"

And *that* was the first meeting of TPUG, the Toronto PET User Group.

## Simple Beginnings

Though they didn't know it that Saturday afternoon, what those three men started would grow to be one of the largest and most respected Commodore user groups in the world. The single element that they had in common was a desire to learn more about the ins and outs of Commodore computers, and a willingness to share what they had learned with others.

If you have wanted to start a user group but hesitated because of the enormity of the task, it may be because you're looking at the huge groups that have evolved over months or years, like TPUG with more than 13,000 members. There are thousands of programs in its public domain software library and an annual convention in Toronto that attracts people from all over the world. A full-time staff runs the group's office.

Large, successful user groups don't just materialize. Most of them start with a handful of individuals who want to learn more about an exciting hobby.

## "I Wanted Company"

Frank Topping bought a VIC-20 in December, 1982. Retired, he lives in Englewood, Florida, a community of about 20,000 people. An amateur radio operator with several friends who owned computers, he looked around to see if there was a user group in the area.

"I wanted company," says Topping. "Computing is lonesome without other computer hobbyists." Finding no established group close enough to join, he decided that, with a little initial organization on his part, the Commodore owners in Englewood could have their own group.

Topping contacted the local media to see if he could get some publicity for the group's organizational meeting. Four newspapers wrote articles about his efforts, and the station manager of WENG-AM in Englewood interviewed him on the air one morning.

"It was very successful," says Topping. "I got lots of phone calls, and 14 people came to the organizational meeting at my home." It soon became evident that Topping's home wasn't big enough for group meetings, so they contacted a local savings and loan who let them use a meeting room free of charge. "Bits & Bytes," the Computer User Group of Englewood, Florida, that Frank Topping started, has more than tripled in size since that first meeting.

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## Should We?

Publicity and an organizational meeting do not a user group make—unless there is sufficient interest. "The whole substance of our first meeting was asking the question, 'Should we?'," says Topping.

Interest, a bit of organization, a place to meet, and at least one computer is all you really need to start a user group. There are no formal guidelines or requirements. Commodore appreciates its user groups, but places no restrictions on them.

You may have actually started a user group without knowing it. Do you get together with friends occasionally and try to figure out programming problems together? That's a user group. The only difference between your informal gatherings and the Montgomery County Commodore Computer Society or the Eau Claire Commodore 64 User Group is a little formality.

## Getting Formal

So you and a friend have decided to start a group. You could follow Frank Topping's example and try to get some media coverage. You can post signs at local computer stores, school bulletin boards, even laundromats and grocery stores. Or word of mouth may be sufficient.

Try to have your first meeting at a public place, rather than someone's home. You might be surprised at the turnout. Many groups have started in the back room of a computer store or a small school auditorium.

You will want to set some kind of agenda for the first meeting, and select someone to serve as a temporary leader until officers are elected. Writing bylaws may take up the whole first meeting.

There is no official set of Commodore user group bylaws. If the word *bylaws* is intimidating, call them rules, or your charter, or group guidelines. All you're doing is defining the group and how it will function.

Your bylaws may contain a statement of purpose, a mission, a reason for the group's existence. Something like, "This group exists for Commodore owners to assemble and share information about their computers."

You can decide if you want to elect officers—which you probably will—what their responsibilities will be, and how long they will stay in office.

Dues is another issue. It may not seem necessary at first, but there are some things that might come up later that would cost money—room rental, postage for a newsletter, speakers, and refreshments, for example. Many user groups just starting out set yearly dues at between ten and twenty dollars.

In addition, you might want to decide on a name for the group, meeting time and place, and appoint or elect people to be in charge of publicity and refreshments.

Your bylaws can contain whatever information you think is appropriate. Try to keep it flexible. The rules don't have to be carved in stone, but a little organization at the group's beginning can save a lot of trouble and bad feelings later on.

## Getting Down To Business

Now that that's out of the way, you can get started on what you set out to do: share information about computing.

But what information? Who teaches and who learns? You can find this out by having everyone at the first meeting, and new members as they come in, write down what they could do some kind of presentation about, and what things they would be most interested to learn.

Your agenda coordinator or committee can use this information to plan each meeting. You might want to bring in special speakers from local computer stores or schools for certain topics, but you may have enough talent within your group to plan a whole year's worth of meetings.

Some groups falter at this point. If no one is comfortable enough with his or her computer knowledge to present something to the group, you could start by bringing in software and giving oral demonstrations and reviews. Or by having individuals study a tutorial in a book or magazine and explain it to the group.

How you present information can be a problem as your group grows. A group of ten can gather around a couple of computers for demonstrations. Seventy-five people may require some special equipment, like a large-screen video monitor.

A word of encouragement: If you hesitate to join a small group because you just bought a VIC-20 and can't get through the first chapter in the manual, don't worry. Computer hobbyists love to share what they've learned. So what if you can't explain string variables? Offer to bring oatmeal crunchies and a pound of coffee to the meeting.

## Growing Up

If you live in a small town miles from a major metropolitan area, meeting once a month and sharing new information may be sufficient to meet everyone's needs. But many groups that have grown to tens or hundreds of members find that they want more than that. Here are some examples.

*A Newsletter.* This can be a one-page mimeographed sheet with notes from the last meeting and announcements for the next. Some groups have enough members and resources to put out a monthly magazine with advertisements, programs, reviews of new software and hardware, and programming tips.

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Books and magazines may also be a part of this library, as well as newsletters from other user groups. Again, be aware of copyright laws. It is illegal to type in a program from a copyrighted publication that you have not purchased, just as it is to get a copy of such a program on tape or disk. By buying a computer book or magazine, you are buying the right to copy the software contained therein for your use only.

*Bulletin Board Systems.* Most Commodore BBS's were born out of user groups. They can be expensive to maintain and troublesome to keep running, but the shared information and new knowledge they can provide Commodore users is the reward.

*Subgroups.* If there are enough members with special interests, you could break into subgroups for a portion of the meeting, or even hold separate meetings—a word processing workshop, struggling through machine language, or maybe just a VIC-20 and a Commodore 64 group meeting separately.

*Discounts.* Buying certain items in bulk, such as blank diskettes, often greatly reduces individual cost. Also, local computer dealers and retailers are often willing to offer discounts to user group members. This benefits not only the group, but also increases business for the dealer.

## Only A Framework

The suggestions presented here are just that: suggestions. Each of the hundreds of Commodore user groups around the world has its own unique history. Let yours evolve. Try to get as many people actively involved as you can. Everyone has something to bring to the group.

If you really run into trouble with the logistics of getting a group off the ground, it might be worth a long-distance phone call to a successful user group to find out how they solved similar problems.

And try not to get too bogged down in organization. Once your group reaches a certain size, more of it will be necessary, but keep your purpose in mind. You're a group of Commodore users spending some time together to enhance your own computer knowledge and share what you've learned with others.

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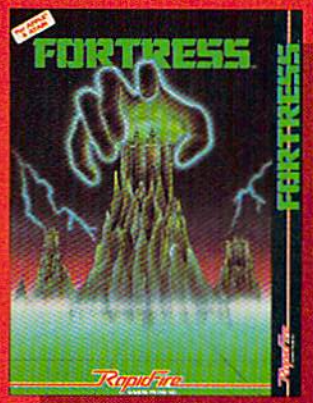
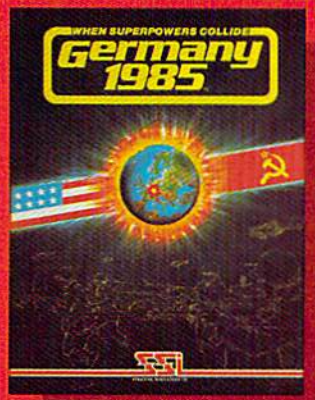
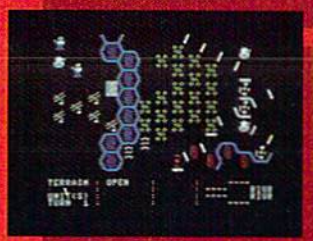



A simple and fast strategy game of power and conquest that's right up there with the classics such as chess and *go*. When you play the computer, it actually learns from you and improves with time to become the ultimate opponent. On disk. $34.95.



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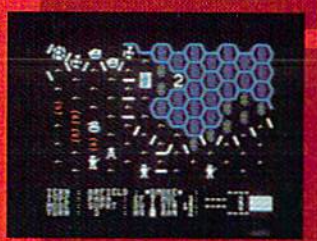
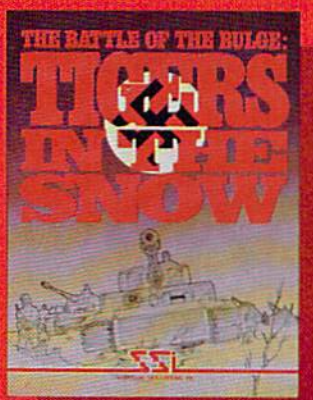
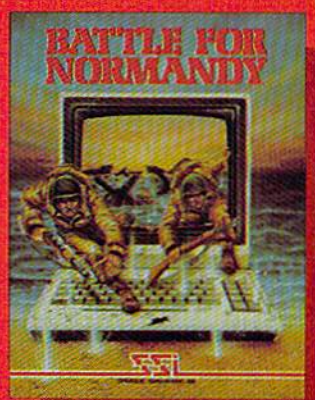
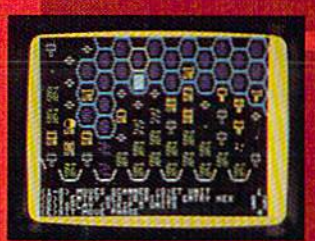


This second game in the series "When Superpowers Collide" takes you to the desert oilfields of Saudi Arabia. Soviet troops have captured these vital points, and it is up to the U.S. Rapid Deployment Force to regain them. On disk. $34.95.




As the German Commander in this re-creation of the Battle of the Bulge, you must use your deadly Tiger tanks to break through the Allied lines in the snow-covered Ardennes Forest. As the Allied leader, you must stop this German blitzkrieg. On disk & cassette. $39.95.



This game takes you to the northern coast of France for the start of *D-Day*! As the Allied Commander, you must see to it that the invasion succeeds. As commander of the German forces, you must not let history repeat itself! On disk & cassette. $39.95.

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# A Guide To Commodore User Groups

## Part 2

Kathy Yakal, Editorial Assistant

**Here is the second half of the list of Commodore user groups that began in last month's GAZETTE. If you are a new Commodore owner looking for some support and assistance, you may want to attend a meeting in your area.**

If you send a written request for information from a user group, please enclose a self-addressed, stamped envelope.

Additions, deletions, and corrections to this list should be addressed to:

*COMPUTE! Publications*
*P.O. Box 5406*
*Greensboro, NC 27403*
*attn: Commodore User Groups*

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**Greater Omaha Commodore 64 User Group**
Bob Quisenberry
2932 Leawood Dr.
Omaha, NE 68123
402/292-2753

**Omaha VIC-20 User Group**
Bob Rowe
1418 St. Raphael St.
Bellevue, NE 68005
402/292-3961

**The National VIC-20 User Group**
George E Kaywood
P.O. Box 34575
Omaha, NE 68134

### NEW HAMPSHIRE

**C-64 User Software Exchange Resources (U.S.E.R.S.)**
Paul E. Kyle
P.O. Box 4022
Rochester, NH 03867

**Southern New Hampshire VIC-20 User Club**
Don Osterman
P.O. Box 7067
Nashua, NH 03060
603/888-0959

**TBH VIC NICS**
J. Newman
P.O. Box 981
Salem, NH 03079

### NEW JERSEY

**ACGNJ PET/VIC/CBM User Group**
Joseph M. Pylka
30 Riverview Terrace
Belle Mead, NJ 08502

**Commodore Friendly User Group**
Rich Pinto
49 Hershey Rd.
Wayne, NJ
201/696-8043

**Commodore-64 Users Group**
Thomas Martin
680 Leigh Terrace
Westwood, NJ 07675
201/664-3304

**Computer Club of Ocean County**
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Toms River, NJ 08753
201/341-3797
BBS 201/244-2259

**Northwest Bergen VIC Users Group**
Arnold Wiesenfeld
221 Wayfield Cr.
Wyckoff, NJ 07481
201/891-5196

**South Jersey Commodore Computer User Group**
Mark Orthner
46B Monroe Path
Maple Shade, NJ 08052
609/667-9758

**VIC Software Development Club**
H. P. Rosenberg
77 Fomalhaut Ave.
Sewell, NJ 08080

**VIC Times**
Thomas R. Molnar
46 Wayne S.
Edison, NJ 08817

### NEW MEXICO

**New Mexico Commodore User Group**
Danny or Betsy Byrne
6212 Karlson N.E.
Albuquerque, NM 87113
505/821-5812

### NEW YORK

**Adirondack Commodore 64 User Group**
Paul Klompas, c/o Ray Supply
Upper Glen St. P.O. Box 745
Glen Falls, NY 12801

**Brentwood-Bayshore VIC/64 Users Club**
Serafin R. Vargas
Brentwood Public Lib. Second Ave. & Fourth St.
Brentwood, NY 11717
516/273-7883

**Broome County C-64 Users Group**
Richard Sher
31-S Jane Lacy Dr.
Endicott, NY 10760
607/754-7382

**Capitol District Commodore 64/VIC-20 User Group**
William Pizer
363 Hamilton St.
Albany, NY 12210
518/436-1190

**Commodore Computer Users Group of Ithaca**
Max Paperno
519 E. State St.
Ithaca, NY 14850
607/277-3981

**COMMODORE SIG Computer Club of Rockland**
Peter Bellin
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914/246-8936

**HV Commodore Club**
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35 Old Route 299
New Paltz, NY 12561
914/255-6267

**Kingcomp (Commodore User Group)**
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1250 Ocean Ave.
Brooklyn, NY 11230
212/859-3030

**L.I.V.I.C.S.**
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3 Blueberry Ridge Rd.
Setauket, NY 11733

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Nanuet, NY 10954
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BBS 623-4248

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New York, NY 10012
212/673-7241

**New York Commodore User Group (NYCUG)**
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New York, NY 10025

**North Country Computer Club**
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Ogdensburg, NY 13669
315/393-4677

**Schenectady Commodore User Group**
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The Video Connection,
Canal Square
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**Utica Commodore User Group**
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1801 Storrs Ave.
Utica, NY 13503
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Lindenhurst, NY 11757
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**VIC User Group**
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Stony Brook, NY 11790
516/751-1719

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Peter Archer
P.O. Box 860
Nelson, New Zealand
54/79362

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Hank Roth
P.O. Box 30694
Raleigh, NC 27622

**Commodore 64 Research Triangle User Group**
Doug Latta
670A Glendower Rd.
Raleigh, NC 27612
919/787-5748

**Commodore User Group, c/o Talton's Select Business Equipment**
Tom Stidham
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Durham, NC 27702
919/489-4155

**Microcomputer User Group**
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Boonville, NC 27011

**Raleigh VIC-20 User Group**
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410-D Delta Ct.
Cary, NC 27511
919/469-3862

**Triad Amateur Computer Society/ Commodore User Group**
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Greensboro, NC 27407
919/275-8014

**Triad C-64 User's Group**
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P.O. Box 5406
Greensboro, NC 27403
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Raleigh, NC 27619
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Lincolnton, NC 28092
704/732-0932

**VIC-20 & 64 Group**
Tim Gromlovits
Rt. 11 Box 686E
Hickory, NC 28601
704/495-7922

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**CLERCOM 64**
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Milford, OH 45150
513/831-5684

**Commodore Computer Club of Toledo**
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Temperance, MI 48182
313/847-0426

**Commodore User Group**
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Bellbrook, OH 45305
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Elyria, OH 44035
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5104 Mayfield Rd.
Lyndhurst, OH 44124

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Cincinnati, OH 45206
513/961-6582

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Tulsa, OK 74101

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Albany, OR 97321
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Molalla, OR 97038
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**Salem Pacific Northwestern Bell VIC User Group**
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**Westmoreland Commodore User Club**
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Greensburg, PA 15601
412/836-2224

## PUERTO RICO

**Commodore User Group of Puerto Rico**
Ken Burch
RFD #1 Box 13
San Juan, Puerto Rico 00914
809/791-5840 (no calls before noon)
BBS 781-0350 (8 p.m.-8 a.m.)

## RHODE ISLAND

**Narragansett Commodore Users Group, c/o EPA Environmental Research Lab**
Robert R. Payne
South Ferry Road
Narragansett, RI 02882

**Newport Computer Club**
Dr. Matt McConeghy
10 Maitland Ct.
Newport, RI 02840
401/849-2684

## SOUTH CAROLINA

**Beaufort Technical College User Group**
Dean of Instruction
P.O. Box 1288
Beaufort, SC 29902
803/524-3380

**Commodore Computer Club of Columbia**
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Columbia, SC 29210
803/772-0305

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Doug Jones

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Pierre, SD 57501
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Metro Computer Center

**Memphis Commodore User Club**
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**Nashville Commodore User Group**
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**Mid-City Commodore User Group**
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**PET User Group**
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**Southeast Houston VIC User Group**
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Houston, TX 77089
713/481-6653

**VIC User Group**
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**The Utah Commodore 64 and VIC-20 User Group**
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Clearfield, UT 84015
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**VIC LICK**
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% Mountain Computer Society
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801/261-0119

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**Central Virginia User Group**
Dale Moore
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**Fredericksburg Area Computer Enthusiasts**
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**Lynchburg User Group**
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Lynchburg, VA 24501

**Roanoke Area Computer Enthusiasts**
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Roanoke, VA 24019
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**Southwestern Virginia Commodore Users**
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Elk Creek, VA 24326
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**CBM Users Group**
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**NW Commodore User Group**
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Seattle, WA 98109
206/284-9417
BBS 743-6021

**PSACE**
Ken Tong
1800 Taylor Ave. N.
Seattle, WA 98109

**Seattle Commodore 64 User Group**
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Dept of Pathology SM-30,
Univ. of Wash.
Seattle, WA 98195

**Spokane Commodore User Group**
Terry and Sara Voss
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Spokane, WA 99201
509/327-7202

**World Wide User Group (Military Personnel Only)**
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Tacoma, WA 98498
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**USO Computer Club**
**USO Outreach Center**
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Washington, DC 20332

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D-5750, Menden 2
West Germany

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Crivitz, WI 54114
715/854-2269

**Commodore 64 and VIC-20 Software Exchange Group**
E.J. Rosenberg
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608/835-5538

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Caledonia, WI
414/632-6922

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Racine, WI 53406
414/554-0156
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**Eau Claire Area CBM 64 User Group**
John F Slavsky
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Eau Claire, WI 54701
715/874-5972

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Middleton, WI 53562
608/831-4852

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Elm Grove, WI 53122
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**S.W.I.T.C.H.**
Len Lutz
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Menomonee Falls, WI 53051
414/255-7044

**Waukesha Area VIC Enthusiasts (WAVE)**
P.O. Box 0641
Waukesha, WI 53187-0641

# Nevets

Steven R. McCloskey

**A clever action game, "Nevets" requires both strategy and a lot of dexterity with your joystick. Using character graphics, it is written for the unexpanded VIC. We've added a version for the 64.**

In "Nevets," you are transported to the Land of Adnerb, where your mission is to protect four power capsules against the ever encroaching Nevets. Your only defense against the thieving Nevets is a turret gun, which you control with your joystick.

The screen displays a lower and an upper level, with two power capsules at the center of each level. The Nevets may approach from right or left on either level. The turret, at the bottom center of the screen, can be moved up and down with the joystick, and the gun can be aimed by moving the joystick left and right. Pressing the fire button fires the gun.

There are 40 levels of play. You must destroy your quota of Nevets (displayed on the screen) within 60 seconds to get to the next higher level. When you meet the quota, you receive a bonus—the time remaining times ten.

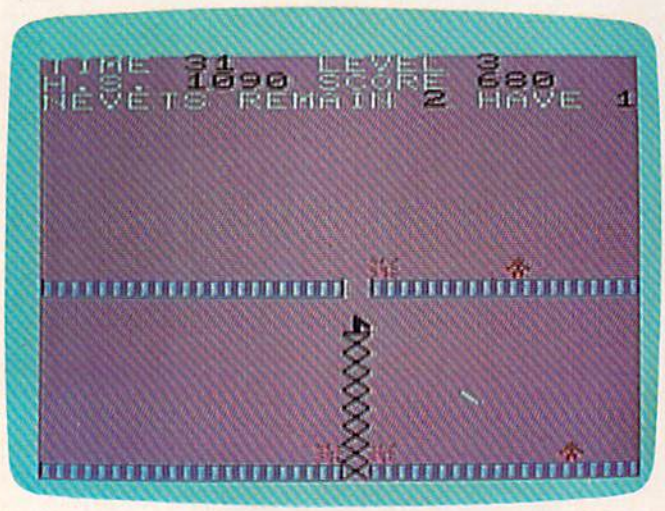
The game ends when time runs out or all four power capsules have been stolen. You then have the option of playing again. The game also keeps track of high score.

## VIC Program Structure

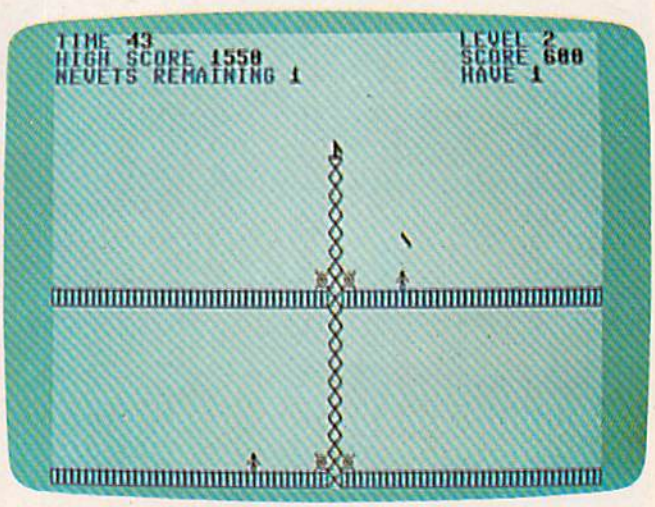
Here's the VIC version program structure for those interested in how the program was written:

| Lines | |
|---|---|
| 5–70 | Title and graphics |
| 75–90 | Screen setup |
| 110–160 | Joystick reading routine |
| 165–190 | Variable setup |
| 200–330 | Main program loop |
| 400–410 | Fire subroutine |
| 500–510 | Game over subroutine |
| 600–610 | Nevet #2 subroutine |
| 700–710 | Nevet #1 subroutine |
| 800–840 | Nevet #2 variable subroutine |
| 900–940 | Nevet #1 variable subroutine |
| 950–960 | Power capsule subroutine |

*See program listings on page 143.*




*One power pod has already been stolen. The player is about to eliminate one of the thieving Nevets in the VIC version.*




*It may be too late to defend both power pods; the Nevets are getting too close (64 version).*

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Here's talking to you, kid.

*(The Apple version includes an 8-bit digital-to-analog converter and audio amplifier on a card. It requires 48K and a speaker. The Atari version requires 32K.)*

# Say it again, S.A.M.

S.A.M.

Developed by Don't Ask Computer Software, Inc.


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# Bingo 64


Richard L. Witkover

**"Bingo 64" is a cleverly written computer version of the classic game. It makes good use of the 64's graphics and sound capabilities to provide you and three friends with many exciting games of bingo. A joystick is required.**

Few people have not known the anticipation, heard the click of the balls, the call of the number, and finally, the excited shout of "Bingo!" Here's a four-player version of this world-famous game written for the Commodore 64.

## Setting Up The Game

Before you begin playing, you have to choose your mode of play from a menu. *Manual ball feed* allows you to control the pace of the game. If you opt for *auto ball feed*, the computer automatically picks the next number. Choose *manual cover* if you want to cover the spots on your card yourself (using the joystick). If you want your 64 to cover the spots, pick *auto cover*.

After you make your choices, four blank cards are displayed on the screen. Each column on a card corresponds to one letter of the word BINGO. The five numbers in each column are selected from 15 possible values and are checked to prevent duplication. This process is repeated for all four cards. The selected numbers are displayed on the cards and stored in the three-dimensional array C%. A cover token is then placed over the free box in the center, giving it the status of a called number.

## Ready To Play

The cards are on the screen, and you are ready to begin playing. At the bottom of the screen are five balls (sprites), each labeled with a letter in the word BINGO.

Numbers are selected through a random graphics routine. The lettered balls jump up and down like kernels of popcorn. The height a ball reaches is random. If it jumps above a line on the screen, it is selected. If not, it falls back with a plop, and another ball is given a chance.

After the column letter has been selected, a random number is chosen. To prevent duplication, all called numbers are entered in the two-dimensional array N%. The newly selected number is compared to the numbers in the array. If a match occurs, the number is discarded and another one generated. When a unique number is found, it is printed on the enlarged sprite in the middle of the screen, along with its letter.

## Checking For A Match

Next, each number in the appropriate column on each card is checked for a match. A chime sound signifies a match. If the number doesn't appear on any of the four cards, a sour bong sounds.

# Tough competition.


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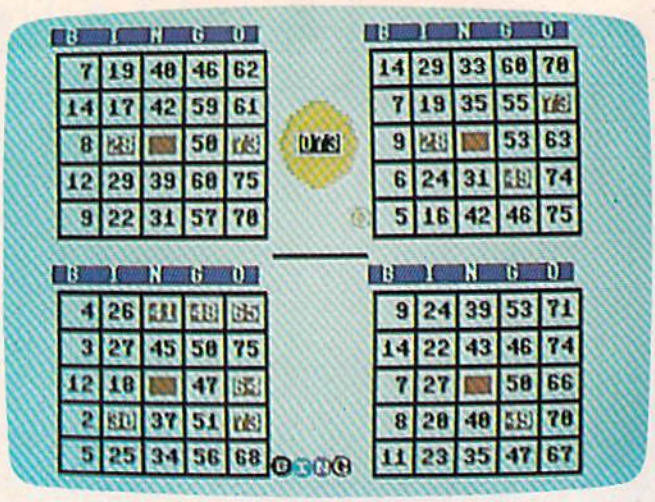

*The computer calls the shots in "Bingo 64."*

| Variable | Function |
|---|---|
| A1–4 | Parameters of pattern for winner scan |
| AU | Mode flag for ball feed and cover |
| BO | Bingo flag |
| B0,1 | Digits under joystick cursor |
| C% | Card numbers array |
| CC,CM | Joystick cursor position |
| CD | Card number |
| CL | Column number |
| CO% | Ball color array |
| DU% | Duration of notes array |
| FB | Fire button switch |
| FH%,FL% | Music frequency high and low bytes |
| FR | Joystick row number |
| HB | High byte of screen color memory |
| J0–3 | Joystick direction switches |
| L | Ball letter array |
| LN | Length of ball number string |
| N% | Called number array |
| NC | Ball color index |
| NM | Called number |
| NN | No-number match flag |
| NU | Value of called number within column (1–15) |
| N1,2 | Digits of called number |
| OB | Reversed number flag (logical variable) |
| PD | Joystick memory register contents |
| P1 | Screen memory location of N1 |
| RN | Row number on card |
| S | Start of screen memory for cards |
| SD% | Sprite data array |
| SN | Screen memory location of box digit |
| SS | Sound chip memory location; also, screen-to-color memory offset |
| V | Video chip memory location |
| WI,WJ | Indices of box to be checked for winner |
| WM | Memory location of box to be checked for winner |
| WP | Contents of WM |
| X | Ball X-position array |
| Y | Ball Y-position array |
| YM | Maximum ball height |
| Z | Present box number value |

If you selected auto cover, the computer covers a matched number by printing it as a red reversed character. If you chose manual cover, you must use the joystick to position the marker and press the fire button to cover your number. If you make a mistake, you lose the number.

When a number is covered, the program checks the row, column, and diagonal for a bingo. Since the covered numbers have been printed in reversed character mode, this is easily done from screen memory. The program needs to check the five boxes to see if they all contain reversed characters (screen codes greater than 127). If a winner is found, the covers change color and music plays. Each card is checked for the possibility of multiple winners.

## One Machine Language Routine

The first DATA line contains a short machine language routine which initializes screen color and sprite memory locations. The remaining DATA statements set up sprite data and music. The program contains extensive REMarks to make the logic flow easier to follow, and the variable names are listed below, with their functions. If you would like a copy of this program, send $3, a self-addressed, stamped envelope, and a blank cassette or 1541 diskette to:

*Richard L. Witkover*
*P.O. Box 560*
*Upton, NY 11973*

*See program listing on page 157.*

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## O'RILEY'S MINE™

You're a mad Irishman digging your way through an abandoned mine filled with oil, coal, gold, rubies, diamonds—and hungry creatures. You'll need the luck of the Irish to survive, but with so much at stake, it's a chance you're willing to take.

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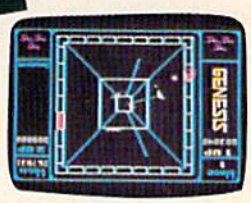


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# Some Answers From Commodore:

# A Conversation With Myrddin Jones

Selby Bateman, Assistant Editor, Features
Tom Halfhill, Editor, COMPUTE!'s PC & PCjr Magazine

*Myrddin L. Jones is vice president of marketing for the Computer Systems Division of Commodore Business Machines, Inc. At the winter CES he spoke to* COMPUTE!'s GAZETTE *about the new 264 line of computers, Commodore's continued support for the VIC-20 and 64, and his perception of the changing needs of computer buyers.*

GAZETTE: Now that the Commodore 264 line of computers has been introduced, how do you respond to 64 and VIC-20 users who may fear their computers will be given less attention?

Jones: First of all, the 64 is one of the largest bases for third-party and Commodore software which has only just started. Most of our resources are currently dedicated to 64 software. And the transition, as I understand it, from 64 to 264 software isn't that great. So I don't really see it being any threat to the availability for the 64.

I think the Commodore 64 is such a well-used machine in education today—and our thrust is more and more toward productivity and educational-type software—that I don't think there will be any diminution of support for the 64. We've already sold over a million of them in the U.S. We're way ahead of our schedule, so I don't think you'll see it being abandoned at all.

Frankly, the 264 is really not aimed at quite the same target market as the Commodore 64, because the 64 is oriented toward music and sprites and gaming, and it's very good for that. The 264 has strength in built-in programming capability, and as we move forward, in built-in software to suit a specific need. It has more word processing, small business package applications rather than gaming.

I think they'll complement each other rather than substitute for each other. And of course the 264 is going to be higher-priced.

GAZETTE: Why buy a 264 instead of a 64 that has a word processor and, say, a Simon's BASIC? It would be the equivalent of the 264 for less money.

Jones: The difference is that the market is changing because the consumer is far more knowledgeable.

So from a practical viewpoint, they look for more and more built-in support and material. That's what we're aiming to do with the 264 series—give them some choices of basic machines. If they want a word processing-based machine without compromising, we have a machine to suit them. If they're interested in financial analysis applications or want a basic machine with that built in to suit them, I'm sure as we move along you'll see more and more complexity in what we're able to integrate into the equipment.

GAZETTE: Will the built-in software on ROM chips be installed at the factory or done by the dealer?

Jones: It will be done at the factory.

GAZETTE: You have changed the keyboard on the 264 from the keyboard used on the 64. Why?

Jones: The whole design concept for the machine was different. I think we started out working with the SX64 (Commodore's portable 64) and found out that the keyboard has a slightly different characteristic than the 64. And we learned from some of the things that we found with the 64, which is a good bread-and-butter machine. I think we have a little more class with the keyboard on the 264. It's styled better.

I think the cursor controls are easier to use for the average person. And we shifted around the function buttons for the long haul to make sure we had a product that was compatible with the 19-button numeric keyboard, so that there is a continuity of style in the family like we had on the Commodore 64 with the VIC-20.

The other thing we've done is that we don't have that bulky control console with a lot of stuff on it. We have more of our works inside the keyboard itself than most other people do.

GAZETTE: Will the new family of computers—the 264, 364, and SX64—be sold through all of the same outlets as the VIC-20 and the Commodore 64?

Jones: Absolutely. I really don't think there's any difference anymore. The old difference between a personal computer and a home computer and a high-end videogame has vanished. There's a desktop computer now with varying degrees of capability and varying orientations. That's because everybody's going after the same space.

I think what happened with Coleco and the Adam is that they built in something that they compromised. As a result, they have the worst of two worlds instead of the best of two worlds. What we try to do with our planning is to put something in that's fully featured and that is exactly the same thing that you could buy off the shelf. So that, in effect, when you get it, you're getting something that's easy to use. You set it up and you roll. That's a smart philosophy and I applaud that.

Our designers did that, and it was in process long before I joined the organization. You've seen our *3-Plus-1* [integrated personal productivity package]. It brings the technology down to the right level. It's got enough variety for the average small business. We've converted it, with the graphics, into something they can visualize very easily with very little instruction. It's nowhere near a *Lotus 1-2-3*, but it gives you enough of the kind of capability that the average user can get mileage out of.

That's what we're trying to achieve in almost every category of software we've got. Except gaming, where we're going after quality at a good price. That soccer game [*International Soccer*] is an example of the things you're going to see from us. Some of the playabilities we've got are outstanding.

GAZETTE: You've said that the 264 will be available in the spring, essentially in the second quarter of 1984. How realistic is that date?

Jones: I think we're pretty far along. We have the operations manual already available. We also have 40 pieces of software for it that are ready to produce. They're the best of the Commodore 64 series. So, we're trying to have some continuity.

GAZETTE: Have VIC-20 sales begun to taper off?

Jones: Well, naturally they would. We started emphasizing the 64 last April because we felt there was need for a 64K machine. However, the VIC-20 has been very steady, and we're still getting good orders from everybody. We'll continue to sell it as long as the customer buys it. We think there's a place for a starter computer at under a hundred dollars.

GAZETTE: We've heard rumors that Commodore itself might upgrade the hardware on the VIC-20—give it 16K. Is anything like that planned?

Jones: It's been kicked around, but I don't think any decision's been made. It's a good seller.

GAZETTE: When do you think we'll see the 364 available?

Jones: After the 264. [Laughs.] It depends on their priorities. We'll have to go back and gauge the reactions. But I think you'll see the 364 getting the voice built in and getting the numeric system organized, but it will take a little longer than the 264. I would perceive it to be before the fall. I think you'll see the whole series out before the end of the summer.

GAZETTE: Are there any other members of the 264 family planned?

Jones: I'm not aware of any. Essentially it's a productivity-oriented machine and I'm sure there are a lot of other things we're going to end up doing. It has unlimited flexibility, since you can build in a variety of software. We'll have to see what happens in the market.

Our perception of computers may be a little different than others. The easiest analogy is that the keyboard is the library card, and to survive long-term, you have to offer the people who use it a variety of books that suit almost everybody's individual taste. And that's a difficult thing to do when you have to reinvent the wheel.

Look at education [software]. You could have six hundred or seven hundred titles in education alone. Our aim is to have a matrix of opportunities in a library. You could almost take the library card system and categorize it and say, well, we must have representative samples here because the average home requires this and this and this and this.

That's the way we're approaching our whole software strategy now, which says that we have to provide a library that's equivalent to the public library and a pricing that makes it comfortable for the average person at home to buy. It's a new concept we developed, and we're just beginning to implement it now.

# Albert Zap, Won't You Please Come Home?

Fred D'Ignazio, Associate Editor

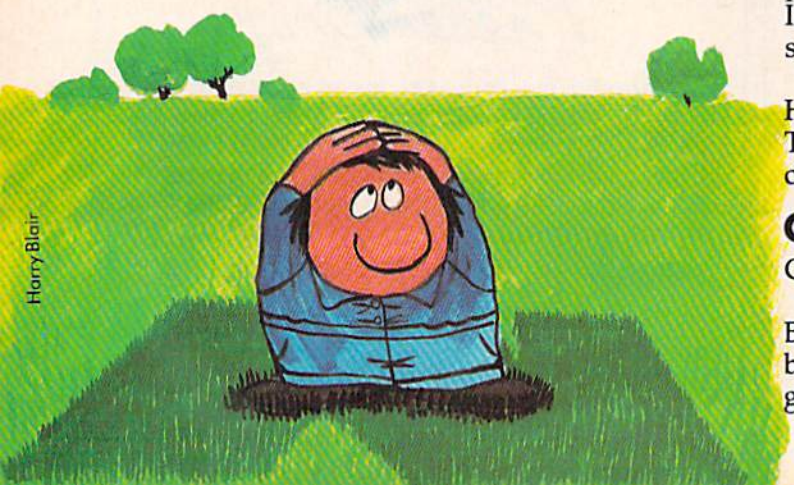
Albert Zap woke up from a long nap and looked out the window of his house. It was a sunny day. The sky was blue. The grass was so green it glowed. Albert Zap decided it was a perfect day for a walk.

Albert walked out the front door of his house. "Tra-la-la!" he sang. He skipped through the gate of the white picket fence. "Such a perfect day for a walk," he said to himself.

Then something terrible happened. Albert had wandered only twenty yards from the front door of his house when the sky grew dark. A shadow fell on him and on the grass at his feet.

Albert looked up, expecting to see a gloomy storm cloud passing overhead. He gasped. Something was falling out of the sky. It was a giant purple letter, and it was falling right toward him. If he didn't move quickly, he, Albert Zap, was sure to get *zapped!*

Albert tried to run, but he couldn't lift his feet. He was frozen in one spot. He looked up again. The elephant-sized letter was coming closer and closer, but he couldn't move. What was he to do?



Harry Blair

## Coming To Albert's Rescue

Computing families to the rescue!

Albert needs a hero or heroine to save him. But not just any hero or heroine will do. It must be one with steady hands, nerves of crystalline graphite, and a heart that's true.

# An educational ad about educational software.

YOU studied all the computers and finally chose the one your family found most useful. One of the main reasons you wanted a computer in the first place is to help your children in school. Not just to teach them how to use a computer, but also to help them get good grades in basic school subjects like reading or geography.

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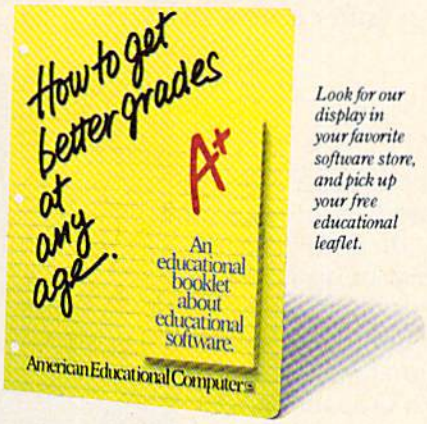
## AEC grew up on education.

The management of AEC started in educational publishing, with collectively over 100 years of experience in the field. AEC knows curriculum and how American education is practiced in the classroom. That's important because children should learn at home the same way they learn at school. Otherwise, you'll have a very confused child, and confusion is not the way to better grades or better learning.



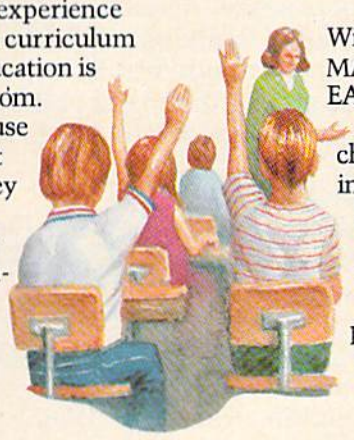

*Look for our display in your favorite software store, and pick up your free educational leaflet.*

## AEC knows that good grades are important.

Any educational software could help school performance in some way. That's because the computer is such a patient teacher, giving instant feedback to questions and allowing children to learn at their own pace.

But AEC software has an important advantage. Our approach has been student tested under actual classroom conditions. So we know it keeps the child's interest while it teaches.

## AEC gets parents involved in the learning process.



With either AEC's MATCHMAKER™ or EASYREADER™ Series, you can take your child through the grades in subjects such as Phonics, Word Attack Skills, Reading Comprehension, Spanish, World or US Geography, and Grammar. Our teacher tested system allows parents to enter material into a lively, interactive format. And because AEC's programs are grade-level oriented, you can help your child all the way through school.

## AEC doesn't play games with education.

AEC programs do contain games, but only as rewards for learning achievement. For example, once your child successfully completes the objective in the Matchmaker Geography program, he or she can play an exciting, action-packed game.


Sure, the games are fun. But they're not the basis, and certainly not the primary focus, of any AEC software. Our focus is strictly on learning. And isn't that what you buy educational software for?

If you have more questions about educational software, contact your nearest AEC educational software center. And thanks for being a concerned parent.

A+

# American Educational Computer

2450 Embarcadero Way, Palo Alto, CA 94303

And one more thing: Albert's hero or heroine must be able to hunt across the computer keyboard and peck the letter that is about to zap him.

Do you qualify? Does your mom or dad? Or your kid sister? Then pitch in, find the letter on the keyboard that is threatening Albert Zap, and give it a quick tap.

If you find the letter before it finds Albert, the letter will crumble like a peanut butter cookie you've just sat on.

## You're Not Home Yet, Albert Zap

When the letter vanishes, Albert breathes a sigh of relief. He has decided that he has had enough walking for today. All he wants to do is go home. He takes a giant step in the direction of his house.

But what is this? Another letter, this time a giant green P, is heading right for him. And, as Albert stares at the sky, other letters follow the P: a plump yellow W, a pair of brown Q's, and a hefty green Z.

Albert feels like Chicken Little. The sky is falling. All he wants is to go home. But he can't move on his own.

Albert looks your way. You are his only hope. Can you find the letters on the keyboard and tap them, one at a time, before they reach Albert?

## Finding A Champion

Albert is not picky about his hero or heroine. He might be a four-year-old with a quick little finger. Or a 68-year-old who won't desert Albert in his hour of need. He'll stay by the keyboard hunting and pecking until he gets Albert home.

But one thing is certain: Albert needs a true champion, someone who will stick with him even when the going gets tough.

And it does get tough.

Getting Albert home looks deceptively easy. After all, the letters are floating down so slowly, lazily dropping from the sky. This game is a snap. You merrily tap the keys, and Albert jogs along toward the safety of his house.

Then disaster strikes. A giant Y falls toward Albert. You see the Y and try to type it, but you miss and strike a T instead.

Albert notices your keyboarding blooper and despairs. He loses all hope. And he loses his mind. He does the opposite of what he is supposed to do. He turns around and takes a giant step away from his home.

Albert's foolish behavior rattles you. Hastily you type another letter. You aim for a B but instead type a V. Albert takes another giant step away from home. You see more letters and make more mistakes. Now Albert is jogging in the wrong direction. The distance between him and his home is steadily widening.

## Safe At Last!

Don't give up hope. Albert isn't lost yet. A true champion will keep typing. She may hit some wrong letters, but most of the letters will be right. Each time she types the wrong letter, Albert scurries away from his home. But each time she taps the right letter, Albert turns around and runs in the right direction.

And eventually Albert makes it home.


*Albert Zap won't make it back this time in AlphaZap.*

But if he doesn't, that's all right, too. Albert isn't hurt—except for a mild headache from being beaned with a blimp-sized letter. And, with just the touch of a button, you can start the game over again and give him another chance. Once again, Albert is back outside his house going for a walk, and a new group of overweight letters is falling out of the sky. You can keep coming to Albert's rescue until you finally bring him home.

Unfortunately, Albert Zap does not have a lot of sense. As soon as you bring him home, instead of thanking you he heads back out his front door for another walk. Seconds later, more letters are raining down out of the sky.

It seems Albert Zap likes to live dangerously.

## *QuickFinger*

Albert Zap is the hero of a typing game called AlphaZap, put out by Quick Brown Fox, Inc.—the people who make the *Quick Brown Fox* word processor for the VIC-20 and the Commodore 64.

AlphaZap runs on the Commodore 64. It is part of a trio of typing games, collectively known as *QuickFinger*. The *QuickFinger* package comes on disk and costs under $40. It should already be in the stores, but if you can't find it, you should contact Quick Brown Fox directly:

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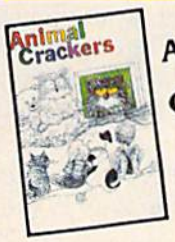


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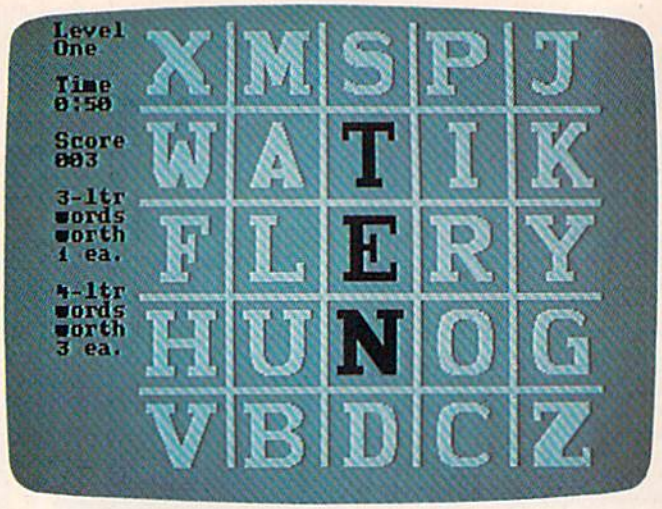


*Link the Letters*


*Keyboard Pacer*

## Tackling The Terrible Keyboard

Which part of a computer terrifies people the most? Is it the alien-looking floppy disk drive? The blank, empty-looking display screen? The snakelike cables?

Nope, it's the keyboard. The keyboard is like a wall that most adults and kids have to climb over. And most of them don't.

For little kids the keyboard is a jungle, stuffed with too many keys in too small a space. Kids' eye-scanning and finger-tapping motor skills often aren't up to tracking down and pressing that unique key that will make a program run or a game reward them. Computer keys often leave small children with tears, anger, and frustration.

The situation isn't much better for adults. Most adults don't know how to touch-type. Most adults have never heard of QWERTY. They have learned their alphabet from A through Z, then they look at a computer keyboard and find the letters all mixed up.

And if the jumbled letters weren't enough to stop them, all those extra keys on a computer keyboard will. How might a fearful adult feel about the keys with names like BREAK, STOP, CONTROL, END, RETURN, and ESCAPE? For an anxious adult, even a "friendly" computer key like HELP can take on an ominous, sinister meaning.

## Taking The First Step

Yet what would computers be without their keyboards? There are more and more alternatives to the keyboard. New devices for interacting with the computer are now appearing on the market, including mice, touch pads, and light pens. But the computer keyboard is still the primary way most people tell the computer what they want it to do.

We have to find ways to help people cope with the computer keyboard. One way is the typing program.

Typing programs, like *Typing Tutor* by IBM, *Type Attack* by Sirius, and *MasterType* by Scarborough, are a godsend to the average family member who is interested in learning how to use a computer but who is put off by the computer keyboard.

*QuickFinger*, from Quick Brown Fox, is, in my opinion, one of the best of these typing programs. It is for a very popular machine (the Commodore 64). It makes learning the computer keys easy and fun rather than boring and tedious. It has a trio of games, so you can switch back and forth. When you get tired of playing one game, you can switch to another game and still be practicing and improving your keyboarding skills. And the games are *deep*.

## Deep Typing

Tripp Hawkins of Electronic Arts has called for a new generation of microcomputer programs for the average person. To be for everyone, a program must be hot (appeal to the senses), simple, and deep.

What Hawkins means by deep is that a program must be suitable for users at a variety of skill levels *or* for a single user who is acquiring new skills and becoming more sophisticated. The program must be able to teach a person at one level, then it must be prepared to continue teaching the same person at ever higher levels.

The *QuickFinger* programs are deep. They are suitable for little children with tiny fingers or high-level executives with meaty paws or long painted fingernails. They are for hunt-and-peck or swift touch typists. They can be your first introduction to the computer keyboard or your refresher course, even if you already type 50 words a minute or more.

All the *QuickFinger* programs operate at multiple skill levels. You can enter a program at level one or level sixteen. Or you can let the program

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lead you automatically through the levels as your skill increases. Your progress is slow but steady. If you are having trouble mastering a certain level you can hang around until you feel comfortable and ready to try something more challenging.

As you progress the computer keeps score. You can save your scorecard on disk and recall it easily for later sessions on any of the three programs.

## An Extra Bonus

I have focused only on the AlphaZap program, but the other two programs are lots of fun, too. Keyboard Pacer shows a picture of the computer keyboard on the picture screen. One at a time, the letters on the buttons turn black. When you find that letter and press it, a new letter turns black.

This is a good program for even the tiniest child or the most fearful adult. You might be able to find only one key in two minutes, but if you get it right, you are rewarded.

The last program is called Link the Letters. This time you see a grid of fenced-in giant letters, like a screen-sized crossword puzzle. You have to link the letters into words. When you make up a real word, you get points and are rewarded with a charming sound like two crystal champagne glasses clinking together in a toast.

As a parent, I especially like the Link the Letters program. It is a good spelling game for my children. It helps develop their eye-tracking skills (up, down, to the left, and to the right). And it teaches them some of the structure of the English language, including common word beginnings, two-consonant blends, and word endings. It makes our language playful. And it helps a child learn how to organize words and recognize patterns.

## And Now Back To Albert

The best thing about *QuickFinger* is that when you get tired of linking letters and pacing yourself on the keyboard, you can go back and rescue Albert Zap again. He's a nice guy, really. But he doesn't have enough sense to come in out of the rain.

# Making Calendars

Paul C. Liu

**Put your printer to good use by making a full set of calendars. These four programs will give you a screen calendar, a wall calendar, an appointment calendar, and one for the year at a glance. For the VIC-20 and Commodore 64.**

A practical use for a computer with a printer is making your own calendars. Here are four calendar-making programs written for the VIC-20, three of which require the use of a printer. Since the programs are written entirely in BASIC without PEEKs or POKEs, they will also run on the 64 and can be easily adapted for other computers or non-Commodore printers.

In calendar making, it is essential to know the correct day of the week for any given date. If we let D1 be the day of the week (for Sunday D1 = 1, for Monday D1 = 2, and so on), and let M, D, and Y be the month, day, and year respectively, D1 can be calculated by:

```
D1=INT(2.6-(M-2)-0.2)+D+
   Y-1900+INT((Y-1900)/4)
D1=D1+INT(19/4)-2*19
D1=D1-INT(D1/7)*7+1
```

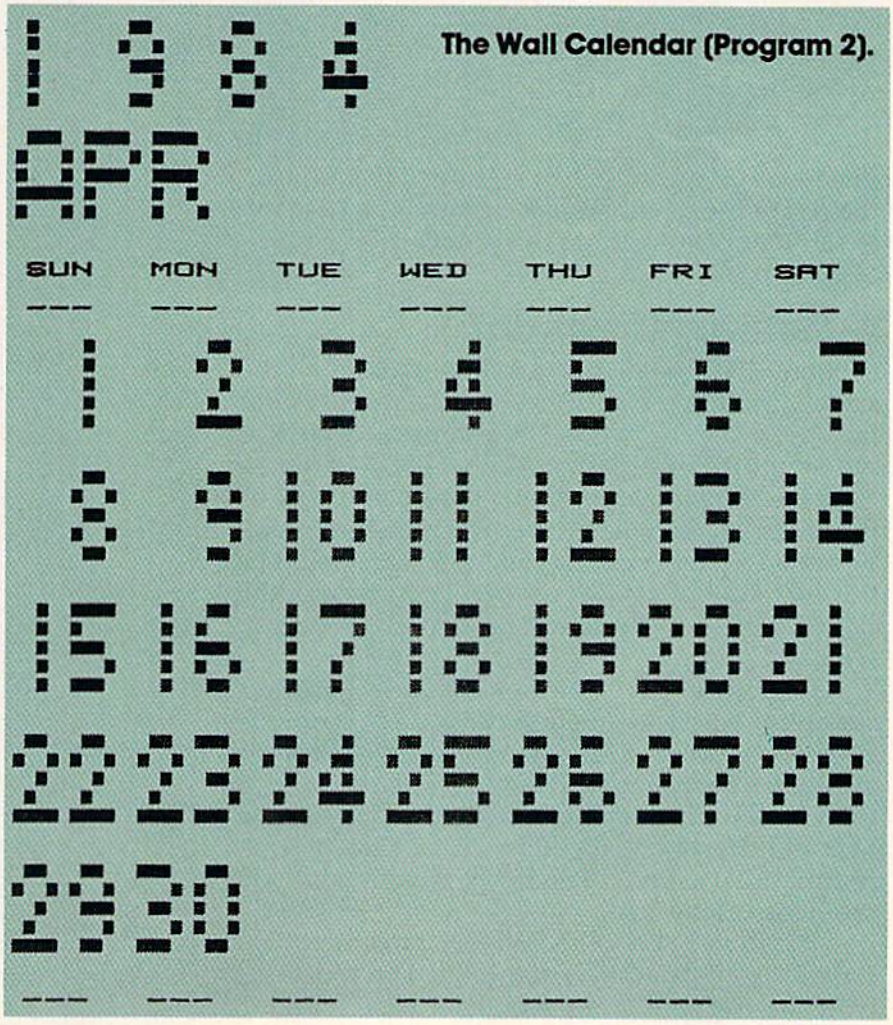
Two modifications have to be used with the above formulation. For M equal to 1 or 2 we have to add 12 and subtract Y by 1. In other words, we consider the months January and February as the thirteenth and fourteenth month of the previous year. In addition, for M equal to 4 or 9 the calculated D1 has to be increased by 1.

## It's Good For Over 100 Years

This algorithm performs flawlessly for the twentieth and twenty-first centuries, up to the year 2100. If you really want to be meticulous beyond that, you can make further modifications by reducing D1 by 1 after March 2100, and repeating that every 100 years. You must do this because the century years like 2100 and 2200 which are not divisible by 400 are not leap years, but the algorithm treats them as if they were.

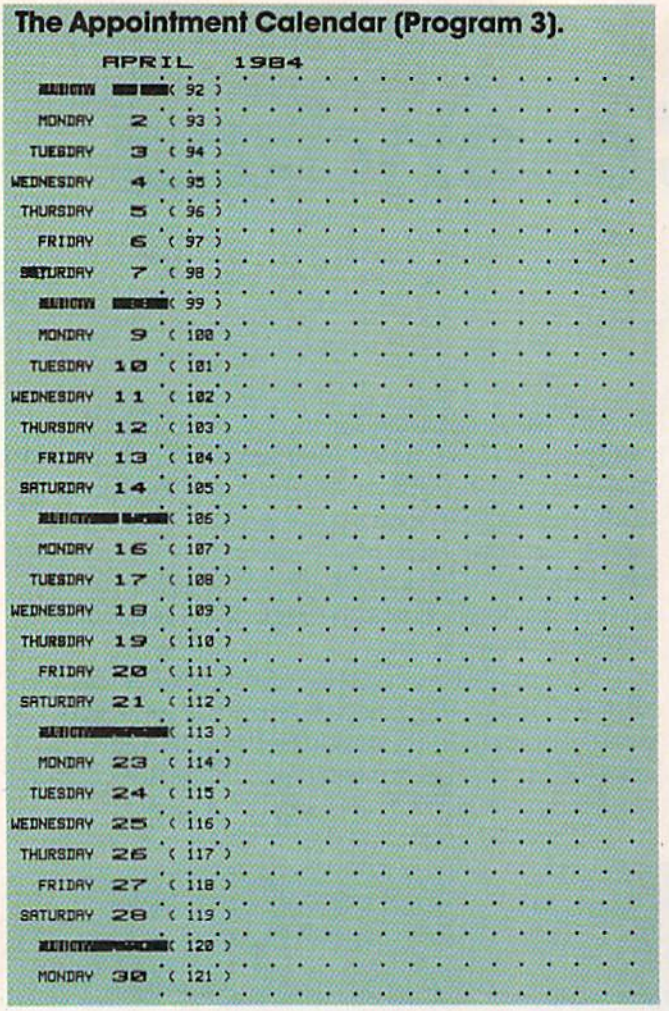
The programs contain modifications like the above to make them accurate for the next five centuries, provided, of course, that the current calendar system is not reformed. (The last calendar reform was in 1752.)

Once we know the day of the week for the




The Wall Calendar (Program 2).

**The Appointment Calendar (Program 3).**




given date, especially the first day of the month, the rest of the calendar-making task is just a matter of setting up and getting the proper format and display.

## A Monthly Calendar

Program 1 will display a monthly calendar on the screen. In this and the other programs, after you load the program, type RUN and press RETURN, the computer will briefly explain what the program is for and ask you to input the month and year of the calendar you wish to see. The numbers should be separated by a comma, and the year should be the full four digits (1984, not 84). Then the monthly calendar of your choice will be displayed on the screen.

Program 2 will give you a copy of what you see on the screen in the first program by printing it on your printer in enlarged form. This is a long program (it requires 8K memory expansion on the VIC) because it contains a set of enlarged numbers and characters, together with a bank of subroutines to use them. The result is a calendar you can hang on the wall.

Program 3 also gives you a printed monthly calendar, but in a different format. The program tabulates the days of the month as a list. It can serve as an appointment calendar for your desk, with room for short notes each day. Along with the regular date, you are told what day of the year it is. This program RUNs on the VIC without memory expansion.

## A Year On One Sheet

Program 4 will give you all 12 months of the year printed on one sheet. The message "Happy New Year" is at the top of the calendar, but you can put a different short message there by modifying the text in line 7. This program also needs no additional memory for the VIC.

In Programs 2, 3, and 4, after you input the month and year as requested, the computer prompts you to turn on the printer. Before you do this, you should set the perforation of the printing paper over the starting position of the print head so that the calendar will appear entirely on one sheet of paper. The programs are written for the Commodore 1515 and 1525 printers. Other printers may require modifications to the program.

*See program listings on page 150.*

HAPPY NEW YEAR 1984

**JANUARY**

| S | M | T | W | T | F | S |
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**APRIL**

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**MAY**

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**JULY**

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**AUGUST**

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**SEPTEMBER**

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**OCTOBER**

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**NOVEMBER**

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**DECEMBER**

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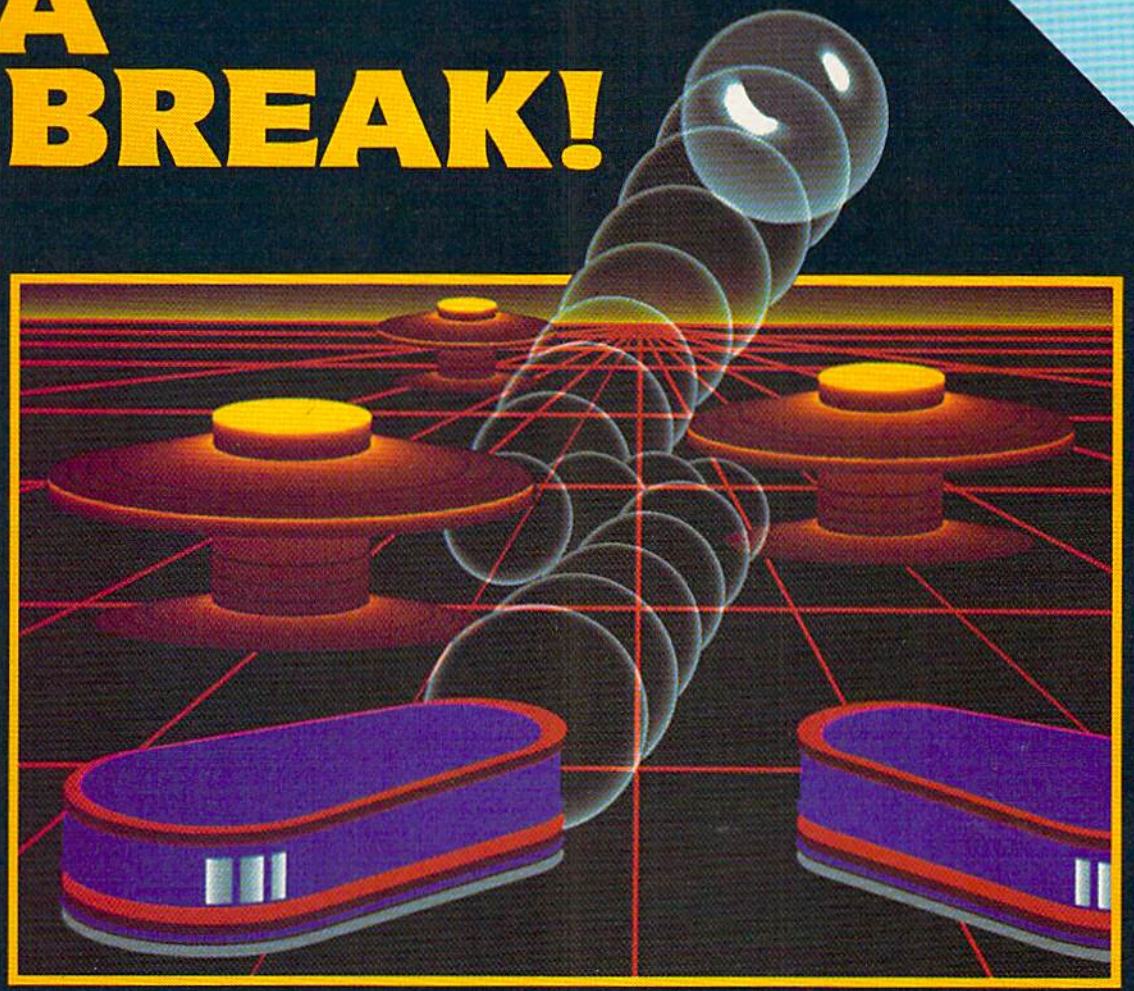
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 | | | | | |

**The Yearly Calendar (Program 4).**

# TAKE A BREAK!

For Commodore 64



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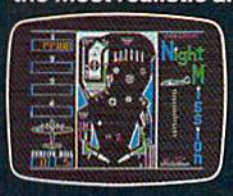

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# French Tutor

Michael Quigley


**"French Tutor" is a helpful study aid designed for those learning or strengthening French vocabulary and translation skills—English to French, or French to English. Written for the VIC-20, we've added a version for the Commodore 64.**

With two children studying French in elementary school, one of my reasons for buying the VIC-20 was to create some French instructional programs.

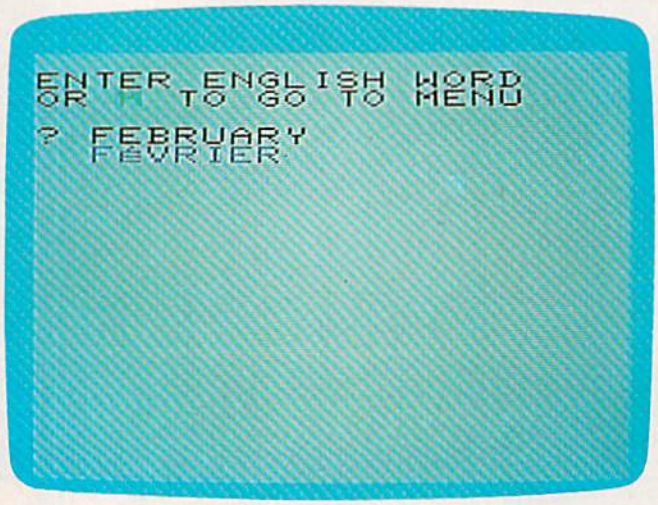
"French Tutor" was suggested by Steve Steinberg's "Language Lab" (COMPUTE!, July 1982), which provided for both drill and translation. It was relatively easy to adapt to the VIC, with a few minor modifications. For example, a dummy word (XX) is needed as the last item in the DATA statements to prevent the program from running out of DATA if a particular word is not in the list.

## Custom Accented Characters

Another modification involved the use of accents, which Language Lab did not include. The solution was to create the accents with programmable characters, as described in "Custom Characters for the VIC" by David Malmberg (*COMPUTE!'s First Book of VIC*). Program 1 describes which keys have to be pushed to obtain accented characters.

In addition to the familiar accented vowels, this program includes some which are used less frequently—the umlauted ë as in Noël, ü as in Saül, and ö for words of German origin. Also included are the combined œ for words like œuvre and æ as in Cæsar.

Program 1 also has a musical signature (which could be eliminated if it begins to pall).



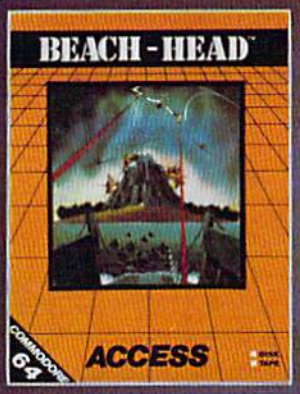

*A correct translation is entered in "French Tutor (VIC version).*

## Language Drills

Program 2, which is loaded by Program 1, is made up of four sections: French to English vocabulary drill, English to French vocabulary drill, French to English translator, and English to French translator. Because of severe restraints on the VIC's memory in Program 2, there are only 101 words, most of which employ accents and are no longer than five letters. With more memory, this total could be increased. If you do

# ACCESS

## NOTHING BUT THE BEST





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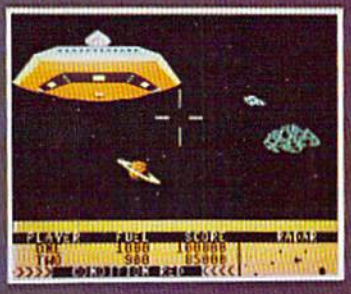


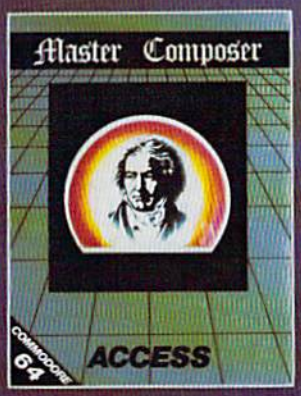


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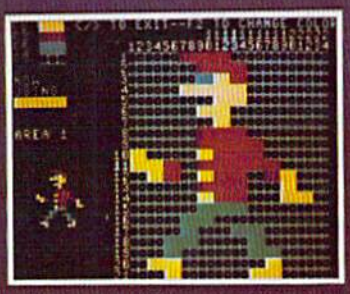

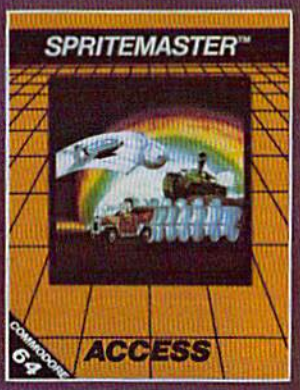


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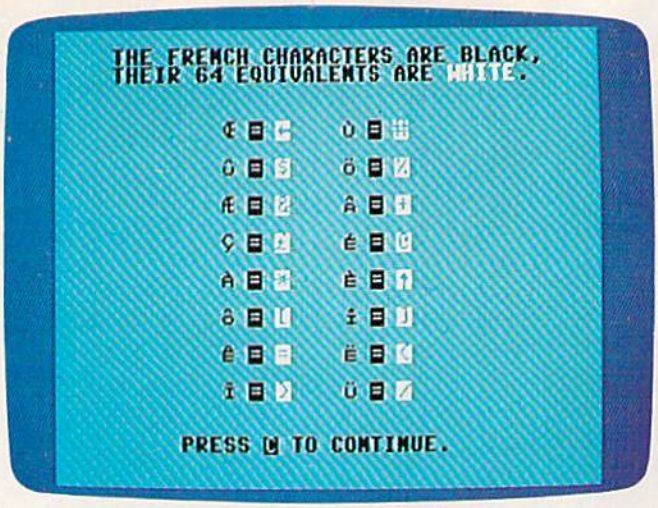


*"French Tutor" also includes French accents and symbols (64 version).*

have more memory, make the corresponding change to the number in line 43 (line 1610 in Program 3 for the 64) which randomly selects the words.

Additional memory can also be used to add more sound, but that will necessitate relocating the programmable characters. Also, the random selection of words can be changed so that, for example, if eight words are chosen, none will be repeated, which is not possible as the program is presently written.

Using the program with a disk drive opens up even more interesting possibilities. The four sections of Program 2 could be transformed into four individual programs, which could then be accessed by the menu. The disk drive's speed is an asset in jumping from one program to another, or to the menu itself.

## Use The Keyword Abbreviations

Memory in Program 2 is at a premium, and no extra spaces should be inserted. In order to make some lines fit in the maximum 88-character length, BASIC keywords should be abbreviated—PRINT becomes ?, GOSUB becomes GO followed by SHIFTed S, DATA becomes D SHIFT-A, and so on. (See *Personal Computing on the VIC-20*, pp. 133–34, or pp. 263–64 of the *VIC-20 Programmer's Reference Guide*.) In particular, lines 1–5 and several of the DATA lines require abbreviations.

Don't attempt to RUN the finished Program 1 more than twice to see if it works, or you will get an OUT OF MEMORY message. SAVE it on tape often when creating it, so you can always go back to your previous version if this should happen.

## Adding Words

The maximum number of words allowed for each Vocabulary Drill section in Program 2 is nine. This is because the VIC recognizes only the first integer with the GET A$ statement in line 10, which doesn't require the user to hit the RETURN key; that is, 20 words would become 2 words. In order to increase this number to 10 or above, eliminate the question mark from line 9, and make the following substitution for lines 10 and 11:

```
10 INPUTN:IFN<1THEN10                    :rem 83
11 IFCO=NTHEN14                          :rem 162
```

This now requires use of the RETURN key after the number is input.

For the 64 version, change lines 1280–1290 to:

```
1280 INPUTN:IFN<1THEN1280                :rem 39
1290 IFCO=NTHEN1320                      :rem 109
```

To make the program work with a disk drive, give Program 2 the name "F". Then, in Program 1, delete line 555 and make the following changes:

```
390 IFA$="N"THENPOKE36869,255:GOTO560
                                         :rem 163
580 POKE7993,34:POKE7994,6:POKE7995,34:PO
    KE7996,44:POKE7997,56                :rem 121
590 POKE198,1:POKE631,131:END            :rem 161
```

*See program listings on page 146.*

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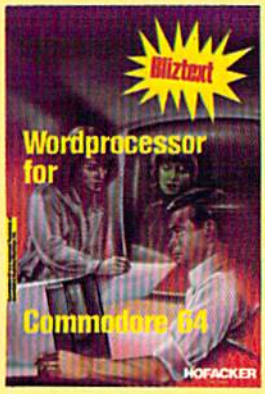


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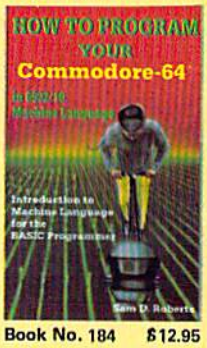


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# REVIEWS

## Edumate Light Pen

Dan Carmichael,
Assistant Editor

*Our artists enjoyed drawing with the Edumate Light Pen. Here are two samples of their work.*

In a recent poll conducted by our sister publication, COMPUTE!, only 6 percent of the readers indicated they own a light pen. In this age of the computer, the light pen has yet to catch on. It's unfortunate, too, because the light pen can make programs both easier to use and fun for the noncomputerist.

One such product is the Edumate Light Pen offered by Futurehouse. It comes completely wired and ready to plug into the joystick port of your Commodore 64 or VIC-20. Also included are an instruction booklet and a software package containing various programs for the light pen.

### A Full Demonstration

The software includes a hi-resolution drawing program, a disk utility, a music program, and a game of 3D Tic Tac Toe.

Draw Routine lets you draw in the hi-resolution graphics mode using the light pen. You are offered a choice of 16 colors (64 version), with options to clear the whole screen or erase individual lines.

Disk Utility is a general-purpose DOS (disk operating system) program which offers you a display directory option, and the ability to use the light pen to select a program, load, and run it. You can also initialize, validate, or format a diskette, display the directory, and scratch any files or programs.

3D Tic Tac Toe is played on four grids measuring four squares by four squares each. You select the grids and squares with the light pen. You win by placing an x in four squares horizontally, vertically, or diagonally, on one grid or all four.

Pen Music lets you play music by touching the light pen to various dots on the screen. You're given an array of 12 notes—a full musical scale—in any one of eight octaves. You can also use the light pen to select changes in decay, and the type of waveform you wish to use.

### A Few Restrictions

While all of the programs are usable, they do contain a few serious restrictions.

Only BASIC programs can be loaded using the disk utility. Because the format *LOAD "filename",8* is used instead of *LOAD "filename",8,1*, machine language programs that do not load beginning at location 2049 (the start of BASIC in the 64) will neither LOAD nor RUN.

The disk formatting option does not give you the choice of selecting a name for the diskette. All disks are formatted with the same header: "LPcreate "1.

While the music program does offer you the option of selecting the waveform and the decay setting, you cannot choose the filter, volume, attack, or sustain settings.

One of the more serious restrictions is found in the Draw Routine program. After creating your drawing, you are unable to SAVE it to tape or disk.

### A Good Teaching Aid

One important point about the light pen is its natural ability to attract and hold a child's attention. The light pen can be the added bonus that keeps a child interested in a math or spelling program.

Also, if you're a parent with even beginning or intermediate programming abilities, you can write your own tutoring programs.

In addition, Futurehouse is developing several educational and graphics software packages designed for use with the pen.

The price of the Edumate Light Pen is also a plus. While some software games can cost $29–$39 or more each, the price of the Edumate includes both the light pen and the software.

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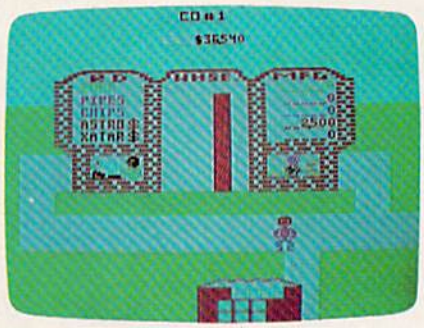
# *In The Chips*: Playing To Win In Business

Tony Roberts, Assistant Managing Editor



*"In The Chips" requires the player to make decisions involving research and development, manufacturing and marketing.*

An understanding of basic business concepts is a by-product of the competition in *In the Chips*, a program from Creative Software. The game is available on cartridge for the VIC-20, with a Commodore 64 version forthcoming.

Playing against either the computer or another person, you attempt to make the most money by developing, manufacturing, advertising, and marketing a group of products.

The game involves a series of turns in which you and your competitor each make decisions for the following business quarter. After your plan has been entered, the computer lets each of you know how you fared. Then you go on to the next quarter, modifying your decisions based on the results of the first quarter.

## Building A Business

You begin the game with a $100,000 investment in your company. Your first move is product development. You may develop up to five products—Zurn, Chips, Pipes, Astro, or Xatar—at a cost of $5000 each. Then you move to your production plant and decide how much of each product to manufacture at a unit cost of $10. Next, you move over to the accounting division and set up your pricing policies. Last on the list is advertising. If you have any cash left over, spend it here, for unadvertised products don't fare too well in this market.

The results of your first quarter depend on the relationship between your product line, production, and advertising and those of your competitor. If you're each selling Chips at the same price, the company doing more advertising will sell more.

After examining the ledger sheets, you go to work on the next quarter. Although you'll be in the red after the first quarter, you'll be able to use the income from first-quarter sales for further product development, production, and advertising. As you make your production decisions during the second and succeeding quarters, the display will show you how many units of each product you sold and at what price you sold them during the preceding quarter. Understanding and acting on

this information is essential if you hope to avoid bankruptcy.

## Standard Game Lasts Two Years

The length of play in *In the Chips* can be set by the players. A standard game is eight quarters (two years), though the program permits games of up to twenty quarters. An eight-quarter game takes about thirty minutes to play.

The best strategy seems to be to spend all of your available cash on production and advertising, and hope that your prices are better than those of your opponent. Keep in mind that the other player is pushing the same four products you are. This is head-to-head competition on the store shelves.

If things don't go well for you, the game may come to an early end when you fall into debt and can't raise enough capital to continue production. You'll be forced to sell off your inventory at a loss and the game will be awarded to your opponent.

Under normal conditions, you can't set prices at below production cost. However, one option permits you to cut prices as much as you like in an attempt to corner the market and force your competition out of business through lack of sales.

## Getting Around The Game

The game is played with a joystick. You are represented on the screen by a construction worker-type fellow in blue overalls and a red hardhat. Using the joystick, you move him from building to building on your business site. Once in a building, you use the joystick to change the numbers on the production

and price ledgers in much the same way that you add your initials to the vanity board of an arcade game. It takes a little time to understand exactly how to move around the board and what to do in each building. But once you catch on to the rules, things go quite smoothly. *In the Chips* features a demo mode in which the computer plays a game with itself. Though the demo moves rather quickly, studying the computer's moves can help you understand the game.

As an opponent, the computer seems fairly static, After you've played a few times, the computer's business plan becomes fairly obvious. Once you understand how the computer behaves, it becomes relatively easy to beat it. Though I haven't had much chance to play against live competition, I find that considerably more unpredictable and challenging.

Playing the game fairly requires a bit of self-control on the part of both players. You should agree not to watch the other player set his price and production levels, and you should refrain from studying each other's balance sheets.

## Learning About Business

In a very general sense, *In the Chips* simulates the business world. All activity is directed toward research and development, production, advertising, and marketing. The control you have in each of these areas is whether or not to spend money, but the game makes no attempt to cover the nuances and subtleties that exist within each of these areas.

However, *In the Chips* does illustrate the relationships among pricing, advertising, and sales, and can be used to demonstrate these concepts. But it must be understood that there's more to business than is portrayed here.

The financial summary provided at the end of each quarter contains plenty of grist for a discussion about the ways of business. The summary includes two parts: the balance sheet and an income and operating statement.

The balance sheet shows how much cash you have, how much capital is tied up in inventory, your investment, and finally, the bottom line.

The income and operating statement details the activities of the preceding quarter. This statement displays the amounts spent on advertising, production and development, and the amount earned in sales. Expenses are displayed in red and earnings in blue, graphically demonstrating income and outflow.

*In the Chips* is an entertaining game, and it's designed to be educational. It cannot be played successfully without first understanding the concepts involved, then thoughtfully applying them. But for anyone old enough and interested enough to learn a bit about business, *In the Chips* is a painless way to do it.

In the Chips
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*$29.95*

# Beach-Head For The 64

Shay Addams

Most computer war games involve moving little units of your army around a grid superimposed on an onscreen map—not the most action-packed way to fight a war. *Beach-Head*, however, puts you right in the thick of things, facing enemy ships and planes head-on. It's a one or two-player game whose object is to win a naval victory, then move inland to knock out the enemy fortress of Kuhn-Lin. There are six different phases in the campaign, each presented with finely detailed and colorful high-resolution graphics.

As the game begins, you get an overhead view of your ten-ship fleet, represented by four white dots floating in the ocean. On the left, a long stretch of beach reveals a narrow entrance to the bay. The fortress can be seen blinking in the lower-left corner, and the enemy fleet lies at anchor in the harbor.

Your first decision is strategic: Steam straight into the harbor, or try to sneak up on the enemy by approaching through a secret passageway into the bay, located further up the coast.

## Guide The Fleet Through Mines And Torpedoes

If you steer your fleet into the hidden entrance, another screen appears to show a wide, round underground lake strewn with mines. You must maneuver your ships one by one across the lake

and out the exit at the upper-left side of the screen. This isn't as easy as it sounds, because enemy torpedoes zip across the lake erratically. But you'll face fewer enemy planes in the next phase by taking this tack.

Either way, your ships enter the harbor, where the display changes to a first-person "you-are-there" scene: A huge aircraft carrier and four other enemy ships are seen at fairly close range.

Propeller-driven fighters take off from the distant carrier, and the droning of their engines gets louder as they approach. Appearing first as tiny dots on the horizon, they quickly grow into finely detailed planes that spit machine-gun fire from their wing tips, then veer off authentically instead of passing overhead. The only evidence of your own weaponry are the tips of a pair of barrels whose elevation and horizontal positioning can be controlled with the joystick.

## Unparalleled Animation

The three-dimensional sensation achieved in this sea-to-air battle is unparalleled. It's almost like being in the middle of a John Wayne movie. Another unusual effect involves the trajectory of your gunfire. The shells don't blast a straight line to the oncoming target, but describe a true arc, rising and falling in a smooth motion. When an enemy plane is hit, the explosion looks like comic book art rather than the flashing bursts typical of most games.

Each plane that manages to get past you does a little damage to one of your ships. The current damage is displayed at the bottom of the screen, and when it reaches a certain level, one of your ships will be destroyed. A red surveillance plane flies over occasionally; it's worth 1000 points. Shoot down enough enemy planes, and the carrier tries to escape by sailing off the left side of the screen.


*An enemy fighter is shot down in the opening scenes of* Beach-Head.

## Calculating Your Broadsides

This brings up the ship-to-ship battle. The shrill whistling of incoming shells alerts you before they hit, sending up tall white plumes when they splash in the water. After you fire a shot, several seconds elapse before it smashes into a ship or lands in the water. You can't fire another shot until the first one lands. At the bottom, a read-out displays your guns' current elevation. When one of your shells hits, a little range finder tells you how close you were to hitting the other ship.

It might say "10.5 degrees long" for instance. Each time the joystick is pushed forward, the guns are elevated half a degree. This means you have to do some quick mental calculations to determine how much to change the guns' elevation on the next shot. Pressure builds while you're trying to subtract 10.5 from a current elevation of 77, but it's worth it when you see the enemy ship sink slowly beneath the waves after you score a direct hit.

## Attacking The Beach

Sink all the ships, and the overhead view reappears so you can steer your fleet to the beach. This scene puts you in the driver's seat of a small tank that must weave through a series of closely placed walls and mines while you blast away at gun emplacements. The higher your score when you reach this scene, the more tanks will be lined up as reserves.

Once in motion, you can't turn back. The scenery scrolls by and there's no way to change your speed. It's a do-or-die situation. Make it across the beach and you'll face the Kuhn-Lin fortress and its unerringly accurate cannon.

It sits atop a big brown hill, where you immediately see a small white window. You have to put a shot through it. It turns black when you hit it, then another appears. Ten windows must be hit in order to demolish the cannon, which slowly aims down at you while you're popping shots at the windows. It never misses; the only way to nail it is to rely on a force of several tanks, each of which must hit several windows.

The sight of the cannon exploding and a little white flag waving from the remains of the fort is another visual plus that makes this shoot-em-up one of the best of its kind for the Commodore 64. You can choose from four skill levels and save high scores to the disk, and the pause feature is convenient when you want to call a temporary truce.

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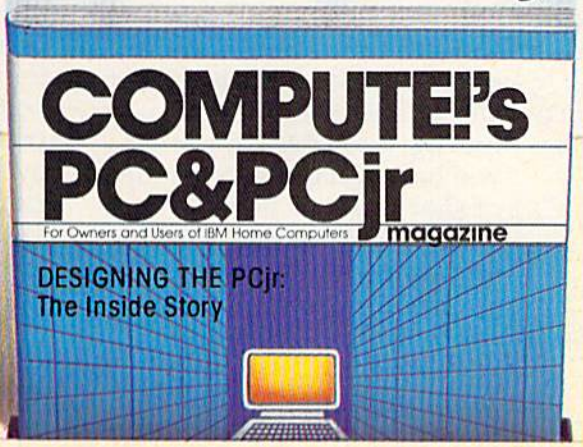


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# Lunar Leeper And Cannonball Blitz

Harvey B. Herman, Associate Editor

I trust that I'm not repeating myself too much when I say that the real advantage of owning a VIC-20 is that you get a real computer which can also play super games. I thought it was a bargain at $300 when it first came out; now at about $70, it is a steal. Any disadvantages—a limited memory and a 22-column screen, for example—are outweighed by its capabilities.

Recently, I received two more cartridge games to add to our growing collection. My kids, and to a lesser extent the adult kids (my wife and I), have had a lot of fun with what I have dubbed the second generation of VIC games. (The first generation was largely pedestrian.)

## Lunar Leeper

"Leepers are cute,
Leepers are sly,
It's a game full of dodging
to shoot up an eye.

Fly up and fly down
Forward and back,
Rescue your men
before Leepers attack."

The first two stanzas of the poem on the cartridge box cover neatly summarize this fast game. Your joystick controls a spaceship. Your mission: to score points by bringing men to safety on a cliff and destroying an evil eyeball.

Sounds easy, but of course it's not. In level one, you must evade one-eyed, froglike creatures (lunar leepers) which are jumping at your ship and shooting at you. They will eat you and your men if you are not careful. When this happens, you are literally sucked into their heads to the accompaniment of appropriate sound effects.

What makes the game difficult to master is that the speed and direction of your ship are controlled by the joystick, without benefit of brakes. You must keep your eye on an inertia meter or you might be moving too fast to pick up a man. Furthermore, you must keep an eye on your fuel gauge so you can refuel before your fuel runs out and you crash.

This game has features that we like to see in all games. It offers a choice of starting levels and a pause control. You keep moving up in difficulty when you have rescued all your men or shot all the leepers. There is variety. For example, level two is completely different from level one. In level two you find yourself in a cave containing a giant eyeball which must be destroyed while you dodge the eyeball protectors. There is little room for error in this convoluted maze. A good score requires lightning-fast reflexes and little time for thinking.

*Lunar Leeper*, which is also available on cartridge or disk for the Commodore 64, is an excellent game.

## Cannonball Blitz

"Cannonball Castle, fortress of the enemy redcoats, sits high atop Nutcracker Hill. It is your mission, as a rebel soldier, to climb Nutcracker Hill and destroy the castle. Not so fast, though—there are many traps and obstacles ... a constant rain of cannonballs could cause a fatally large headache."


*The ship has rescued a crew member, but cannot reach the fuel pod.*

The above blurb (from the package) is descriptive of the game. You want to get up to the top, but the Redcoat, kicking rolling cannonballs at you, has other ideas.

The game commences innocuously enough with a serenade of "When Johnny Comes Marching Home." Then the balls come rolling down at you and you don't have much time to think. You can jump over them if you're quick, or you can use falling cannonballs and a seesaw to propel up one vertical level. A balloon helps you ascend the final step to the Redcoat's flag.

Like other good games, it has a choice of levels. If you manage to reach the top and capture the flag, you listen to a victory song ("This Old Man," for example) and move up a level of difficulty. Points are scored by jumping over cannonballs, and at higher levels, by striking cannonballs with a hammer.

I found the game very difficult and never passed level one. So did my kids at first, but now one of them claims he has mastered it and can win almost every time. Keep that in mind if you have expert players who bore easily once they get the knack.

Lunar Leeper
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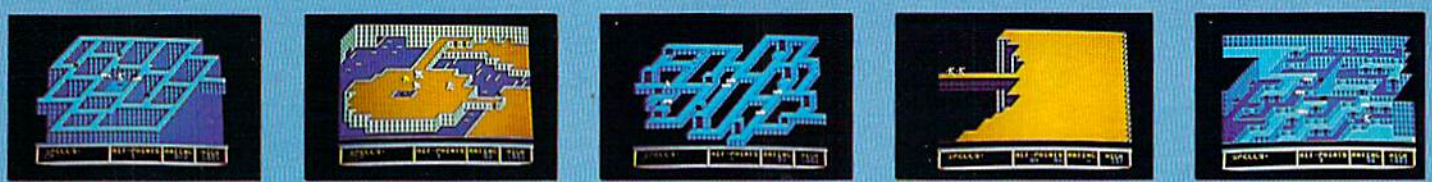

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# SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL, FEATURES EDITOR

# Q A

*Each month,* COMPUTE!'s GAZETTE *will tackle some questions commonly asked by new VIC-20/Commodore 64 users and by people shopping for their first home computer.*

**Q.** ***What is the meaning of the decimal numbers in BASIC 2.0, BASIC 5.1, etc.? Do the terms "extended BASIC" or "enhanced BASIC" have a real, definable meaning? Or are they mostly advertising puffery?***

**A.** In computerese, decimal numbers tacked onto names of products—usually programs—indicate the current version of the product. In other words, they denote the product's current state of revision. A word-processing program named *WordMangler 2.2* is a more current version than *WordMangler 1.5*. The higher the number, the later the revision.

As far as I've been able to determine, there aren't any formal rules governing the use of these numbers. Logically, you would think that the first version of a program would always be labeled 1.0, right? But often new programs appear on the market with a postscripted 2.0 or even 3.5. Apparently the earlier-numbered versions were not fit for public consumption and never made it out of the programmer's workshop.

In lieu of formal rules, a few general conventions seem to be followed. If a revision is more or less minor—to fix a small bug, for example—the number is incremented by only a fraction, such as 2.0 to 2.1. But if major changes are made—perhaps to incorporate significant new features, or adapt the program to another computer—the number is moved up a whole notch, such as 2.0 to 3.0.

The same conventions are followed when numbering programming languages such as BASIC. (BASIC itself, of course, is just a large program written in machine language.) You've probably seen these revision numbers when writers refer to various versions of Commodore BASIC. The very first Commodore computer, the PET (Personal Electronic Transactor), came out in 1977 and had a version of BASIC known today as Original ROM BASIC (so named because the BASIC was stored in ROM—Read Only Memory). Later, this BASIC was revised and became known as Upgrade ROM or BASIC 2.0. The BASIC language built into the VIC-20 and Commodore 64 is essentially BASIC 2.0.

Improved models of the PET, known as the 4032, 8032, and SuperPET, have an even better version called BASIC 4.0. Among other things, this BASIC has more efficient garbage collection and built-in disk commands. Compare these two procedures for deleting a file off a diskette in disk drive 0.

In BASIC 2.0:

```
CLOSE 15:OPEN 15,8,15,"SCRATCH0:filename":
  CLOSE 15
```

In BASIC 4.0:

```
SCRATCH "filename"
```

What's more, BASIC 4.0 even asks, "Are you sure?" before going ahead and scratching the file. That's where the terms "extended BASIC" or "enhanced BASIC" are applied. In effect, BASIC 4.0 is an extended or enhanced version of BASIC 2.0. It's easy to see how extended commands can make a computer easier to use.

Unfortunately, there are no absolute, definable meanings to the terms "extended" or "enhanced" when applied to various BASICs. Presumably, these terms indicate that the BASIC does indeed have more advanced commands, but remember that one computer's extended BASIC may be no better than another computer's standard BASIC. For example, the extra sound and graphics commands found in many extended BASICs sold for the VIC and 64 are built into the regular BASICs in some other home computers. To avoid being misled by advertising puffery, ask to see a list of the extra commands so you can judge for yourself. If possible, try out the commands before buying the BASIC to see how useful they really are.

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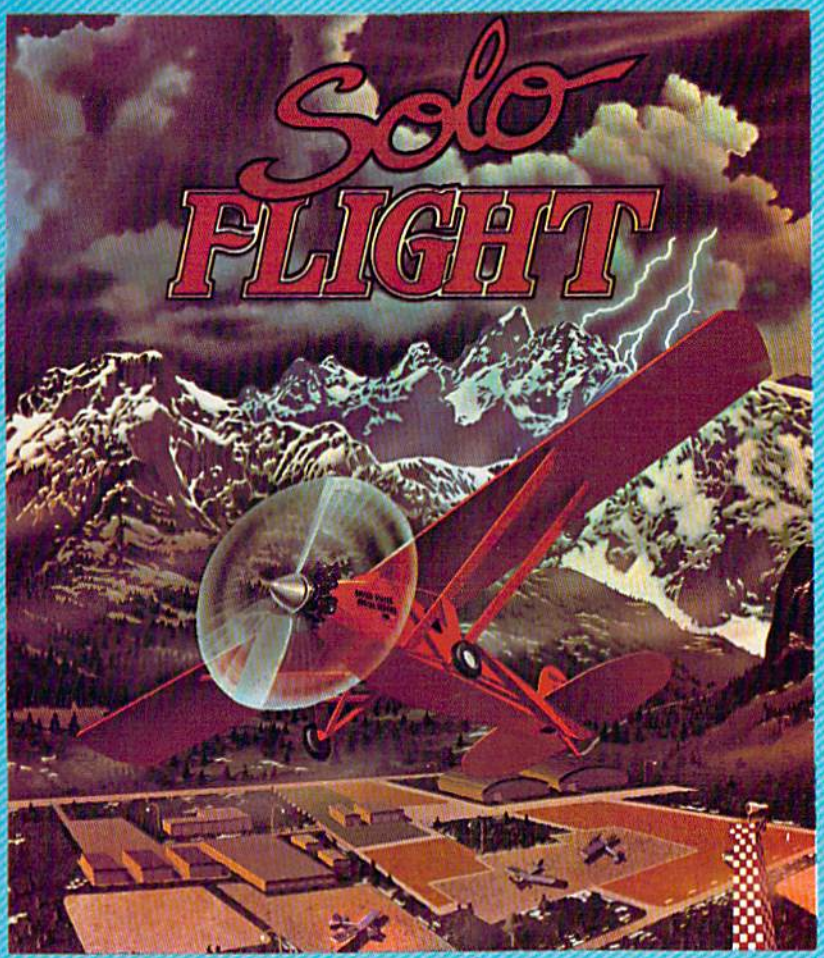


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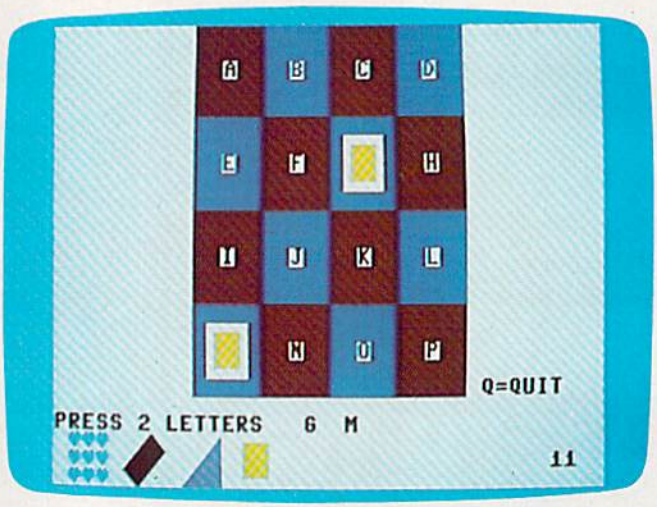
C. REGENA

# MATCH-EM

A question I am often asked is how to convert programs for one computer to versions for another. Although published program listings for the VIC and 64 were at first sparse, they aren't anymore. The need for conversion is less important. However, you sometimes find a program written for another computer that you wish you had for yours.

Conversion isn't that difficult. The main BASIC commands are the same for most all microcomputers, and the logic is the same. The major differences in the programming commands for microcomputers are the sound and graphics commands. Each brand of computer requires a special method of programming sound and graphics. I have found it easier not to strictly convert these commands, but to rewrite sound and graphics for each particular computer.

I have had quite a few requests to convert "Match-Em," originally published for the TI-99/4A in the April 1983 issue of COMPUTE!. Here it is for the VIC and the 64.




*The goal is to find the matching pairs in "Match-Em," for the VIC and 64.*

## How To Play Match-Em

Match-Em is a simple matching game designed for young children. The screen displays 16 squares, each with a different letter. Press the letters on two of the squares to try to match the shapes hidden behind those letters. If you successfully "match-'em," the shape will be drawn at the bottom of the screen, and you will not be able to use those squares again. If you choose a square which has previously been matched, instead of a shape you will see rows of X marks.

There are eight pairs of shapes to try to match. The game is over when all eight pairs have been discovered. The object is to score as low as possible—you get one point for each guess.

If you wish to stop the game at any time, press Q to quit. The placement of all the shapes will be shown. After each game you have the option of trying again. If you press Y for yes, the shapes are scrambled in a different order, and the score is reset to zero. If you press N for no, the program ends.

Feel free to change the graphics. I used some shapes made up from the graphic shapes on the fronts of the keys. You can get fancy and create sprites on the 64 if you wish. And you can make up different designs or even animals to match.

The principles of a matching game are the basis for many educational games. You can use the same general logic to develop matching games for a variety of subjects. For example, instead of shapes you could match a capital letter with a lowercase letter. Try matching a picture with its beginning letter. Match parts of compound words, or perhaps homonyms, antonyms, or synonyms. In geography, match states and capitals or,

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perhaps, rivers with countries or countries with continents. In history, match a date with a historical event. In mathematics, match a problem with its answer.

## How The VIC And 64 Versions Work

I first wrote the 64 version of this game, then combined lines and changed the graphics and sound commands for the VIC version. To aid my program explanation, I kept the VIC line numbers consistent with the 64 version.

Line 1 defines the border and screen color combination, clears the screen, and defines the printing color.

Line 10, a DIMension statement, is used to reserve array space for 16 elements each in A, B, C, and P. A and B keep track of the eight shape numbers. C is the color number for a particular square on the screen. P is a position number used in drawing the graphics for a particular square.

Lines 20–80 print the title screen and instructions. Line 90 reads the values for the position and color of each square from the data in lines 100–130. In line 140, CC is defined as a number that relates the screen memory map with the color memory map. A$ and B$ are used to print the 16 red and blue squares.

Lines 150–160 turn on the sound and define variables used to play sounds—a beep to signal the player's turn to press two letters, an "uh-oh" sound for no match, and an arpeggio for a correct match.

Lines 170–180 wait for the player to press the f1 key to start the game. To type this line, press the f1 key between the quotes in line 180. You may choose a different key to be pressed if you prefer.

Line 190 clears the screen, and in the 64 version line 200 changes the screen to white. Lines 210–230 print the red and blue squares on the screen. Line 240 prints the letters on the squares, then line 250 prints the Q option.

Lines 260–300 are my way of arranging the shapes. Each of the shapes is numbered from 1 to 8. The B array can be considered a screen with the shapes in order (1-2-3-4-5-6-7-8-1-2-3-4-5-6-7-8). The A array is formed by choosing one of the B elements randomly. After a B element has been chosen, it is set to zero so it cannot be chosen again. Line 3[illegible]hen redefines the B array to be the same as the A array. If the player presses Q or ends the game, the B array is used to see the original position of all the shapes.

Lines 310–330 define random colors for the shapes, making sure the shape color is not white, red, or blue. The score (SC) and number of correct shapes (S) are initialized to zero. S is used to determine the position to print the shape at the bottom of the screen when it is correctly matched. Line 340 POKEs color onto the screen where the score will be printed.

Line 350 prints the message to press two letters. Lines 360–370 increment and print the score at the bottom right corner of the screen. Lines 380–390 create a beep to indicate to the player that it is time to press two letters.

Line 400 scans the keyboard to see which letter the player presses. If no key is pressed, the POKE statements blink the dash for the letter on the screen. Lines 410–420 make sure that the letter pressed is between A and Q and that all other keys pressed are ignored. The letter pressed is printed on the screen, replacing the dash. R1 is the first letter pressed, and R2 is the second letter. Line 430 has the computer branch if the letter Q has been pressed.

Lines 440–470 print the shape corresponding to the square chosen. If the square has previously been matched, A will be zero and X marks will be printed instead of a shape. In line 470 the ON-GOSUB branches to the appropriate subroutine to draw the particular shape. GOSUB 780 colors the shape.

Line 480 sets the position for the second dash, then line 490 blinks the dash while waiting for the second letter to be pressed. Lines 500–570 are similar to lines 410–470, which print the shape of the second letter chosen.

Lines 580–640 play the "uh-oh" sound if a match is not made. Lines 650–680 play an arpeggio if a match is made. Lines 690–700 print the shape at the bottom of the screen, then line 710 sets the A elements to zero so they cannot be matched again. Line 720 branches if all eight shapes have been matched and the game is over.

If the game is not over, line 730 waits until the player presses the space bar to continue playing. Then lines 740–760 "cover" the squares and replace the previous letters with dashes so line 770 can branch back to the beginning of the choosing procedure.

Lines 780–800 contain a subroutine to color the shape after it has been drawn. A subroutine in lines 810–840 replaces the shape on the screen with its original red or blue square and corresponding letter. Lines 850–1070 contain the subroutines to draw the eight shapes.

Lines 1080–1100 contain the procedure if a player has correctly matched all eight shapes. The message to press two letters is cleared, then some random tones sound to signal the end of the game.

If a player presses Q or if the player has matched all eight shapes, lines 1110–1130 show all the shapes for the 16 positions on the screen. Lines 1140–1170 print the option to try again, and the program branches appropriately.

*See program listings on page 140.*

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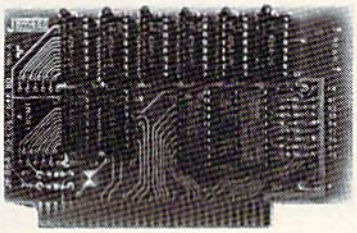

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# Little Known BASIC Commands

Todd Heimarck, Assistant Editor

**You probably know how to use BASIC commands like PRINT and INPUT. But how many of your programs contain WAIT, ATN, or LOG? These and other seldom used Commodore BASIC commands can help you do more with the programs you write.**

When you're speaking or writing, you can choose from a smorgasbord of about 175,000 English words, not counting proper names. Some have been around hundreds of years and are rarely used anymore; when was the last time you said "yclept" or "soothly"? Others are narrowly defined technical terms, used primarily within a trade or profession.

As diverse as our language is, there are a few words that do most of the work. Linguists estimate that if you know just 3,000 English words, you are able to understand over 80 percent of what you read or hear.

## Expanding Your BASIC Vocabulary

Commodore BASIC is much more limited than English or any other natural language. For one thing, it contains only about 70 words. And there are strict rules of syntax about how you can use them. BASIC is not a language for poets.

But BASIC is similar to English in that there are a few workhorse words, common commands that are used time and again.

To get information into the computer, you need INPUT, GET, and READ-DATA. To perform loops and make decisions, FOR-NEXT and IF-THEN. To put the results on the screen, PRINT.

Now let's expand our vocabulary a bit with some of the little known commands.

## ABS (ABSolute value)

ABS determines the absolute value of a number. It leaves positive numbers alone and changes negative numbers to positive. It may sound rather useless, chopping off minus signs, but there are some interesting things you can do with it.

The most obvious application of ABS is in financial calculations. When you want to make sure that no negative numbers appear in a program, you simply ABS them. Another application would be a checkbook register which lists all deposits and checks. Perhaps your program automatically uses negative numbers for checks, but you want to print the list without minuses all over the screen.

ABS can be used to avoid crashes in programs using SQR (square root) or LOG (logarithm). These mathematical functions and others will accept only positive numbers; numbers less than zero will cause an error message.

ABS can also be used in a toggle routine. Let's say you want a variable to switch back and forth between two different values. You could use the following subroutine:

```
1 T=3
499 REM TOGGLE SUBROUTINE
500 IF T=3 THEN T=16: RETURN
510 IF T=16 THEN T=3: RETURN
```

Each time you want to toggle, you GOSUB 500. As you can see, T switches back and forth between 3 and 16. But the following routine will

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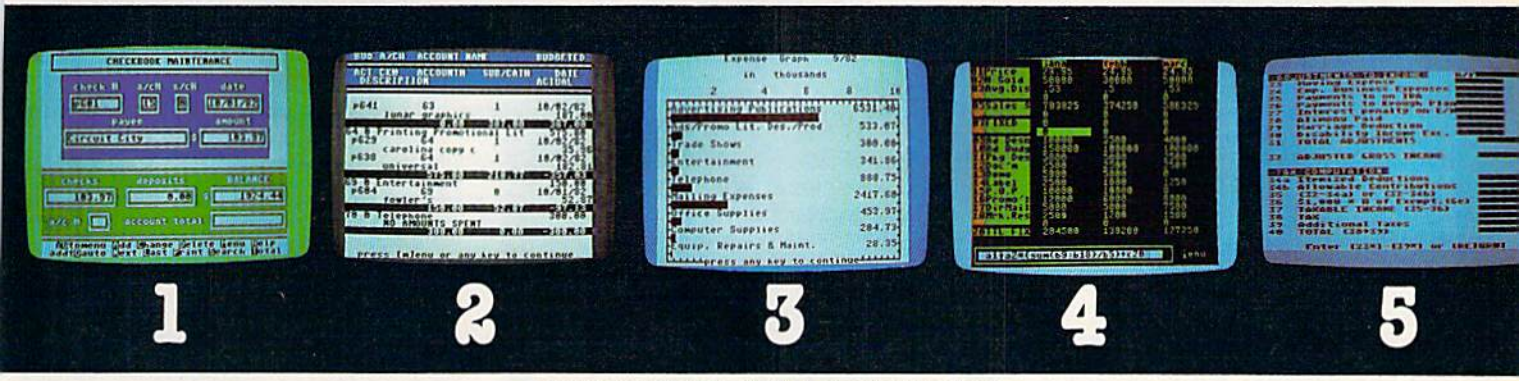


actual screen display *Indicates function being shown

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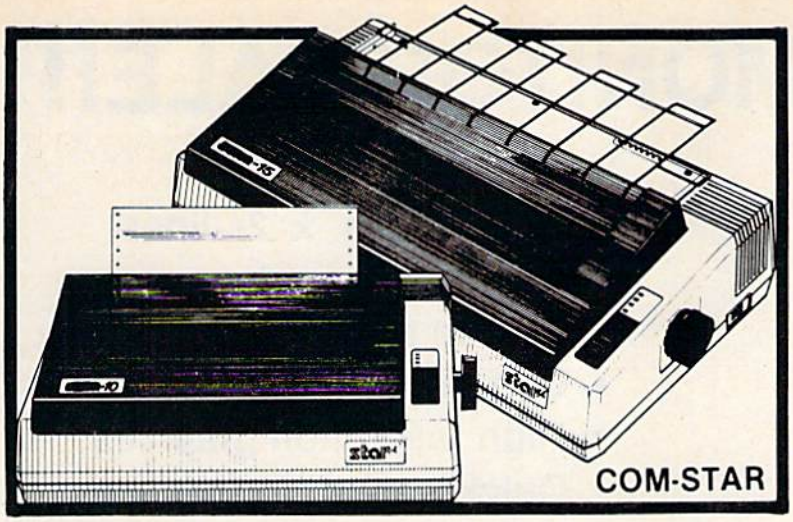


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do the same thing with just one line:

```
1 T=3
499 REM ABS TOGGLE SUBROUTINE
500 T=ABS(T-19): RETURN
```

Line 500 does it all. If T is 3, 3 minus 19 is –16, and the ABS chops off the minus sign. But if T is 16, subtracting 19 yields –3, and the minus sign is chopped off.

## POS (POSition of cursor)

To understand how the POS(X) command works, you should recall that you are limited to 88 characters per program line on the VIC-20 (80 characters on the 64). However, a full program line won't fit on one line of the screen. A line on the VIC's screen is only 22 characters wide, and a screen line on the 64 takes only 40 characters. So, a full program line can fill up to four screen lines on the VIC and two screen lines on the 64.

A program line stored in memory is called a *logical screen line*. This logical line is displayed on your TV or monitor in one or more *physical screen lines*. The POS(X) command tells you the position of the cursor within the logical screen line. On the VIC, the position number ranges from 0 to 87, and on a 64, it ranges from 0 to 79.

Whenever you press RETURN, the cursor position pointer is set to position 0 (the first position), and the cursor moves to the beginning of a new physical screen line. Every time you type a character, the position pointer increases by one and the cursor moves one position to the right on the screen. On the VIC, when you type in the twenty-third character, the cursor moves to the beginning of the next physical screen line, but the pointer increments to position 22, in the logical screen line. (This occurs with the forty-first character on the 64; the pointer would contain a 40.) The pointer continues to increase until you type the maximum allowable number of characters, or you type a RETURN.

The POS function is little used, for good reason. When was the last time you asked yourself, "I wonder where the cursor is?"

But there is a way you can use POS. When the 64 PRINTs a line longer than 40 characters (22 characters on the VIC), it wraps around to the next line. Words are often split haphazardly, making text hard to read.

To avoid splitting words, you can use POS(X) to check the cursor position and LEN(N$) to check the length of the next word to be printed. If position + length exceeds the character limit of the physical screen line, PRINT CHR$(13) to reset the position pointer to 0, then continue printing your text.

The variable X in the parentheses of POS(X) is a dummy argument; it doesn't matter what value you use.

## WAIT

Like POS, WAIT is seldom needed in BASIC programs. To understand how it works, think of it as WAIT-UNTIL. For example, you WAIT to cross the street UNTIL the light is green. WAIT stops program execution UNTIL a memory location contains a certain number. When the location contains the proper value, program execution continues.

WAIT statements use the form WAIT *l*, *m1*, *m2*. *L* is the memory location to be checked. *M*1 is mask one; *m*2 is mask two (which is optional). The computer PEEKs memory location *l*, exclusive-ORs the value with *m2* and ANDs it with *m1*.(For further information on masks and the logical operations AND and exclusive-OR, see "The Inner World Of Computers, Part 2: Why Computers Are Logical" in the December 1983 GAZETTE, or *Machine Language for Beginners*, COMPUTE! Books.)

WAIT is rarely used because memory locations don't change arbitrarily. Since memory is used for storage, you expect memory to hold onto its contents. If a number in RAM changes, there has to be a good reason.

Certain peripherals use memory locations as buffers and registers. Thus, WAIT is usually used in input/output operations. You might want your program to pause until a signal comes over the phone line to your modem, for example. You would use WAIT to check a buffer or input register when the signal comes in, the register changes, and the program continues.

Datassette users can protect graphics displays with a WAIT statement.

Let's say you write a program which uses data stored on a tape, but it does not read the data until halfway through the program. You know that when the program sees OPEN it will print PRESS PLAY ON TAPE in the middle of the screen. You may have a nice graphic display (or a high-resolution screen) that you don't want ruined by the prompt.

A WAIT can test to see if a button has been pressed on the tape player:

```
WAIT 1,16,16   (64 version)
WAIT 37151,64,64   (VIC version)
```

If you put this line in just before you OPEN the data file, the program will wait until a button is pressed on the tape drive. It will not print PRESS PLAY ON TAPE. When the play button is pressed, a bit is switched in memory. Your computer stops waiting and opens the file for input. But, alas, solving one problem may create another. If the user does not know what is happening, he or she may end up waiting for the computer to do something, as it waits for the user to do something. To help other people use your programs, you should

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put a prompt on the screen just before the WAIT statement is executed, telling the user what to do.

You can do it the other way, too. If you want the computer to wait for the user to press the stop button on the tape player, use:

**WAIT 1,16 (64 version)**
**WAIT 37151,64 (VIC version)**

There are times when a joystick does not work with the VIC because the play button on the cassette drive is still on. Using the above WAIT statement can test for this problem.

## CONT (CONTinue)

CONT is a valuable debugging tool. It allows you to restart a program which has stopped because you pressed the RUN/STOP key, or because the program hit a STOP or END.

Let's write a simple program with a bug:

```
10 M=2                                    :rem 29
20 INPUT "NUMBER"; N                      :rem 136
30 PRINT N; "TIMES TWO IS"; N*M           :rem 213
40 FOR M = 1 TO 20: NEXT M: REM DELAY LOO
   P                                      :rem 152
50 GOTO 20                                 :rem 0
```

Now RUN the program. The screen says NUMBER? Type in 15, press RETURN, and it gives the result of 30. So far, so good. Now try zero. Zero times two is zero. It seems to be working. Type 4 and the computer says four times two is eighty-four. Something is wrong.

It's debugging time. Insert this line: 35 STOP.

RUN it again and the computer multiplies correctly. Then it stops and says BREAK IN LINE 35. Type CONT and it continues. Try another number (except zero). The answer is incorrect; the program stops again. Type PRINT N, M and you will discover that M is now equal to 21. If you want to try another number, type CONT. Each time you will discover that M equals 21. That's a clue that something is not working right.

If you're wondering what the bug is, you may notice that M starts out as 2 (line 10), but that it is also used in the delay loop. To correct it, you have to use a different variable in line 40.

Some bugs do not occur right away. The first time through, everything works. Then the bug pops up. The best way to step through a program is to use the STOP-PRINT-CONT combination.

There are a few BASIC commands that can be used only in a program; they don't work in immediate mode. CONT is unique: It is the only command used exclusively in immediate mode.

## SGN (SiGN)

SGN is used to evaluate numbers. If the number is positive, the result is 1. If the number is negative, SGN gives you a –1. If the number is zero, you get a zero.

This function complements the ABS command discussed above. ABS throws away the sign so you can look at the number. SGN throws away the number but keeps the sign.

Some programmers use SGN to make decisions about branching.

```
10 FOR J = 1 TO 5: READ K: PRINT K;
                                          :rem 198
20 ON (SGN(K)+2) GOTO 30, 40, 50 :rem 238
30 PRINT "IS NEGATIVE.": GOTO 60  :rem 42
40 PRINT "IS ZERO.": GOTO 60      :rem 24
50 PRINT "IS POSITIVE."           :rem 115
60 NEXT J                         :rem 239
500 DATA 15, 300, -4, 0, -654.32  :rem 72
```

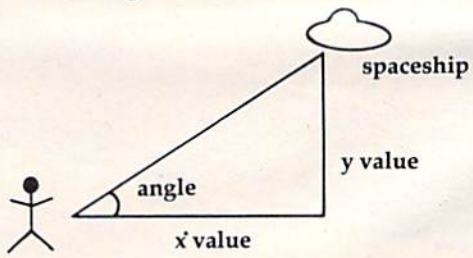
In the program above, line 20 checks the sign of the number. SGN(K) yields –1, 0, or 1. Add two to get 1, 2, or 3. The ON-GOTO then makes the program branch to line 30, 40, or 50. It's a quick way to check for positive or negative numbers and branch accordingly.

SGN is also good for comparisons. To compare two numbers (the scores of player one and player two, for example), subtract one from the other, and use SGN to evaluate which one is higher, perhaps with the ON-GOTO syntax of line 20 above.

## ATN (ArcTaNgent)

Few people have neutral feelings about trigonometry; you either love it or hate it.

If you can't remember anything you learned in trig, don't worry, this won't be too technical. First, look at the triangle below.




Imagine that you are looking at a spaceship flying toward you out of the sky. Your computer can figure out the values for x and y, but you have to aim the laser, which is your only defense. And you don't have a joystick; you have to figure out the angle at which to shoot.

You're in luck because your computer knows how to use ATN. ATN(Y/X) gives you the angle in radians. Divide by π (pi) and multiply by 180 to get the answer in degrees. (To type the π symbol, hold down SHIFT and press the up-arrow key.) This simple program calculates an angle from X and Y coordinates.

```
10 PRINT "X AND Y COORDINATES"    :rem 241
20 INPUTX,Y                       :rem 207
30 IF X=0 THEN S=SGN(Y):D=90*S:R=S*↑/2:GO
   TO50                            :rem 39
40 R=ATN(Y/N): D=R*180/↑          :rem 251
50 PRINT "ANGLE IS";R;"RADIANS": PRINT D;
   "DEGREES": GOTO 10             :rem 164
```

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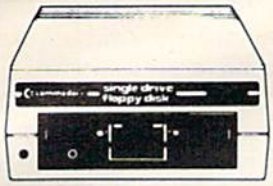

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When you run the above program, you will notice that the angle will always range from $+\pi/2$ to $-\pi/2$ ($+90$ to $-90$ in degrees). If you want the full range of 0 to 360 degrees, you have to figure out which quadrant you're in and adjust the results. You would most likely use SGN to find out if x and y are positive or negative.

ATN may seem to be an esoteric, obscure function of interest only to mathematicians, but there are times you may need it.

If you want to do a three-dimensional display, for example, you will probably need ATN to figure the angles. It may also be useful in a *Star Trek* simulation when you need to figure out where the ship is and which shields the Klingons are battering.

Anytime you are working with angles, remember ATN.

## LOG (natural LOGarithm)

This is another function which may intimidate those who aren't mathematicians. The idea behind it is actually fairly simple and can be helpful in some programs.

If you type PRINT10↑4, the result is 10000, because it's ten to the fourth power. Reversing this function, the logarithm (base ten) of 10000 is 4. Simply put, the logarithm of a number is the exponent you use on the base.

AM radio dials use a logarithmic scale, which is why the distance between 600 and 800 appears to be bigger than the distance between 1400 and 1600. You can also find a logarithmic scale on a slide rule.

The LOG built into your computer does not use base ten. It is a *natural logarithm*, which has certain special properties. Try the following short program:

```
10 INPUT"NUMBER";N                    :rem 135
20 PRINT: PRINTLOG(N)/LOG(2),         :rem 247
30 PRINT LOG(N)/LOG(10)                :rem 52
40 GOTO 10                            :rem 254
```

This program figures out the log (base two) and the log (base ten) of a number. Try inputting the numbers 10, 100, 1000, and so on. The right-hand column should contain whole numbers. Now try 2, 4, 8, 16, and 32. You should see integers on the left.

So far it's just math. Now let's use LOG to solve a common problem. Computers are good at moving numbers around. And it is sometimes necessary to print a column of numbers with all the decimal points lined up, nice and neat.

Unfortunately, Commodore BASIC has neither a PRINT USING nor a PRINT AT command. Beginning programmers sometimes align numbers with a complicated string-conversion procedure. For example, they might use INT to make the number an integer, STR$ to make it a string variable, LEN to find out the length, and finally a calculated TAB to print the number in its place.

Using LOG can make things simpler. The following program aligns numbers of all sizes.

```
10 T=LOG(10): D=14                    :rem 166
20 INPUT N                             :rem 64
30 S=INT(LOG(N)/T)                     :rem 51
40 PRINT TAB(D-S);N                   :rem 102
50 GOTO 20                              :rem 0
```

Line 30 figures the base ten logarithm of the number from line 20. In effect, you find the length of the number by using its (base ten) logarithm. Numbers 1 through 9 have a log of zero, 10 through 99 have a log of one, and so on.

But, unfortunately, we have once again solved one problem and created another. We cannot find the logarithm of a negative number or zero. This can be remedied with two of the BASIC commands described earlier. Add the following line to trap zero:

```
25 IF(ABS(SGN(N))-1) THEN S=0: GOTO 40
                                      :rem 25
```

It would actually be simpler to say IF N=0 THEN S=0, but let's go with ABS and SGN. To deal with negative numbers, change line 30 from LOG(N) to LOG(ABS(N)).

And now we have it, a routine for aligning decimal points, without having to resort to integer/string conversion.

## Using Little Known Commands

The most useful BASIC keywords are still the most common ones, such as PRINT and FOR-NEXT. But if you take the time to learn these seldom used commands, you may be rewarded someday when you are struggling to solve an unusual programming problem.

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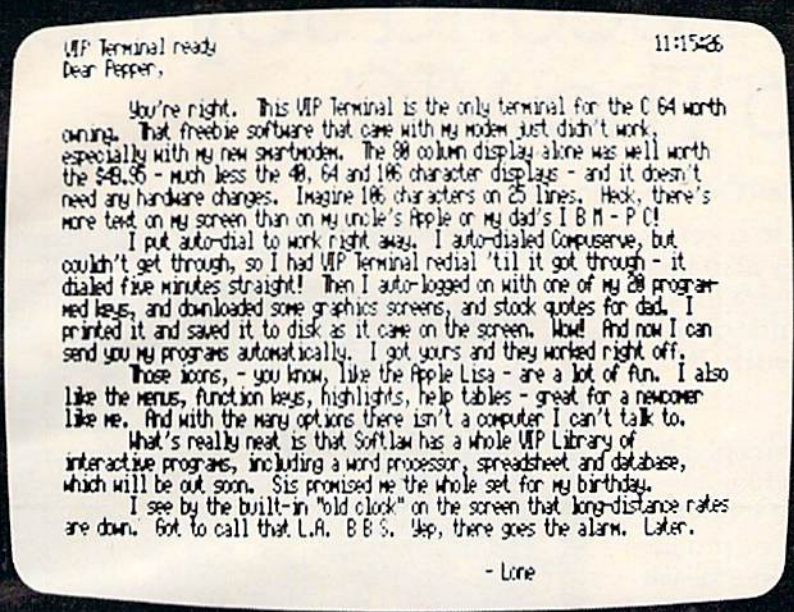


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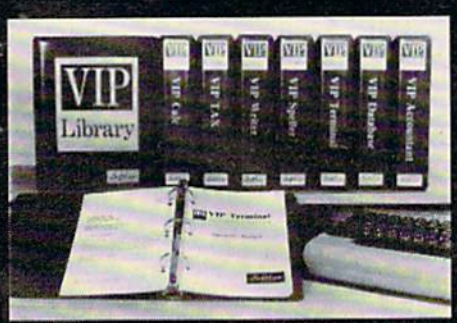


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# Tank Mania:
# Adding A Second Joystick To The VIC

Ken Gibbons and Curtis Rich

**Not only do the authors show how to connect a second joystick to your VIC-20, they also provide a two-player game to put the extra joystick to work. The project is simple and does *not* require you to open your VIC or modify it.**

All of us have had many enjoyable hours playing games against the VIC. But there's nothing like the thrill of beating a human opponent who is canny and unpredictable. Here is where a problem arises—all of the destructive energy you unleash at computer bad buys usually ends up being absorbed by the keyboard. In an exciting action game it can take a real beating, especially in a two-player game.

Also, perhaps you have noticed how easy it is to press the wrong key, or that the computer recognizes only the first key pressed and ignores all others until the first key is released (an especially effective tactic when you are trying to prevent your opponent from moving). For this reason most home computers provide us with game ports.

## Only One Game Port

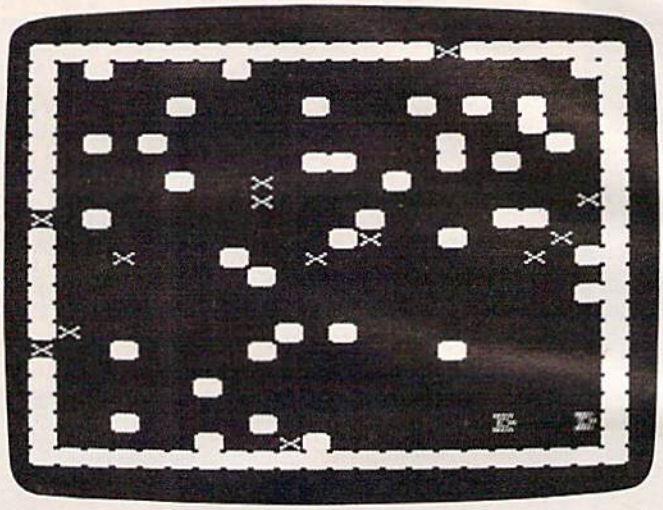
You can use joysticks, paddles, and light pens. with these game ports. The joysticks and paddles are perhaps the most popular, because they are inexpensive, easy to use, and can take the punishment of arcade-type action games.

The VIC is no exception. It comes equipped to handle paddles or a joystick. But this is where we find a shortcoming in the otherwise well-equipped VIC. Most home computers have at least two game ports, but the VIC has only one.

## A Joystick In The User Port

The VIC *will* handle two joysticks, though. For about five dollars in parts you can add the second game port, allowing you to operate two joysticks, the paddles with a joystick, or whatever.

The VIC joystick is connected through a Versatile Interface Adapter (VIA) port. The VIC has four of these VIA ports for input and output purposes. Three of the VIA ports are used to read the keyboard, read the original game port, and for various cassette and disk operations. The fourth port (called the user port) is left free. Unless you are using a modem or some other RS-232 device, the User Port on your VIC is idle and is available for a second joystick.

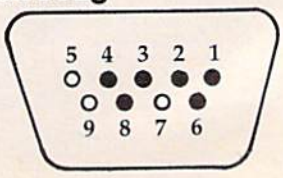


*The red tank attacks, while the blue player maneuvers to get out of the corner in "Tank Mania."*

## Simple Construction

The construction is simple and requires no modification to the VIC. Get an edge connector ($^{12}/_{24}$ with .156 spacing), which should fit the User Port on the back of your VIC. Then get a joystick connector (subminiature D type, nine-pin). It looks like the original game port on the side of your VIC and a joystick should plug into it. When you have the connectors, make the following connections between them. Most connectors have the pins lettered right on them. If yours don't, the VIC manual and the *VIC-20 Programmer's Reference Guide* contain complete pin diagrams. (See the figure.)

**VIC Joystick Plug**



The filled-in holes represent pins which are used. You will notice that this is a mirror image to the diagram which is in your VIC book.

Here's what each pin does:

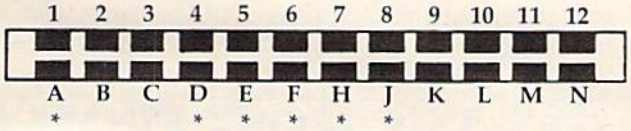
| Pin number | Description |
|---|---|
| 1 | Up – Joy 0 |
| 2 | Down – Joy 1 |
| 3 | Left – Joy 2 |
| 4 | Right – Joy 3 |
| 6 | Fire Button |
| 8 | Ground |

Simply connect these pins to a 24-pin edge connector as follows:

| Joystick | | Edge Connector |
|---|---|---|
| 1 | to | E |
| 2 | to | F |
| 3 | to | H |
| 4 | to | D |
| 6 | to | J |
| 8 | to | A |

The 24-pin edge connector then plugs into the user I/O port on the back of the VIC, which has this configuration.

**VIC User Port**




Pins to which connections are made are marked with an asterisk(*).

When you have finished, plug the connector into the user port, plug in your second joystick, turn on the VIC, and enter this short program:

```
1 DA=37136:POKEDA,Ø                          :rem 65
2 GOSUB 1Ø                                   :rem 19
3 PRINT"{CLR}JØ J1 J2 J3 FB"                 :rem 13
4 PRINT JØ;J1;J2;J3;FB                       :rem 35
5 GOTO 2                                    :rem 16Ø
1Ø P=PEEK(DA):JØ=-((PAND4)=Ø):J1=-((PAND8
   )=Ø):J2=-((PAND16)=Ø):J3=-((PAND2)=Ø)
                                             :rem 52
11 FB=-((PAND32)=Ø):RETURN                    :rem 5
```

This program demonstrates the use of the second joystick. When the joystick is pushed in any direction, the corresponding variables are set to one. The fire button, when pushed, sets FB to one regardless of the joystick's direction. Use the routine in lines 10 and 11 whenever you want to read the new joystick. The new joystick works just like the original. In fact, the only difference is the address of the VIA ports used.

Use the second joystick any way you like. You can leave the original game port free for paddles or a light pen. However, the light pen and paddles will not work if plugged into the new game port.

## A Game For Two Joysticks

"Tank Mania" is a fast, action-packed game for two players, in which each player commands a tank maneuvered by a joystick. The object is to destroy your opponent's tank. Blockades and mines provide natural hazards. You can remove these hazards by shooting them. If you shoot a mine on the border, you can wrap around the screen—try it and you will find the results interesting.

The skill level is set in the first line of the second program. By changing the value of SL, you can control the number of blocks and mines. Finally, the tanks will go between blocks diagonally despite the tight fit.

The first program creates the special characters, prints instructions, and loads Program 2. Before loading the second program, the first program deletes itself, so if you RUN the first program before saving it you will lose it.

Since Tank Mania is such a long game, you can get a tape copy by sending a cassette, $3, and a SASE to:

*Ken Gibbons*
*356 East 900 North*
*Logan, UT 84321*

*See program listings on page 160.*

# Finding Incorrect DATA Statements

Bruno Degazio

**If you've discovered a clever time-saving technique, or a brief but effective programming shortcut, send it in to "Hints & Tips," c/o COMPUTE!'s GAZETTE. If we use it, we'll pay you $35.**

Here is an easy-to-use technique for finding mistyped DATA statements.

DATA statements are great for rapidly POKEing numbers into memory, whether it's for a machine language program, a musical composition, custom characters, or some other purpose. You simply program a FOR-NEXT loop, READ the data, and POKE.

Consider the following program:

```
10 SC=1024: REM FOR VIC USE 7680 (UNEXPAN
   DED) OR 4096 (8K+ EXPANSION)     :rem 9
20 PRINT"{CLR}********"             :rem 22
30 FOR J = SC TO SC+5               :rem 0
40 READ K: POKE J, K                :rem 245
50 NEXT J                           :rem 238
60 REM (MORE PROGRAM LINES)         :rem 97
500 DATA 20,5,19,20                 :rem 150
510 DATA 999                        :rem 91
```

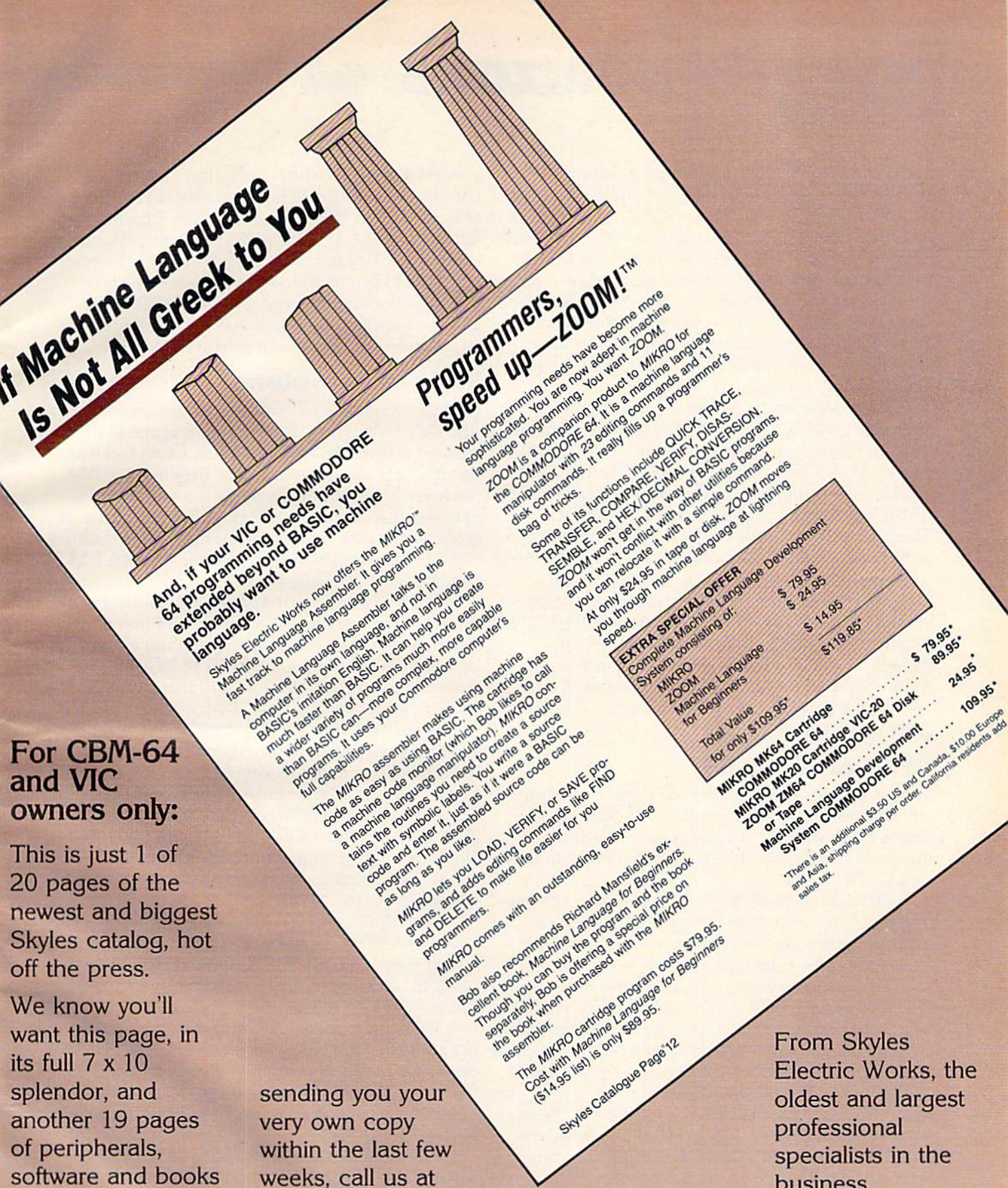
If you RUN the above program, you will get an ?ILLEGAL QUANTITY ERROR IN 40—but there's nothing wrong with line 40. It simply reads a number and tries to POKE screen memory. The real problem is line 510 and the number 999. You can POKE memory locations only with numbers from 0 to 255. The number 999 is out of range and stops the program in line 40. Even though the error message tells you to look at line 40, you really have to correct line 510.

Searching through a list of DATA statements can be annoying, especially if there are lots of them.

There is a simple way of finding the incorrect DATA statement. Memory locations 63 and 64 contain the line number of the last DATA statement used. It is stored in low byte/high byte format. To find the offending DATA line, type this in immediate mode (without a line number):

```
PRINT PEEK(63) + PEEK(64)*256
```

You can then LIST that line to find the item that caused the problem. An incorrect DATA statement is usually the result of a missing comma or a number that was accidentally typed twice. No matter how careful you are, mistakes will sometimes creep into your typing. But this programming tip should reduce your debugging time.

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# HORIZONS: 64

CHARLES BRANNON
PROGRAM EDITOR

Many people are searching for an alternative to BASIC. BASIC is easy to use, easy to learn, and almost carefree in style and coding. Yet BASIC is not as fast as a high-level language can be. It does not encourage or support modular or even structured programming. It is a very general language, so it lacks commands specific to certain situations, such as graphics, games, business/professional applications, and mathematical work. It's also hard to teach and grade (compared to a language like Pascal).

The microcomputer world knows several languages which have come down to earth from the mainframe computers: COBOL, FORTRAN, Pascal, PL/I, LISP, APL, even ALGOL. Languages which work out particularly well on micros include BASIC, of course, PILOT, Logo, C, and Forth. These languages work well within the speed and memory limitations of many personal computers.

The business community has been transforming its software choices by adapting the larger languages (COBOL, FORTRAN) to 64K Z80 CP/M (Control Program for Microprocessors) computers. These languages are often *subsets* of the minicomputer versions of the languages. They are smaller versions of the languages, but are still quite powerful and flexible.

## CP/M And The 64

Many Commodore 64 owners, especially educators and businessmen, are intrigued with the Commodore CP/M cartridge. It appears to be a gateway to the many thousands of programs that will run only on a CP/M system.

CP/M offers the 8080 or Z80 programmer a set of general, transportable microprograms. These microprograms are customized to each computer, yet act the same from a program's point of view.

These microprograms make up the Basic Input/Output System, or BIOS. The BIOS is much like the 64's set of Kernal routines, which enable a 6510 machine language programmer to work with input and output. The Kernal's strongest point is that its routines have the same addresses (entry points) on many Commodore machines. For example, there's a machine language program at $FFD2 (hexadecimal) that lets you output a single character to the screen or current output device (perhaps the printer after a CMD). You can try out this routine from BASIC with POKE 780,ASC("x"):SYS 65490. x is the character you want to print, so put it inside double quotation marks.

All eight-bit CP/M programs are written in either 8080 or Z80 machine language. These microprocessors and the commands they use are not compatible with the 6510, so you need to add a microprocessor to the computer. The Commodore CP/M cartridge contains a Z80 microprocessor and plugs into 64's expansion port. It also contains circuitry that permits the 64 to switch between the 6510 and the Z80. But you don't have CP/M yet. CP/M is supplied on a disk that you load into your 64 before you begin working with CP/M.

## The Disk Problem

It takes a long time to load. The Commodore 1541 disk drive is not fast. To be frank, it is one of the slowest disk drives on the market. Don't feel bad, though, it is also about the least expensive. CP/M, however, was written for machines with fast, expensive disk drives. It is highly disk-intensive. It accesses the disk frequently for the various utilities it performs. The 1541 is the weak link in 64 CP/M. Programs behave sluggishly.

But that is not what makes CP/M unusable on the 64. CP/M adds great capability and potential, a whole new world. But as you found out when you brought your 64 home, it takes software to make your computer do anything. And that's what's missing from Commodore CP/M.

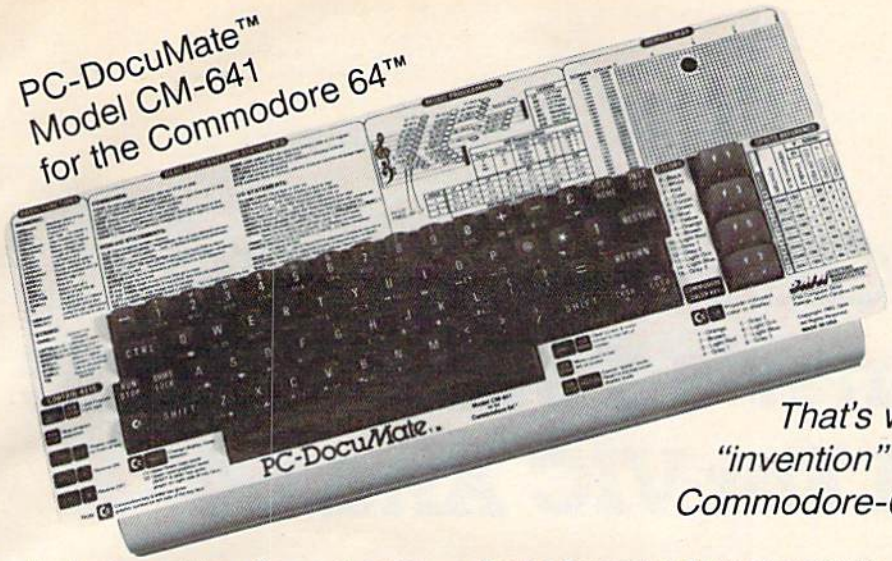
Sure, there are probably 10,000 CP/M programs out there, maybe more. But there's one big point of incompatibility in the world of CP/M: disk formats. Just as you can't even read an Apple or Atari disk on your 64, many CP/M computers cannot interchange disks. The BIOS is general, but other things like screen formatting and cursor control are not. CP/M often requires 80 columns, which isn't easily workable with 64 CP/M.

So COBOL, FORTRAN, and *WordStar* are available with CP/M, but there are no disks you can buy which your 1541 can read. Commodore has some plans to release some 1541-readable CP/M software, but we've yet to see it.

Dedicated "hackers" or machine language programmers may be interested in CP/M. They can write programs which switch between the 6510 and Z80, getting a chance to learn about another microprocessor, and enjoying the best of both worlds.

Some third-party companies are charging upwards of $300 for CP/M (although many do have some CP/M software that can be used with the 64). Commodore should be applauded for making CP/M available for about $60. No other company has sold CP/M, including the necessary hardware, for so little. But right now we're waiting for an encore.

PC-DocuMate™
Model CM-641
for the Commodore 64™




# EUREKA!

*That's what we said when our new "invention" solved all our VIC-20™ and Commodore-64™ programming problems*

We had a problem. So we invented PC-DocuMate™ to solve it. The problem was how to quickly master the VIC-20 and CBM-64 keyboards and easily start programming in BASIC on our new personal computers. First we went through the manuals.

### INCONVENIENT MANUALS

The user's guide was a nuisance and the programmer's reference manual was just plain inconvenient to use. We found the control key combinations confusing and the introduction to BASIC to be too "basic" for our needs. We needed a simple solution to our documentation problems.

So we decided to surround the keyboard of each PC with the information we wanted. We decided to print whatever we needed on sturdy **plastic templates** which would fit the keyboard of either the VIC-20 or Commodore 64.

### SIMPLE SOLUTION

This was the simple solution to our problem. Now we could have the essential information right at our fingertips.

On the left side and top of the templates we put **BASIC** functions, commands, and statements. On the lower left we used **key symbols** to remind us of how to use SHIFT, RUN/STOP, CTRL and the "Commodore" key. Over on the bottom right side we put some additional keys to help remember about CLR/HOME and RESTORE. But we were still a little confused.

### STILL CONFUSED

We found we were confused about music programming, color graphics, and sprites. On both the VIC-20 and the CBM-64 templates we carefully organized and summarized the essential reference data for **music** programming and put it across the top—showing notes and the scale. All those values you must POKE and where to POKE them are listed.

Then to clarify **color graphics** we laid out screen memory maps showing character and color addresses in a screen matrix. (We got this idea from the manuals.)

For the VIC-20 we added a complete memory address map for documenting where everything is in an expanded or unexpanded VIC.

For the Commodore 64 we came up with a really clever summary table for showing almost everything you ever need to know for **sprite** graphics.

### GETTING EASIER

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# Variable Storage:
# A Beginner's Tour Of BASIC RAM For VIC And 64

Pete Marikle

**You can simplify the search for program bugs if you take a short tour through BASIC RAM and use this subroutine that displays variable values.**

Normally, you don't need to know what happens to your program when you type RUN. The BASIC interpreter takes over, leaving you free to use the computer to figure your income tax, write a letter, or save the galaxy.

When your program crashes, though, or gives you an incorrect result, you have to switch from computer user back to programmer, locate the bug, and fix it. Debugging is easier if you can look at the values of your variables and arrays while the program is running, to be sure that loops are being completed and data are being put in the right place at the right time.

Programs 1 and 2 are different versions of a subroutine that displays the current values of all program variables. By inserting STOP statements in any line where you suspect a problem, you can "freeze" the action and GOTO the subroutine to check your logic, statement by statement.

## A Quick Tour Of RAM

Before we examine the subroutine, let's take a sightseeing tour through BASIC RAM for a quick look at where your VIC-20 or 64 stores your programs and variables, how it tells a string from an integer variable, and how you might use less memory by doing a few things differently. You don't have to take the tour in order to use the subroutine, but it will give you a better idea of how the subroutine works.

First, type in this short BASIC program that allows you to peek into the computer's memory:

```
10 S=256:PRINT"{CLR}START ADDRESS":INPUTZ
                                    :rem 228
20 S$="**********************":T$="------
   ----------------"               :rem 7
30 FORX=ZTO(PEEK(55)+S*PEEK(56)):PRINTCHR
   $(144)X,PEEK(X)SPC(2)CHR$(PEEK(X))
                                    :rem 35
35 Y=X+1:U=PEEK(45)+S*PEEK(46):V=PEEK(47)
   +S*PEEK(48):W=PEEK(49)+S*PEEK(50)
                                    :rem 81
40 IFY=UORY=VORY=WTHEN PRINTS$     :rem 44
45 IFX>=UANDY<VTHENT=T+1:GOTO47    :rem 44
46 T=0                             :rem 43
47 IFT THEN IFT/7-INT(T/7)<.01THENPRINTT$
                                   :rem 232
50 WAIT 197,32:NEXT                :rem 69
60 REM END OF PROGRAM APPROACHING:rem 250
```

If you want to use this program again, you should SAVE it to tape or disk.

Now enter these samples in direct mode:

```
AB=12.34:CD=-12.34:AB$="HELLO":AB%=1983:
  AB(1)=111:CD(1)=-111:AB%(1)=1024:AB$(1)=
  "BYE"
```

Hit RETURN, and enter some more:

```
DIMCD$(3,5,5):CD$(1,0,0)="SEE":CD$(2,0,0)=
  "YOU":CD$(1,1,1)="LATER"
```

Hit RETURN again, and your computer will have at least one of every type of variable stored in RAM. Now type GOTO 10 and RETURN. Do *not* type RUN (RUN resets all variables). Respond to the prompt with 4300 as a start address for the unexpanded VIC, 1230 if you're working on a VIC with 3K expansion or Super Expander and 4800 if your VIC has 8K or more expansion memory. For the 64, respond with 2250.

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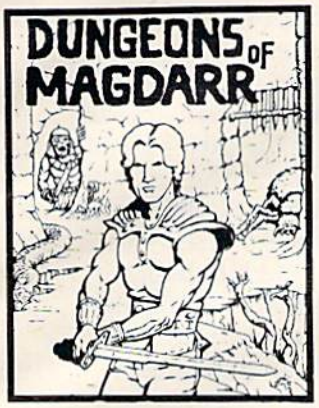


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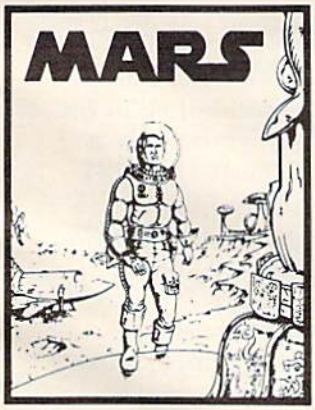


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## The Program Looks At Itself

The space bar is your one-touch control. Hold it down until the screen is nearly full, then sit back and take a look. You are looking at the middle of the tour program, with the memory addresses on the left, memory contents in the middle, and some interesting characters on the right.

Some of those characters are meaningless, because a CHR$ interpretation of the contents of a memory location is invalid and out of context if the location contains a keyword, line link, line number, etc. But many of the characters are valid, recognizable translations of what you put into the program, and these are the ones we care about.

Use the space bar to scroll another hundred or so bytes onto the screen. We're looking for the end of the BASIC program, represented by three consecutive zeros in the center column. It's not hard to find with our REM billboard (line 60) and neat borders in place. Now look at the first address after the three zeros. That's the PEEK 45/46 address (the address produced by PEEK(45)+256* PEEK(46) in line 35). Hold the space bar down until that address is near the top of the screen.

## Looking At Variable Storage

We're now in the area where strings and variables are stored. Everything in this area is in seven-byte clusters, and the program neatly separates those clusters for easy viewing. Find the characters A and B, followed by five more bytes (the cluster is followed by the character C). This first seven-byte cluster is the variable AB. The first two bytes are the variable name. The next five bytes contain the value we gave to AB, in floating-point arithmetic notation. Don't worry about how the math works for now. Suffice it to say that your decimal value is neatly tucked away in those five bytes.

Note that the next variable, CD, has a similar structure. Remember that we gave CD the same value as AB, but negative. Take a close look at the five bytes following CD, and you'll see that values there are almost identical to the values in the bytes following AB, except that the second byte contains a value which is 128 greater than the corresponding byte in AB. (If you subtract 128 from the byte in CD, you should get the value in the corresponding byte in AB.) The high-order bit (Bit 7) in that particular byte is used as a sign indicator: 0 for positive numbers and 1 for negative. Since that bit is on (1) for variable CD, the decimal value of the byte is 128 ($2^7$) higher. Your computer ignores that bit in reconstructing the value of CD, but uses the bit when the time comes to determine the sign of the number.

## String Variables

Press the space bar and look at the next cluster, representing the string variable AB$. The A is clear enough, but where did the B go? Here's the secret: The second character of a string variable name is stored after adding 128 to the normal CHR$ value for that character. It's that high-order bit trick again.

By checking to see if this high-order bit is 1 or 0, your computer can tell whether this is a string variable or floating-point variable. Note that 194 minus 128 is 66, the CHR$ value for the B in AB$. Your computer now knows that the next byte (a 5 in our case) is the length of AB$ and the next two bytes will give it the address where it can find the actual characters you designated for AB$. The address is in standard low byte-high byte order (LB+256*HB=decimal address). The computer will start at that address, to select a number of characters equal to the value (5) in that length byte, and then go on to do whatever you asked it to do with the string. The final two bytes of the cluster are zeros put in to fill the seven-byte cluster.

That address for the string character can point to one of two very different areas of memory. If the string is assigned in the direct mode, the string characters themselves are stored at the top of free BASIC RAM. If the string is assigned by the program, the address points to the place in the program itself where the string values are assigned to the variable name. Since the characters must be stored as part of the program anyway, your computer doesn't waste RAM by repeating the characters in the variable storage area.

## An Unreadable Name

Continuing our tour with the seven bytes immediately following the AB$ cluster, note that the variable name is unreadable. The symbols are a spade and a vertical bar, next to the 193 and 194. Subtract 128 from each and you'll find the CHR$ values for the A and B in the integer variable AB%. When both characters in the name are greater than 127, your computer knows this is an integer variable, that only the next two bytes need be looked at to obtain the value of this integer variable, and that the last three bytes of the cluster will be filled with zeros.

Those two value bytes contain a signed binary number, a different form than we saw with the floating-point variables. Again, don't worry about the details of the math. The more compact method of storing integer variables doesn't do much for you until you start using them in arrays. Integer arrays can cut your memory consumption considerably (two bytes vs. five per entry).

Let's move on to look at arrays in more detail. Hold down the space bar to pass by some other clusters where the variables in this tour program are stored. We're approaching the special address

held in PEEK 47/48, which is the beginning of array storage. You'll know you're there when you see the borderline and the clearly visible A and B characters in the right column.

## How Arrays Are Stored

There are three kinds of arrays, paralleling the three normal variable types: floating-point arrays, integer arrays, and string arrays. Each can be multidimensional, but we'll cover that situation last. Your VIC or 64 allows you to use arrays with up to 11 elements (numbers 0–10) without a DIMension statement, but it does not reserve space for the array until you assign a value to one of the array elements. As soon as you do, it will set up an entire 11-element array, even if you only used one or two elements. Of course, you can DIM for more or fewer elements if you wish. (For more information on arrays, see "How To Use Arrays" in the February issue.)

Each one-dimensional array begins with a seven-byte definition cluster followed by the 11 element clusters (or more or less according to the DIMension statement).

The seven-byte cluster will hold the array name in the first two bytes, following the same general rules we saw for the simple variables, depending on the type of array. The next two bytes will contain a link address to the next array set. The fifth byte tells you (and your computer) the number of dimensions in this array. The sixth and seventh bytes will show the total number of elements in the array set (11 for our un-DIMed examples). These two bytes store the total in reverse high byte-low byte order.

The element clusters that follow the definition cluster will each be five bytes long for floating-point arrays, two bytes long for integer arrays, or three bytes each for string arrays. These clusters contain the same kind of information held in the corresponding normal variables, but without the need for trailing zeros or repeated label bytes that are needed in variable storage.

## Unused Elements Contain Zeros

Hold down the space bar until the first array, AB, nearly fills the screen. See the seven-byte cluster? It's followed by five zeros only because AB(0), the first element of this array, has a zero value. The next five bytes represent the value we gave to AB(1). The following sets of zeros represent the remaining unused elements through AB(10). Use the space bar to look at the CD array, then continue to the AB% integer array.

Again, a seven-byte definition cluster, followed this time by 11 element clusters that are each two bytes long. The lesson in saving memory with integer arrays is dramatic.

Next, note the seven-byte cluster for the AB$ array and its 11 three-byte clusters, each containing the string length byte and the address of the string characters.

## The Three-Dimensional Array

Finally, we reach our sample multidimensional array. Things get a bit tricky here, so follow closely. The definition cluster will now be more than seven bytes long. Add two bytes for each extra dimension. Remember, you can set up two, three, four, or more dimensions of any size if you have the total memory capacity to handle them. The number of dimensions for each array set will be held in the fifth byte of the definition cluster. The very next two bytes will hold the number of elements in the Nth dimension (N = number of dimensions); the next two will hold the number of elements in the (N –1)th dimension, and so on until finally the first dimension is structured.

Immediately following the definition cluster, the array elements will troop by in orderly formation. For our sample, which we DIMed as CD$(3,5,5), the order of the three-byte clusters will be: CD$(0,0,0), CD$(1,0,0)....CD$(3,0,0), CD$(0,1,0),CD$(1,1,0)....CD$(3,1,0).....etc..... until finally reaching CD$(3,5,5).

As you pass through this area, you will see that the clusters for CD$(1,0,0) and CD$(2,0,0) are occupied. If you count, you'll find that the position for CD$(1,1,1) is also occupied, as we directed. As with any string, the characters themselves are stored elsewhere.

If you race on now through the rest of this array, you'll cross the PEEK 49/50 border into the area of unused RAM. Don't be surprised if you recognize some of it. You may find remnants here from other programs which have been NEWed, or CLRed variables.

To end the tour, just hold down the RUN/STOP key and hit the space bar.

## The Variable Dump Utility

Now let's try out the promised subroutine. Because it takes all the values stored in a section of memory and sends them to an output device, our subroutine is called a *dump utility*. Type NEW to get rid of the tour program, type in Program 1, and SAVE it to tape or disk.

The dump utility has high line numbers because it is designed as an easy add-on to existing programs using the VIC quick append method (see COMPUTE!, March 1983). Commodore 64 owners will find it necessary to abbreviate the PEEK statements in line 44580 with P SHIFT-E in order for the line to fit within the 64's 80-character limit.

Type in a few sample variables in direct mode. You can reenter the previous sample set if you like. Again, do not type RUN; enter GOTO 44444

and RETURN. Your variables should be displayed; the program won't display the arrays until you press the space bar. Note that the dump utility doesn't list the contents of multidimensional arrays. It's not hard to do, just time-consuming. The routine will simply tell you which multidimensional arrays have been implemented and what their dimensions and element sizes are.

## Pointer Settings Affect The Utility

Now CLR your variables, enter this new temporary program step, and RUN the program again:

```
10 A$="HELLO":A=1983:AB$(2)="HELLO
   AGAIN"
```

Not much happens, because it ends at line 44443, the subroutine protector. Type GOTO 44444 to view your variables as before. Now for a surprise—when you type GOTO 44444 and hit RETURN once again, you will see a display of the variables used in the dump utility.

This happens because, on the first pass through the routine, line 44444 reads the pointers *before* they are changed to make room for the routine's own internal variables. On the second pass, the new pointer values include the storage areas for the new variables. If you don't ever want to see the internal variables, just modify line 44543 to read:

```
IF PEEK(ZZ)=90 THEN RETURN
```

## Tailor The Utility For Your Needs

You can customize the routine to fit your needs. For example, if you don't need the array and integer variable features, just delete lines 44465, 44525, and everything from 44700 on. That'll leave you with a much trimmer 800-byte package that will still dump all normal string and floating-point variables. If you delete one of the simple variable subroutines, though, you should also delete the corresponding array variable type. Crunch out the REMs and spaces and you'll end up with a tidy utility of well under 600 bytes that'll still fill most needs. Program 2 is this condensed version.

To use your dump utility as a debugging tool, simply insert STOP statements at desired points in your program, type GOTO 44444, analyze variable values, and then type CONT to continue to the next break. Add the appropriate printer commands, and the program will dump to the printer.

*See program listings on page 161.*

Dan Carmichael, Assistant Editor

# VIC Chip Utility

**This month we'll look at a utility that will adjust your screen, change the screen and border colors, or reset the VIC chip at the touch of a finger.**

Allocating time on the family TV set can sometimes be a problem. In many households, nightly TV programs take precedence over computer use. In fact, I do most of my programming on an old black-and-white set that sat, unused, in the garage for years, and use the family set only to check colors, etc. However, the picture on the black-and-white set is way out of adjustment. The screen is shifted so far to the right that every line of print is truncated.

The VIC chip has the answer to this problem. The 6560 Video Interface Chip (for which your VIC was named) is a versatile chip that controls everything from horizontal and vertical screen adjustments to color generation, sound, volume, and more. The VIC chip registers are located at addresses 36864 to 36879.

Some aberrations in your TV set can be corrected by simply POKEing various locations on the VIC chip. But this can be time-consuming because every time the VIC is turned off or on, reset, or RUN/STOP—RESTOREd, the VIC chip is reset, and the registers have to be rePOKEd.

## One-Finger Adjustments

To solve this problem, I designed a "VIC Chip Utility." With this machine language program and one finger, you can adjust the TV horizontally or vertically, or change the screen/border color combinations. You can also reset the VIC chip to its original settings.

The program is also relocatable. This means that it can be placed in the cassette buffer or in high memory at the top of BASIC RAM. If you select the cassette buffer option, the program does not use any of your available BASIC RAM. But if you choose the high-memory option, the program automatically relocates into the top page (256 bytes) of BASIC memory, no matter which memory expansion cartridge you may be using.

The high-memory version automatically seals itself off so it is protected from BASIC. And because the program is interrupt-driven, you can leave it running while you're programming, or even while running your BASIC program. But remember, the program will be clobbered if you choose the tape cassette buffer option and the cassette drive is used.

Type in the program, and SAVE it on tape or disk. Heed the usual warning about machine language programs: One mistyped DATA statement can freeze up the VIC, so SAVE the program before you RUN it. The program will pause a few seconds while the BASIC program POKEs the machine language utility into memory.

## The Starting Address Is Displayed

The program initially displays a brief page of instructions. At the top of the screen you'll see the starting address. To start the program, SYS*nnnn* where *nnnn* is the number displayed on the instruction page. The program can be stopped by pressing the RUN/STOP—RESTORE combination. Below is a chart showing the various keys, and how they control the program:

| Function Keys | After Typing S | After Typing C | After Typing ← |
|---|---|---|---|
| f1 | move screen up | inc. screen/ border by 1 | VIC chip reset |
| f3 | move screen down | dec. screen/ border by 1 | |
| f5 | move screen right | inc. screen/ border by 10 | |
| f7 | move screen left | dec. screen/ border by 10 | |
| | inc. = increment | dec. = decrement | |

The speed of the screen and border color changes can be controlled by POKEing memory location 251. POKEing a value of 1 causes the color combinations to change the fastest. Values between 2 and 255 will slow them down; the higher the number, the slower the changes. The program automatically defaults to a 0, the slowest value. For you machine language programmers, memory location 251 ($FB) is READ only once by the VIC Chip Utility, so this valuable zero page space is still available to you.

After the program has been run and the machine language program POKEd into memory, you may NEW the BASIC program—it's not needed. The utility can be used as a programming aid. To find the best visual display, experiment with the screen and border color combinations. When you see a color combination you like, type PRINT PEEK(36879). This will display the current color combination value. You may use these color combinations in your BASIC programs by POKEing 36879 with the same number.

## Screen Adjustment Locations

The registers (memory locations) that control the vertical and horizontal screen adjustments are 36865 (vertical) and 36864 (horizontal). The utility simply POKEs various values from 0 to 255 here to move the screen. You can use these same memory locations to simulate a scrolling effect. Enter and run this following short BASIC program which will scroll the screen in all four directions:

```
10 FORA=25TO140:POKE36865,A:NEXTA  :rem 1
20 FORA=140TO25STEP-1:POKE36865,A:NEXTA
                                   :rem 156
30 FORA=5TO55:POKE36864,A:NEXTA  :rem 165
40 FORA=55TO5STEP-1:POKE36864,A:NEXTA
                                   :rem 64
```

Notice that while the screen scrolls up and down, the screen format remains normal. However, when the screen scrolls right and left, it begins to distort. This is normal for the VIC chip; it's not something wrong with your computer.

To see how you can produce interesting effects in your BASIC program by scrolling up and down, enter the following short BASIC program:

```
5 PRINT"{CLR}SCROLLING DOWN NOW" :rem 114
6 PRINT"{DOWN}SEE YOU LATER!":GOSUB 100
                                   :rem 214
10 FORA=25TO140:POKE36865,A:NEXTA  :rem 1
20 PRINT"{CLR}SCROLLING UP NOW"   :rem 12
25 PRINT"{DOWN}HELLO!"            :rem 222
30 FORA=140TO25STEP-1:POKE36865,A:NEXTA:G
   OSUB 100                        :rem 232
40 PRINT"{CLR}SCROLLING RIGHT"    :rem 243
50 PRINT"{DOWN}BYE NOW!":GOSUB100:rem 135
60 FORA=5TO55:POKE 36864,A:NEXT   :rem 103
70 PRINT"{CLR}SCROLLING LEFT"     :rem 163
80 PRINT"{DOWN}HELLO":GOSUB 100    :rem 9
90 FORA=55TO5STEP-1:POKE36864,A:NEXT:GOSU
   B 100:END                       :rem 96
100 FORT=1TO1000:NEXTT:RETURN     :rem 133
```

As you can see, the program displays a message on the screen and then scrolls down until it is out of sight. While it is at the bottom, the screen is cleared, a new message is displayed, and the screen is scrolled up again. You can use this technique to display any messages you wish to on the screen.

### VIC Chip Utility

```
59000 POKE251,0:PRINT"{CLR}{DOWN}LOAD IN
      {SPACE}CASSETTE"             :rem 227
59010 PRINT"{RVS}B{OFF}UFFER?"     :rem 109
59020 PRINT"{DOWN}LOAD IN {RVS}H{OFF}IGH
      {SPACE}MEMORY?"              :rem 117
59030 PRINT"{2 DOWN}PRESS {RVS}B{OFF} OR
      {SPACE}{RVS}H{OFF}"          :rem 244
59040 GETA$:IFA$=""THEN 59040      :rem 39
59050 IFA$="B"THEN NN=828:GOSUB60005:GOTO
      60100                        :rem 131
59060 IFA$="H"THEN POKE56,(PEEK(56)-1):CL
      R:GOSUB62010:GOSUB60005:GOTO63000
                                   :rem 53
59070 GOTO 59000                   :rem 60
60005 FORA=NNTONN+192:READB:POKEA,B:NEXT:
      RETURN                       :rem 69
60010 DATA120,169,73,141,20,3,169,3,141,2
      1,3,88,96,165,197,201,39,208,3,206,
      1,144                        :rem 190
60015 DATA 201,47                  :rem 64
60020 DATA208,3,238,1,144,201,55,208,10,1
      74,0,144,224,17,240,3,238,0,144,201
      ,63,208,10                   :rem 145
60030 DATA174,0,144,224,0,240,3,206,0,144
      ,201,34,208,3,32,134,3,201,8,208,3,
      32,237,3,76                  :rem 186
60040 DATA191,234,120,169,147,141,20,3,16
      9,3,141,21,3,88,96,165,197,201,39,2
      08,6,32,222                  :rem 239
60050 DATA3,238,15,144,201,47,208,6,32,22
      2,3,206,15,144,201,55,208,12,32,222
      ,3,24                        :rem 161
60055 DATA 173,15                  :rem 71
60060 DATA144,105,10,141,15,144,165,197,2
      01,63,208,12,32,222,3,56,173,15,144
      ,233,10,141                  :rem 207
60070 DATA15,144,165,197,201,41,208,3,32,
      60,3,201,8,208,3,32,237,3,76,191,23
      4,162,0,160                  :rem 215
60080 DATA0,232,224,255,208,251,200,196,2
      51,208,246,96,169,5,141,0,144,169,2
      5,141,1,144                  :rem 235
60090 DATA169,27,141,15,144,96     :rem 2
60100 PRINT"{CLR}{DOWN}TO START SYS";NN
                                   :rem 115
60110 PRINT"{DOWN}TO STOP PRESS"  :rem 80
60120 PRINT"RUN/STOP-RESTORE"     :rem 133
60130 PRINT"{DOWN}TO CHANGE COLORS"
                                   :rem 247
60140 PRINT"PRESS ";CHR$(34);"C";CHR$(34)
                                    :rem 3
60150 PRINT"{DOWN}TO ADJUST SCREEN"
                                   :rem 12
60160 PRINT"PRESS ";CHR$(34);"S";CHR$(34)
                                   :rem 21
60170 PRINT"{DOWN}CONTROL WITH F KEYS"
                                   :rem 191
60180 PRINT"{DOWN}TO RESET VIC CHIP"
                                   :rem 13
```

```
60190 PRINT"PRESS ";CHR$(34);"←";CHR$(34
      )                              :rem 36
60200 END                            :rem 207
62010 NN=(PEEK(51)+256*PEEK(52)):RETURN
                                     :rem 232
63000 NO=NN:GOSUB 63510:POKENN+150,P1:POK
      ENN+151,P2                     :rem 16
63002 NO=NN+74:GOSUB 63510:POKENN+62,P1:P
      OKENN+63,P2                    :rem 76
63004 NO=NN+162:GOSUB 63510:POKENN+94,P1:
      POKENN+95,P2                   :rem 134
63006 POKENN+104,P1:POKENN+105,P2:POKENN+
      114,P1:POKENN+115,P2           :rem 147
63008 POKENN+132,P1:POKENN+133,P2:rem 175
63010 NO=NN+177:GOSUB 63510:POKENN+157,P1
      :POKENN+158,P2                 :rem 233
63015 NO=NN+177:GOSUB 63510:POKENN+69,P1:
      POKENN+70,P2                   :rem 137
63020 NO=NN+13:GOSUB 63510:POKENN+2,P1:PO
      KENN+7,P2                      :rem 221
63030 NO=NN+87:GOSUB 63510:POKENN+76,P1:P
      OKENN+81,P2                    :rem 86
63500 GOTO 60100                     :rem 46
63510 P2=INT(NO/256):P1=NO-(P2*256):RETUR
      N                              :rem 217
```

# MACHINE LANGUAGE FOR BEGINNERS

RICHARD MANSFIELD, SENIOR EDITOR

# Talking To A Disk

Because several people have asked for information on disk communication, we'll interrupt our construction of an all machine language game and create a useful utility program this month. It will illustrate how to get information directly from a disk to a machine language program.

After you've had a disk drive for a few months, some of your disks are bound to get crowded. You'll have backup disks, old disks you've retired for one reason or another, and disks you haven't used for a while. Housekeeping is called for.

From time to time you'll want to go through your entire disk collection, eliminating duplicated programs (unless they're deliberate backups) and scratching unwanted, revised, or unfinished programs. This cleans up your collection and makes it less likely that you'll need to waste time later when looking for a particular program. You put all your utility programs on one disk, all the games on another, and generally organize things. What's left after this housekeeping is the best version of everything, logically arranged.

## A Disturbance In Light

But this cleanup can be a tedious process if you have to LOAD and LIST each program in a large collection. Tedious and treacherous: You might get so distracted that you scratch something valuable. The "Slist" program we'll write this month can make this job easier. It will quickly show a partial listing of programs from a disk, but, unlike an ordinary list, the program won't be loading. No memory is affected. The program doesn't enter the computer except to slide across the screen and then evaporate as the photons scatter off the top of the TV. It's information in its purest form—just a disturbance in light.

To keep the ML simple, no BASIC keywords will be listed on screen, but programs are easily identified from REM statements, internal text, and the like.

Program 1 is a disassembly of the 64 version. The VIC version is identical except that the program resides in the VIC from address 12288 (instead of 49152) on up. Let's look at it step by step.

First we load the X register with the number 1 to signify the file number. Then JSR (Jump to SubRoutine) within the computer's ROM memory at address 65478 which performs all the steps necessary to prepare a file to be read by the computer.

Next, we throw away the first six bytes in the file. We don't want them. This could be called a "suction" routine because, like a vacuum cleaner, it pulls bytes out and then discards them. The first two bytes it gets from the disk point to the disk location of the next data block in the opened file. The disk drive needs this information, but we don't. Moving from block to block will be handled automatically for us by the intelligence within the drive. The next two bytes are a pointer to the next line number in a BASIC program on disk. The following two bytes are the current line number. We're not going to be listing line numbers—that would make the program more complicated—so we can ignore all of this information.

We step down through six DEX instructions, JSRing each time to 65487, the routine which fetches a byte. It's essentially the same thing as GET#. Each time we JSR to 65487, the accumulator register holds the value of the next byte on the disk. But we just ignore each byte and fetch the next one.

At address 49165 we start our main loop by once again jumping to the get-a-byte subroutine. Before working with the byte in the accumulator, we first test for the end of a program. We load the number from address 144 into the Y register. ST, the current input-output status variable, is always

# SUPERTAX™

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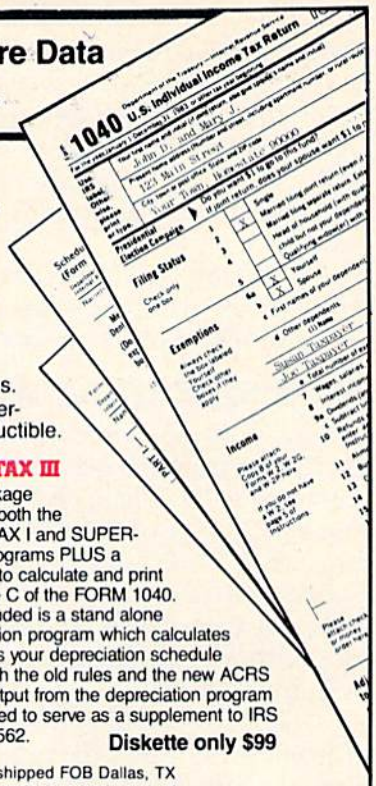


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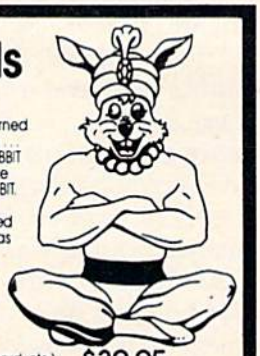

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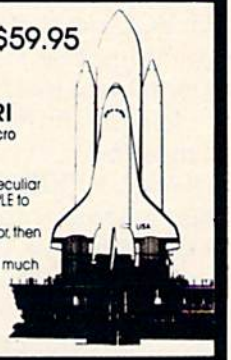

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being updated in address 144. If it isn't zero (BNE, Branch Not Equal to zero), the program is forced down to 49200 which JSR's to the routine in BASIC that stops communication. And we then RTS back to BASIC. A reading error or an end-of-program signal from the disk will flip ST out of its zero state.

If we don't get sent down to this RTS back to BASIC, however, we've found a byte that's part of the program or file we want to see on screen.

## An Undisturbed Accumulator

Up in line 49165, we handed a byte to the accumulator from the disk. It's still in there. Nothing we've done has disturbed the accumulator. In line 49172, we CoMPare the accumulator to 0. Since each BASIC line ends with a true 0 (the *number* zero is stored as a 48 in memory and on disk), we can signify this end-of-line on the screen by printing a carriage return when a zero comes in from the disk.

If it is a 0, we BEQ (Branch if EQual) to the little subroutine at 49190 which does two things. First, it prints a 13 to the screen, which has the effect of causing the cursor to move down one line (carriage return). The BASIC routine at 65490 will put whatever is in the accumulator on the screen, even nonprinting characters like 13. Second, we load the X register with 3 and jump up to the suction routine to get rid of the two-byte line link and the two-byte line number.

It's a two-edged sword that the BASIC PRINT routine will send *whatever* it gets to the screen. There are some nonprinting characters (delete, cursor movements, colors, uppercase shift) that would play havoc with our listing. To eliminate them, we've got to perform two more compares—throwing out any character coming in from the disk which is below 32 or above 128. Lines 49176–49182 do just that. If below 32, BCC (Branch Carry Clear) up to the fetch-the-next-byte routine at 49165. Likewise, BCS (Branch Carry Set), if above 128. BCC takes effect if something is less than something else. BCS takes effect if something is more than something else.

Finally, if the byte in the accumulator passes all these tests, we come to line 49184 which JSR's to BASIC's PRINT subroutine in ROM memory. Then we JMP (JuMP) back up to the fetch-a-byte routine and look for the next character.

You can either enter this machine language program into your assembler or use one of the BASIC loaders, Programs 2 and 3, to POKE it in for you. Don't forget, VIC owners will need at least 8K of expansion memory and will need to POKE 56,48 to keep the machine language routine safe up in high RAM.

To use Slist, first OPEN a file on the disk from BASIC:

```
OPEN 1,8,3,"NAME"
```

And then SYS 49152 (64) or SYS 12288 (VIC). You'll see whatever program you gave as NAME come rapidly slisting down your screen. To see another, just replace NAME and SYS again.

## Program 1: VIC And 64 Slist

```
49152  LDX   # 1
49154  JSR   65478

Remove Disk Data

49157  LDX   # 6
49159  JSR   65487
49162  DEX
49163  BNE          49159

Main Loop

49165  JSR   65487
49168  LDY   144
49170  BNE          49200
49172  CMP   # 0
49174  BEQ          49190
49176  CMP   # 32
49178  BCC          49165
49180  CMP   # 128
49182  BCS          49165
49184  JSR   65490
49187  JMP    --->    49165

Remove Line # And Link

49190  LDA   # 13
49192  JSR   65490
49195  LDX   # 3
49197  JMP    --->    49159

Close Channels

49200  JSR   65484
49203  RTS
```

*See program listings on page 142.*