The Winter Consumer Electronics Show

COMPUTE!'s GAZETTE

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April 1984
Issue 10 Vol. 2, No. 4
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For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

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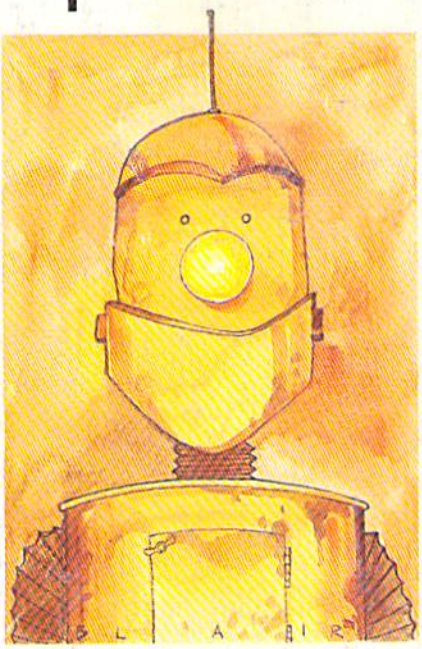
Make any of four impressive calendars with your VIC or 64 and printer.

ROBOTS: The New Mobile Computers

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.

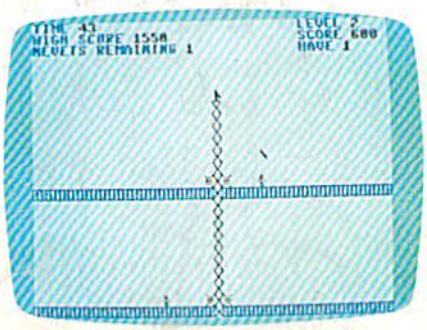


Power BASIC: Numeric Keypad

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

NEVETS

An exciting action-strategy game for the VIC and 64.



Also In This Issue

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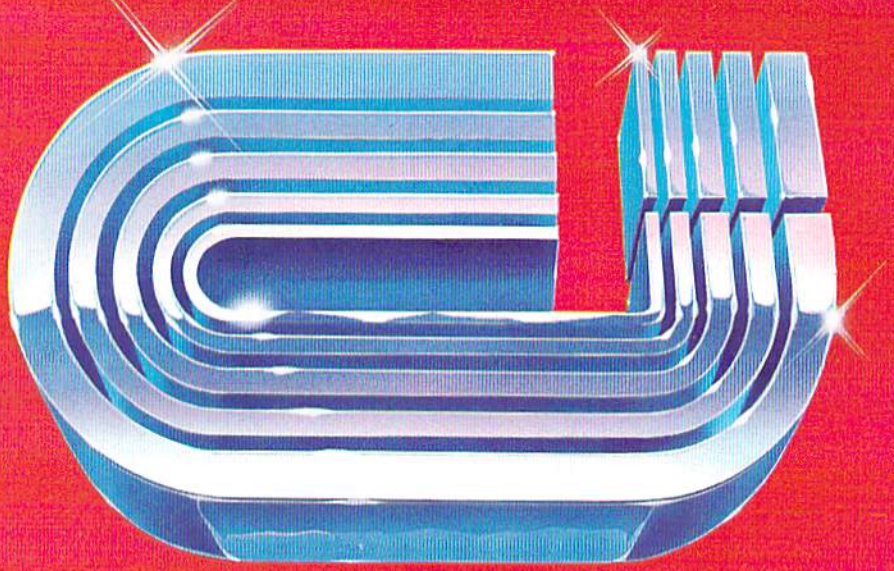

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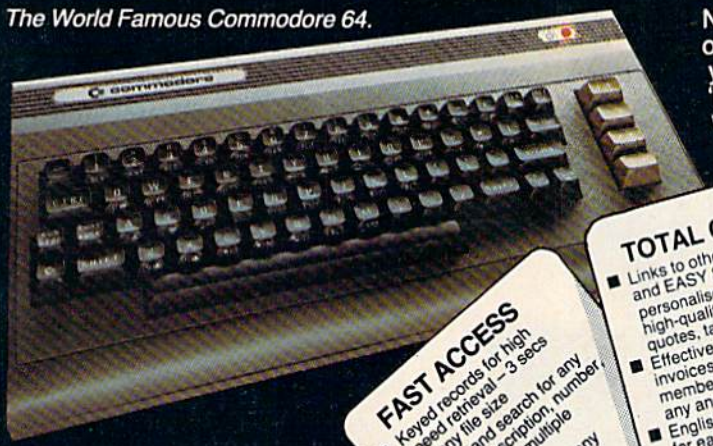

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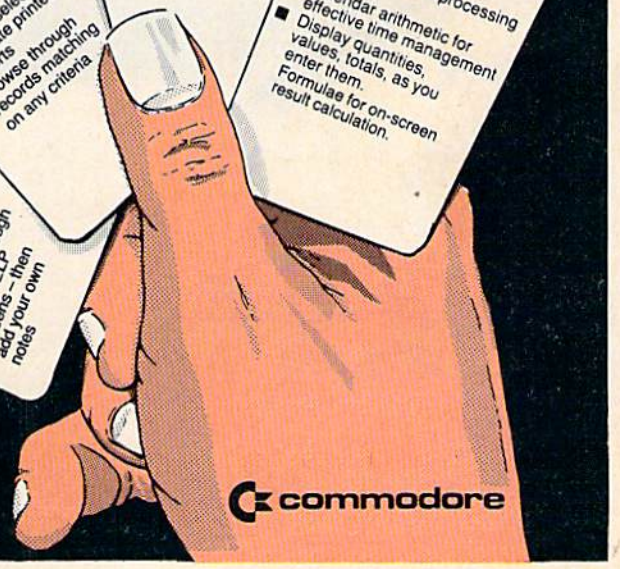

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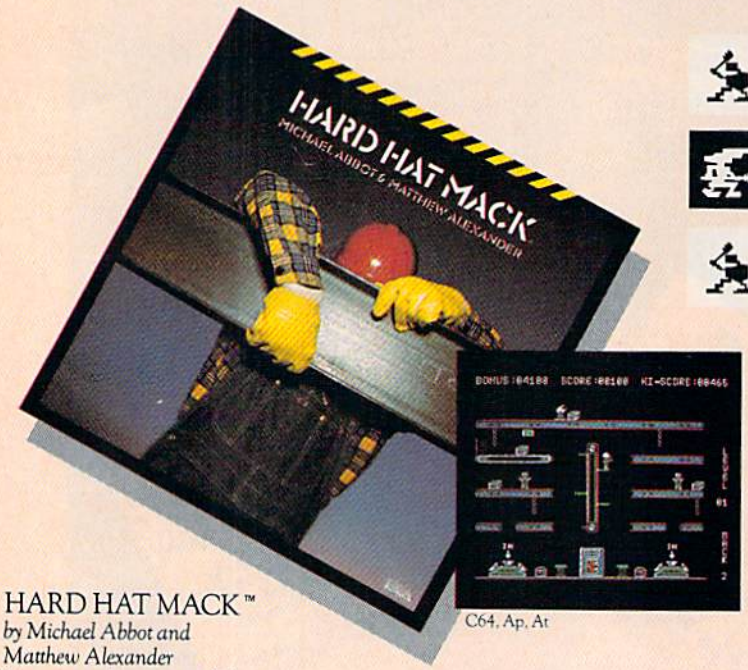

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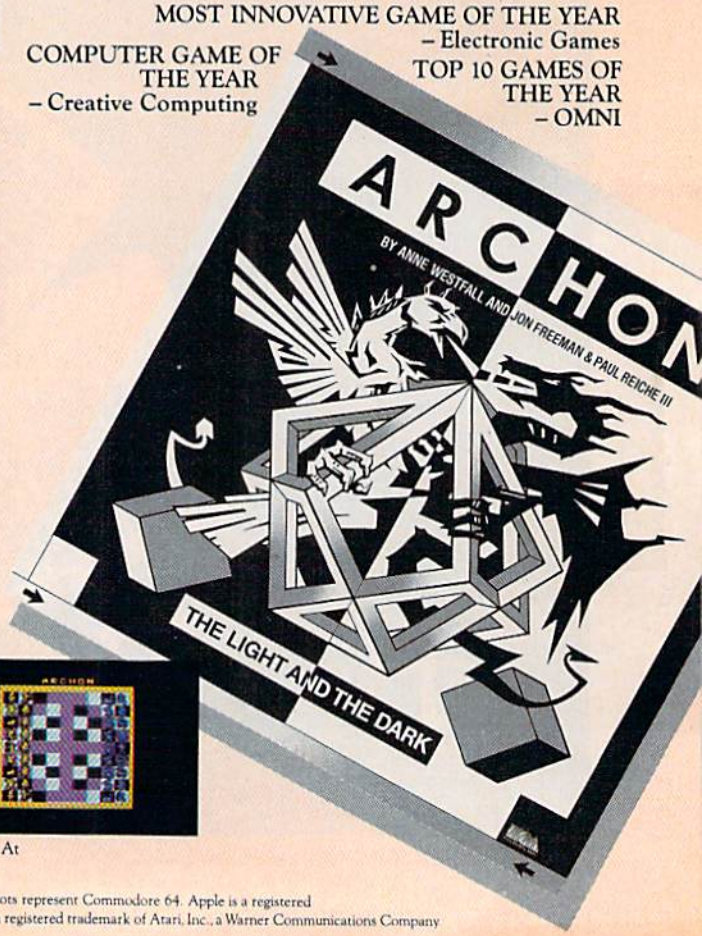
MOST INNOVATIVE GAME OF THE YEAR
– Electronic Games

COMPUTER GAME OF THE YEAR
– Creative Computing

TOP 10 GAMES OF THE YEAR
– OMNI



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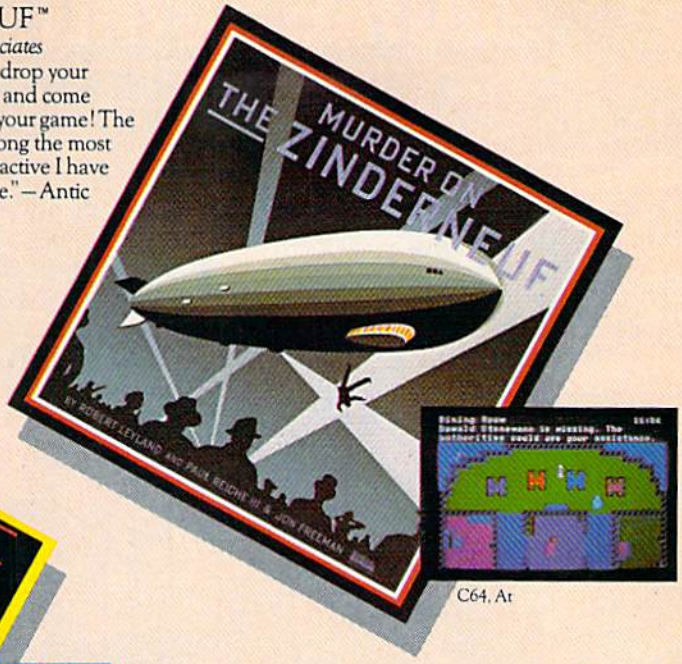

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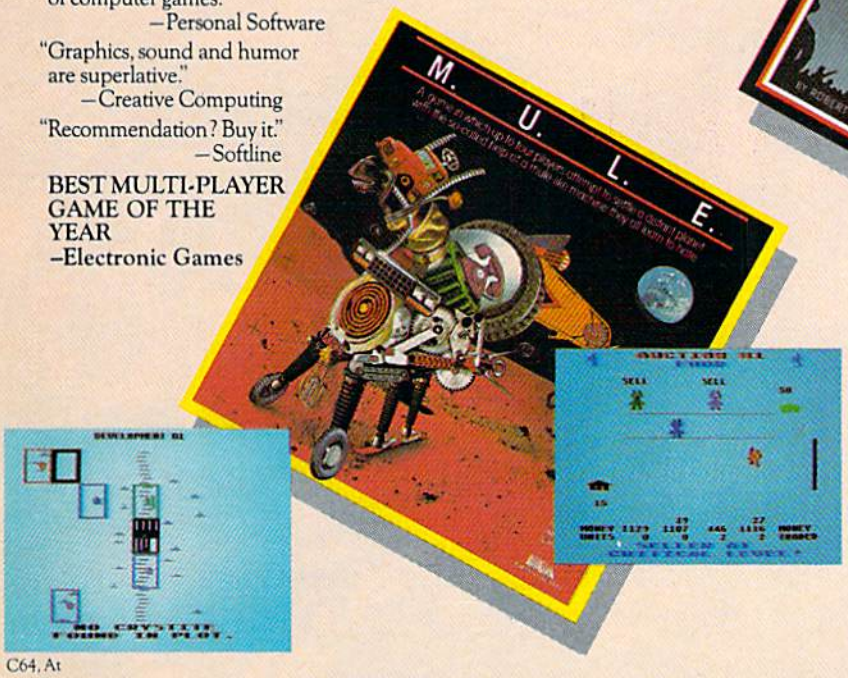
–Electronic Games



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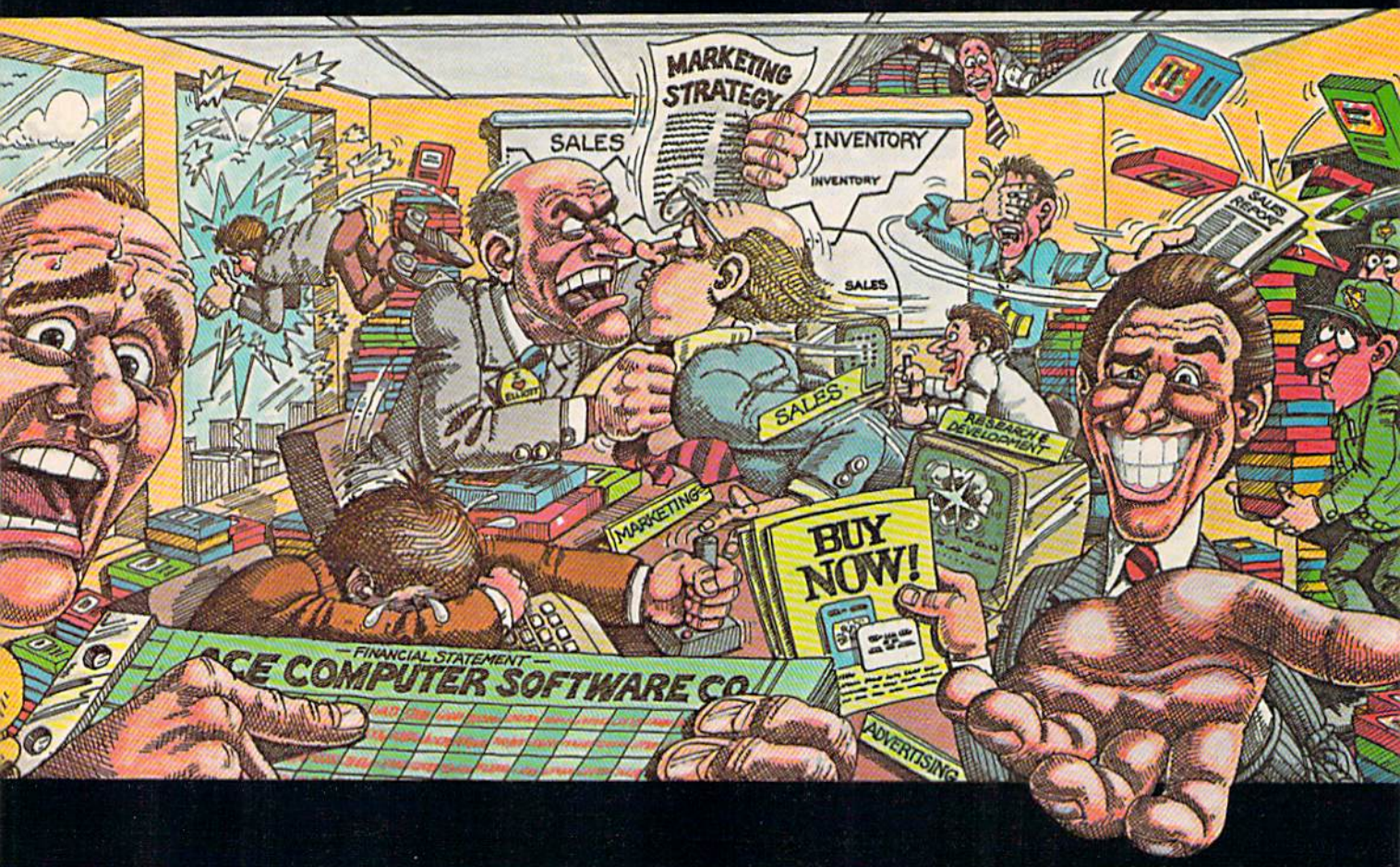

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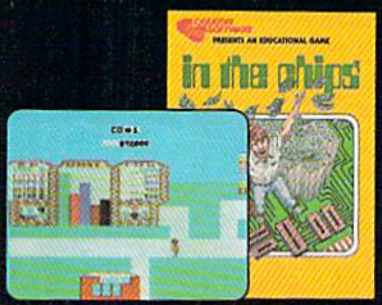

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C R E A T I V E S O F T W A R E

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.

Editor In Chief

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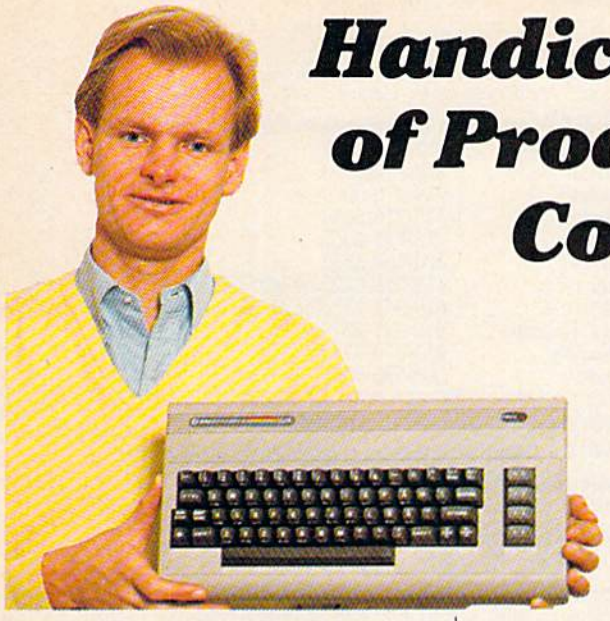

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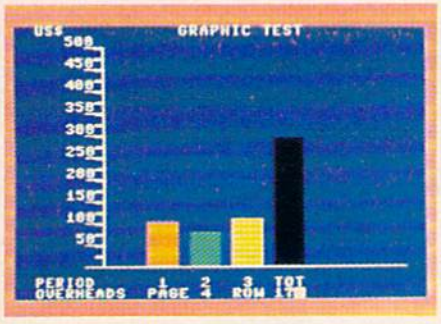

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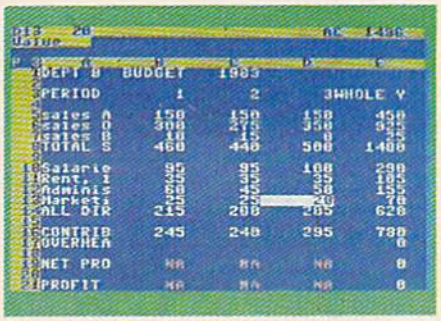

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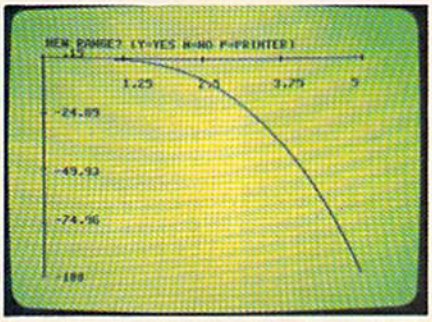

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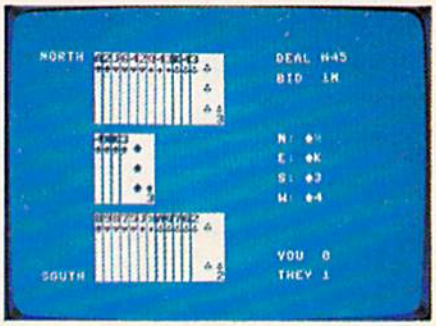

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Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s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

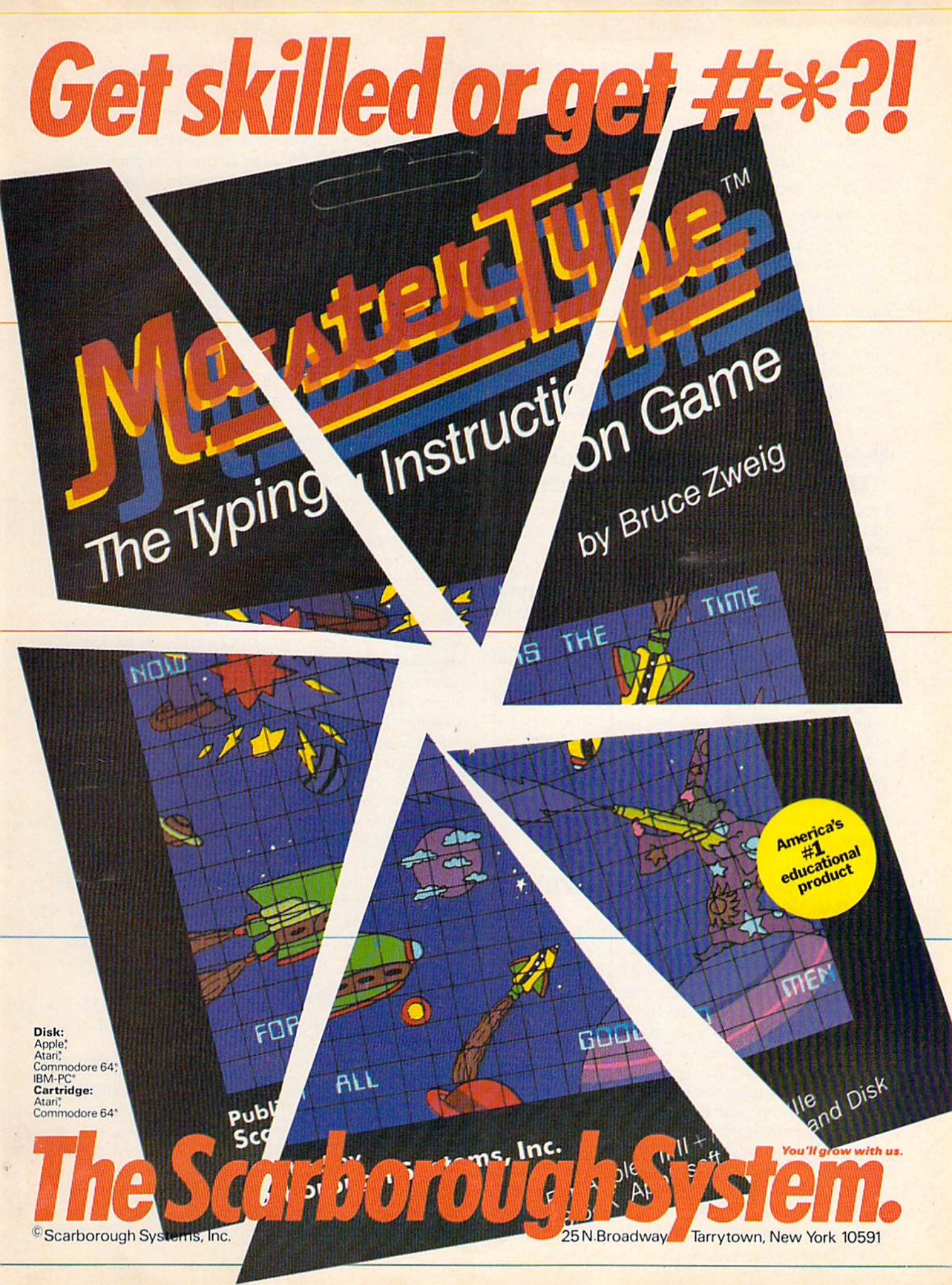
```
10 FOR A=115 TO 138: POKE A,0: NEXT
```

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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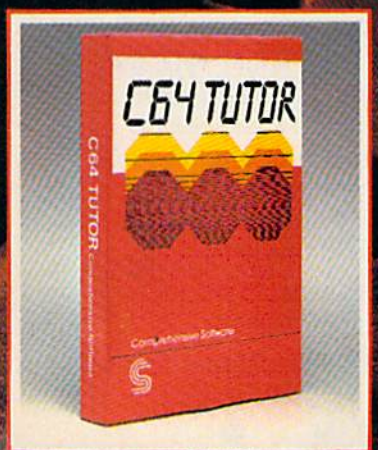

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Transferring Data From BASIC To Machine Language

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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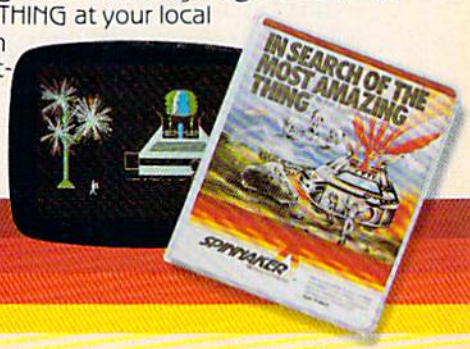

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Commodore's New Computer Family:

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.

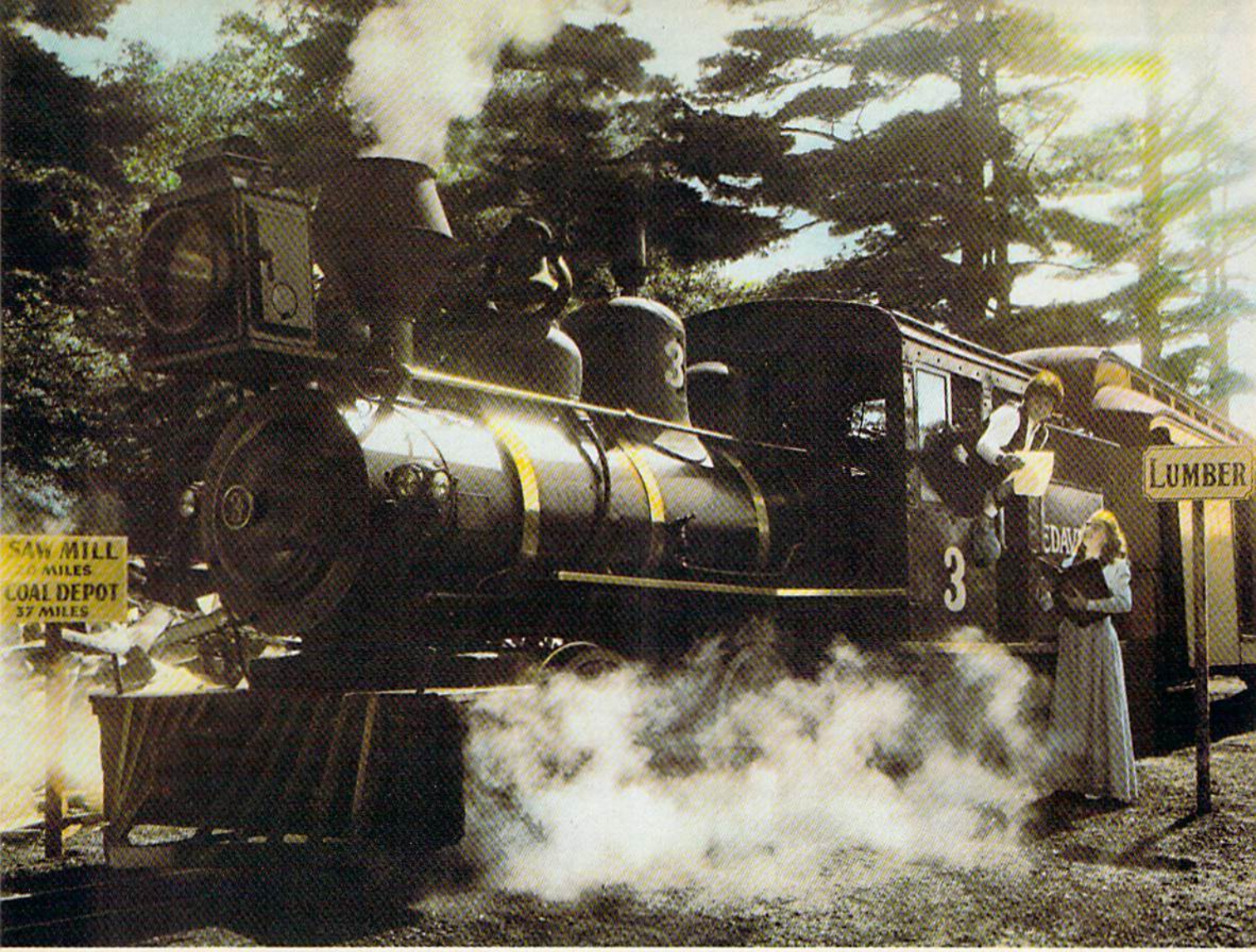
The company announced that during 1983 it became the first microcomputer firm to top the $1 billion mark in sales, more than doubling its $458 million 1982 sales figures. Commodore officials said that all four of its microcomputer models—64, VIC-20, PET, and CBM—achieved record sales levels during 1983.

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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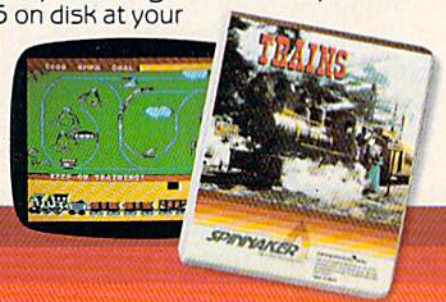

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BASIC. Even the cassette buffer has been slightly relocated in memory. Also, the central processing unit (CPU) is not the 6502/6510 chip found in the VIC and 64; it is a new chip called the 7501. Luckily, the 7501 appears to be largely compatible with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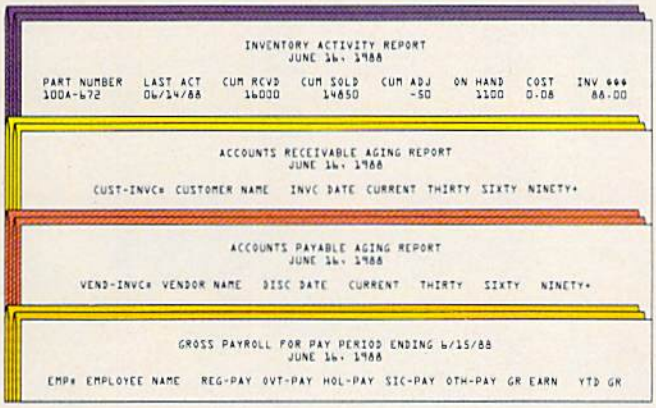

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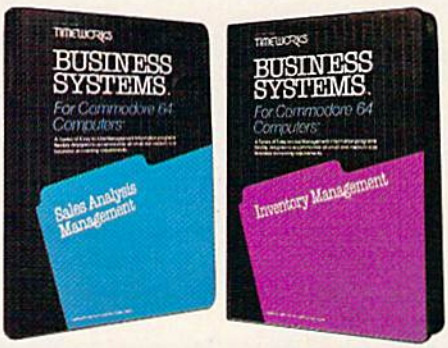

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with a joystick and teaches turtle graphics and programming concepts to children. HesWare also announced three new educational titles from Sunburst Software—*Factory*, for those eight years or older, places the user in the role of a design engineer 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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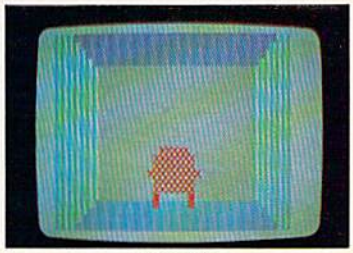

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Robots: The New Mobile Computers

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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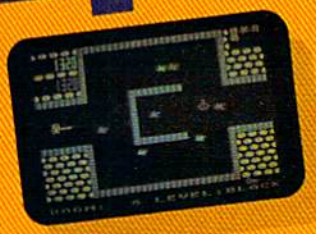

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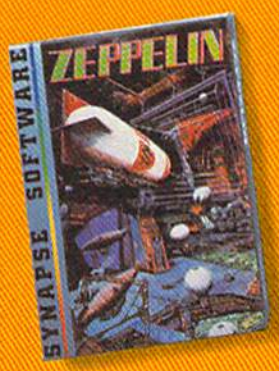

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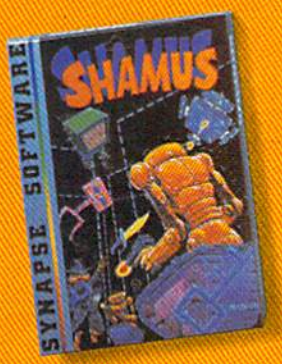

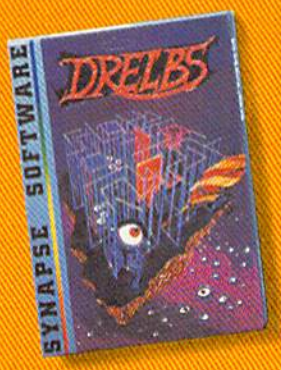

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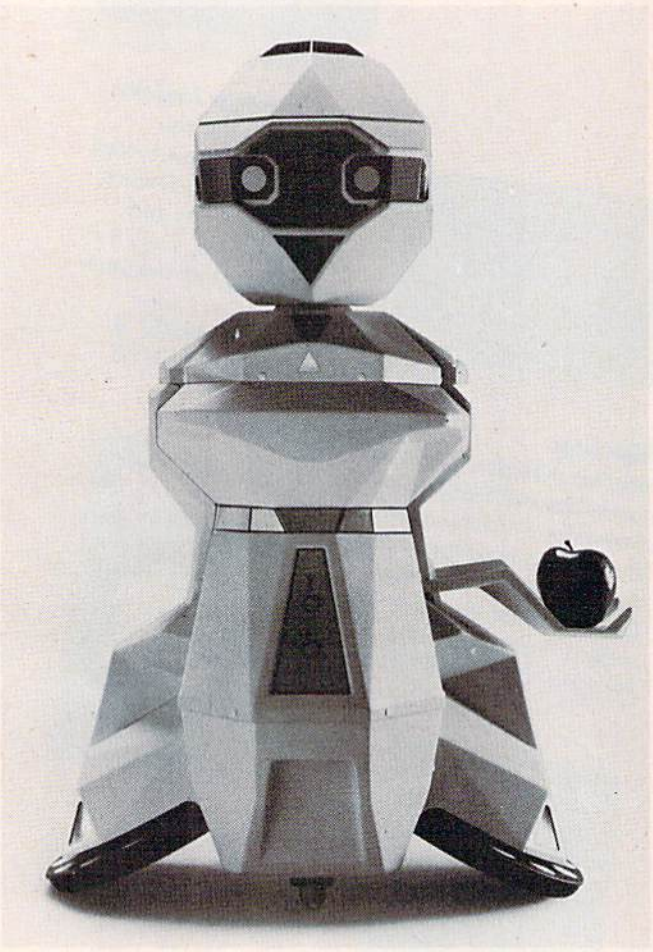

Androbot's Topo, a three-foot-tall computer-peripheral robot, will be available this year for Commodore, Apple, and IBM computers. Base price is $1595.

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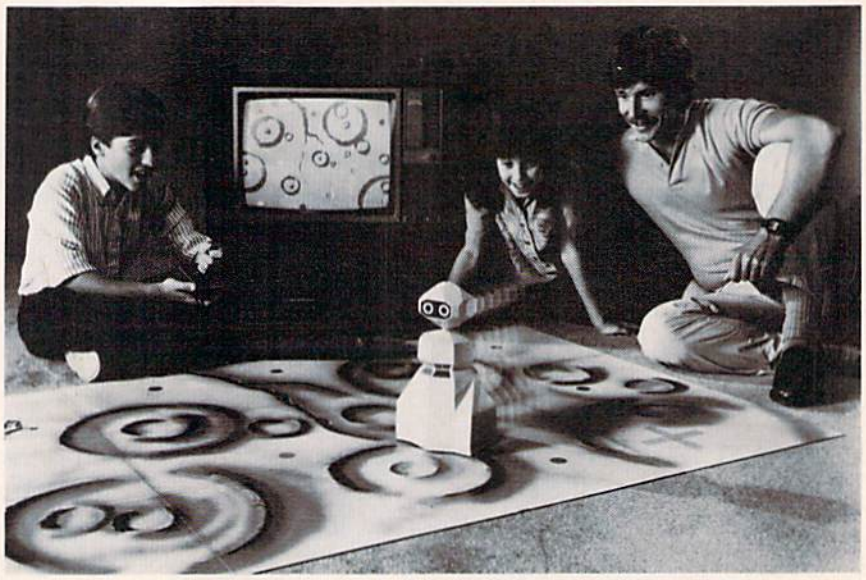
three-foot-tall robot was a wheeled computer peripheral that could be programmed through the keyboard of a microcomputer. All 650 of the prototypes sold at a price of $495 each.

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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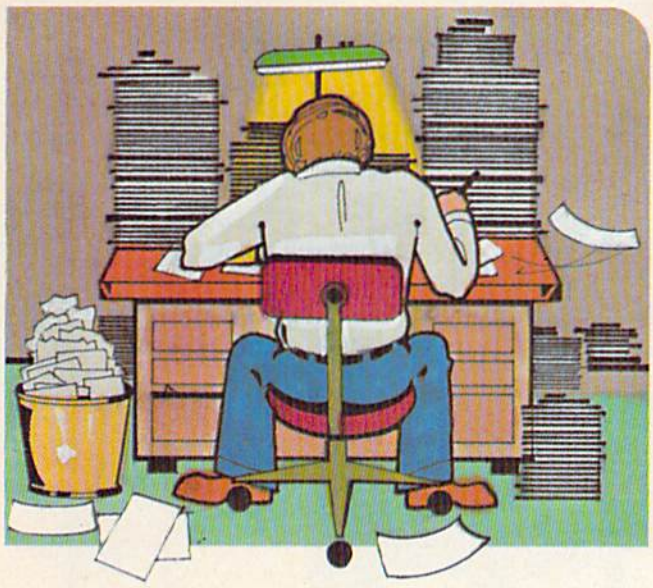

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keyboard, and experimental circuit board.

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.

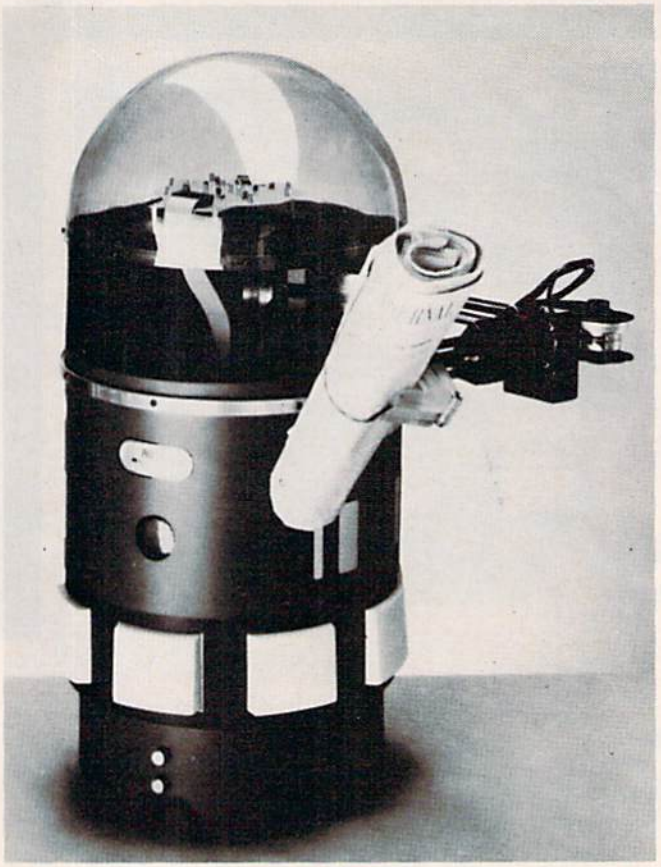
"We think the personal robot industry will follow the kind of explosive growth that we've had over the past six years in the personal computer field," says RB Robot's Bosworth. "The horizon is more like 5 to 10 years and not 10 to 15 years."

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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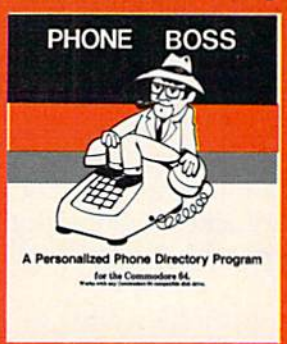

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How To Start A User Group

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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Resource Library. Thousands of public domain programs are available through individuals, other user groups, bulletin boards, and Commodore itself. You can appoint a librarian to take charge of this, someone who will copy disks for group members. People could bring new disks to the meeting and request copies, or the user group could purchase disks in bulk and charge a small fee for the disk and the librarian's time. Remember that it is illegal to copy anything but public domain programs.

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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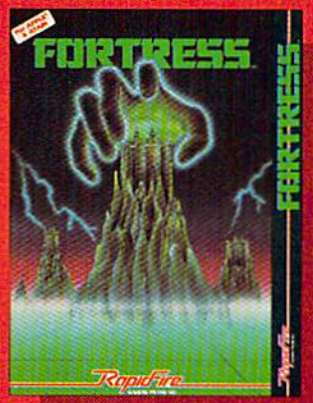

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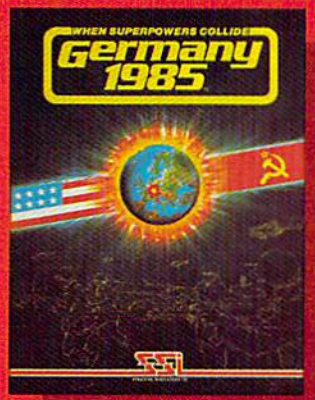
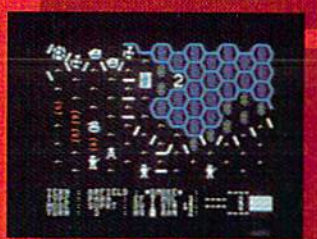
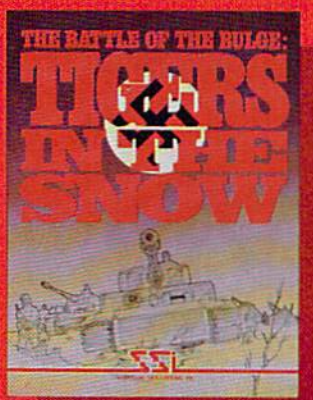


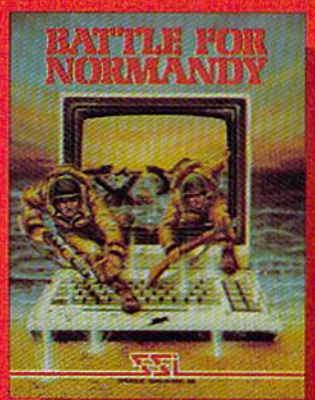
The first game in the series, When Superpowers Collide, our hypothetical projection of possible U.S.-Russia confrontations. GERMANY 1985™ simulates an invasion of West Germany by Soviet battalions. NATO forces must repel this onslaught. On disk. $59.95.

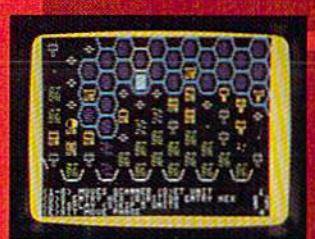


This second game in the series "When Superpowers Collide" takes you to the desert oilfields of Saudi Arabia. Soviet troops have captured these vital points, and it is up to the U.S. Rapid Deployment Force to regain them. On disk. $34.95.



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:

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attn: Commodore User Groups

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The National VIC-20 User Group
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Eau Claire, WI 54701
715/874-5972

Madison Area Commodore User Group
John Carvin
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Middleton, WI 53562
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Milwaukee Area Commodore 64 Enthusiasts (M.A.C.E.)
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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.

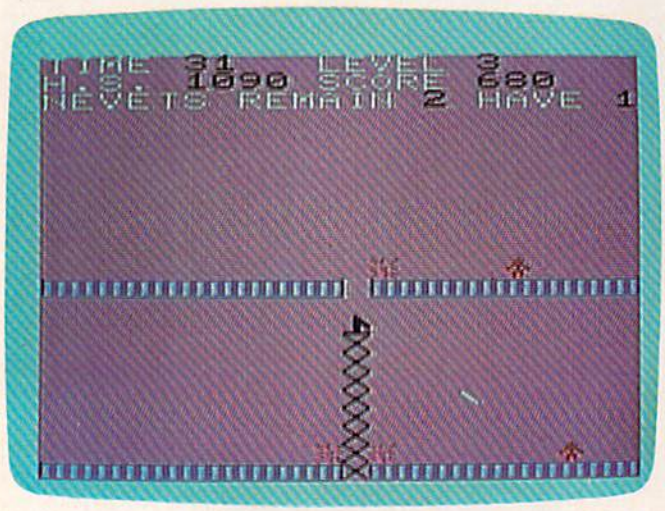
The game ends when time runs out or all four power capsules have been stolen. You then have the option of playing again. The game also keeps track of high score.

VIC Program Structure

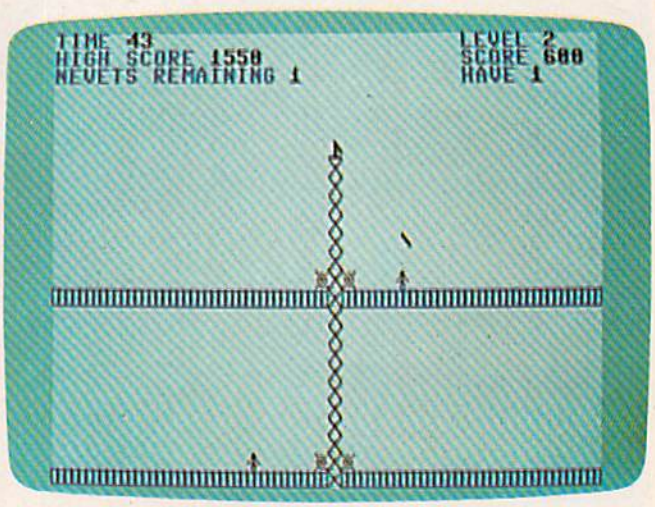
Here's the VIC version program structure for those interested in how the program was written:

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.

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.

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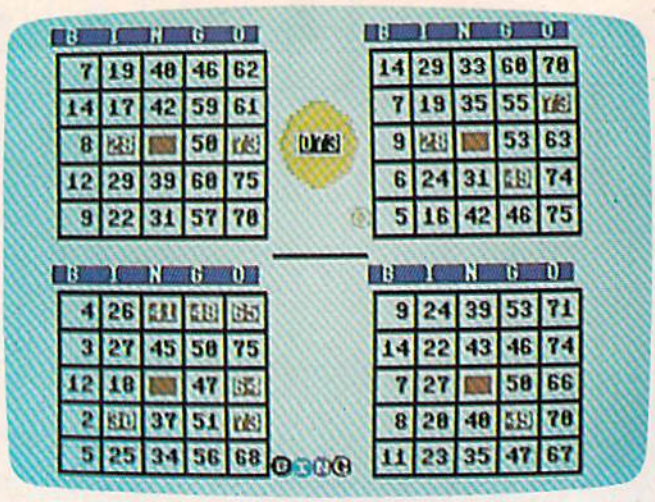

The computer calls the shots in "Bingo 64."

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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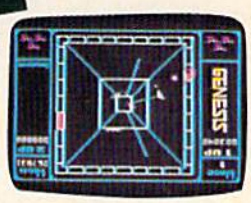

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Some Answers From Commodore:

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.

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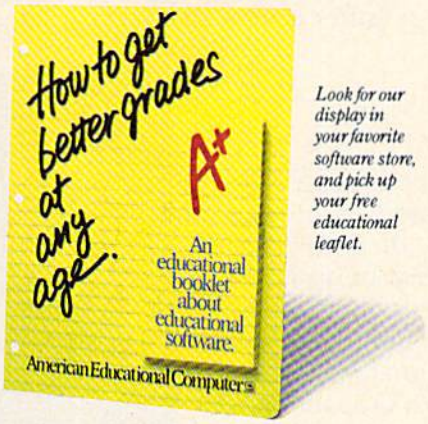
You can help your child all the way through school and beyond.

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.



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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.

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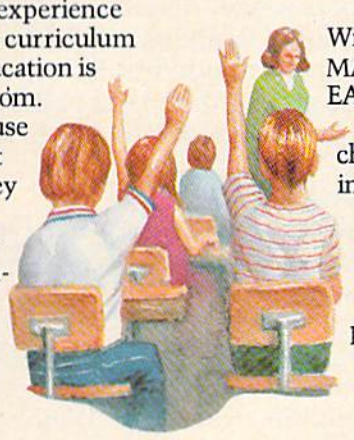

With either AEC's MATCHMAKER™ or EASYREADER™ Series, you can take your child through the grades in subjects such as Phonics, Word Attack Skills, Reading Comprehension, Spanish, World or US Geography, and Grammar. Our teacher tested system allows parents to enter material into a lively, interactive format.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

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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:

Quick Brown Fox
536 Broadway
New York, NY 10012
(212) 925-8290

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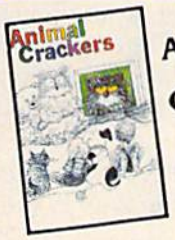

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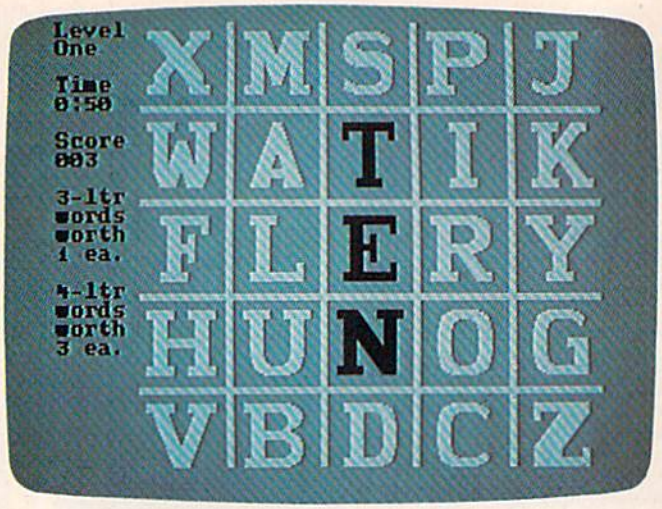

Link the Letters

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
```

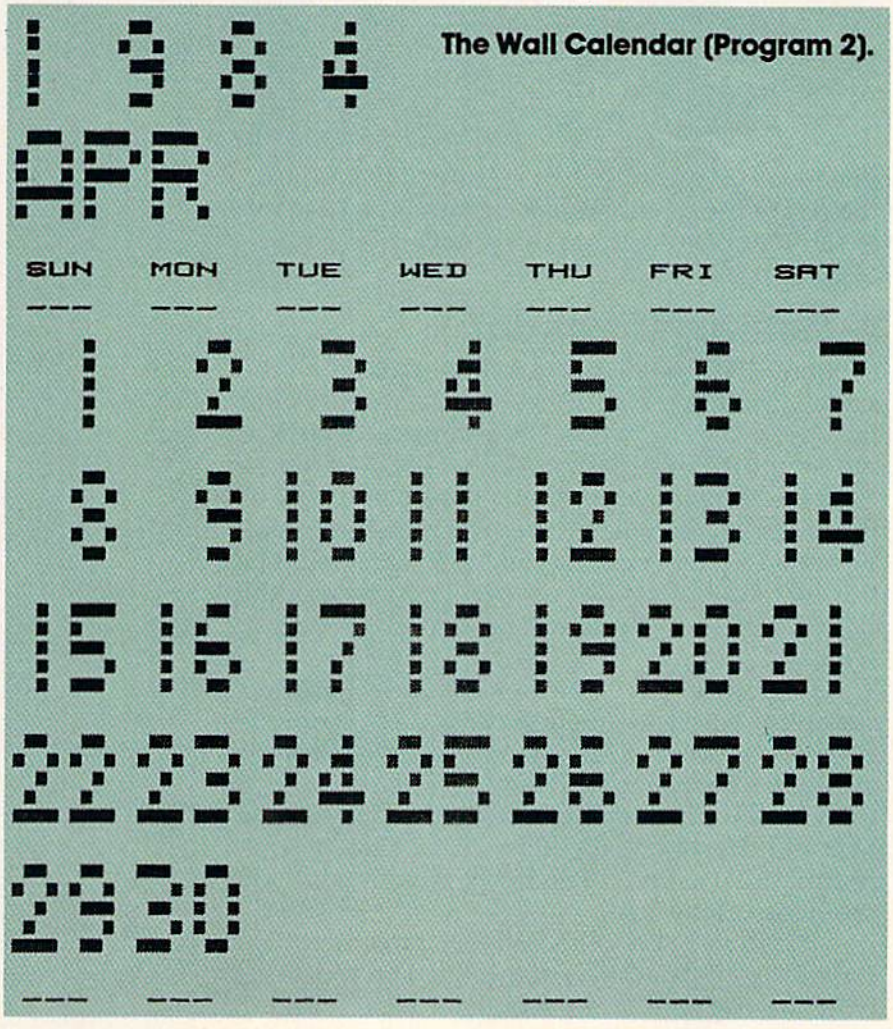
Two modifications have to be used with the above formulation. For M equal to 1 or 2 we have to add 12 and subtract Y by 1. In other words, we consider the months January and February as the thirteenth and fourteenth month of the previous year. In addition, for M equal to 4 or 9 the calculated D1 has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

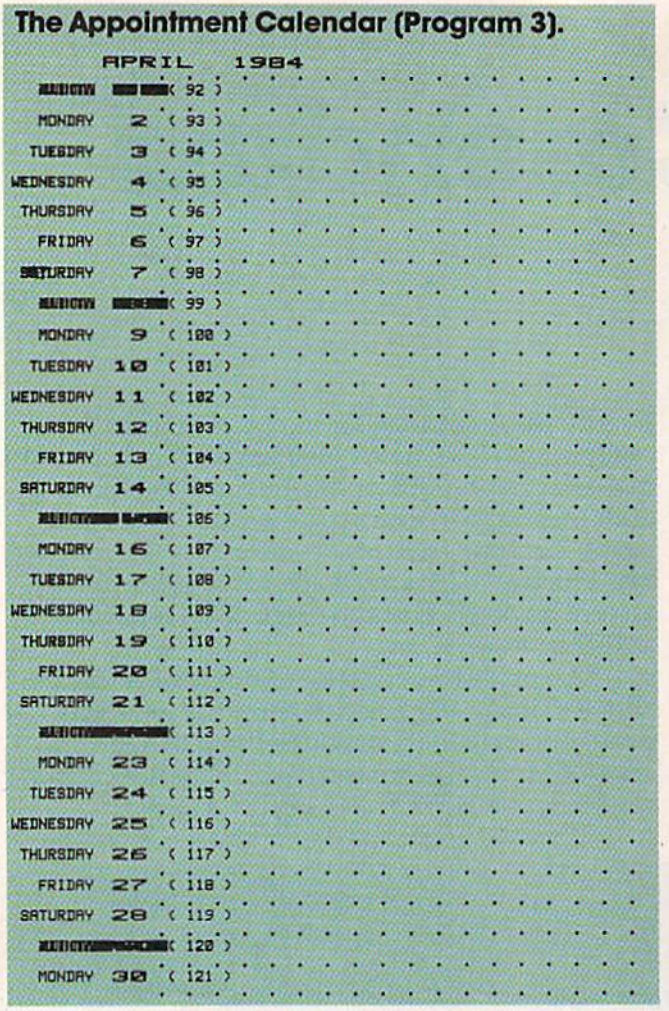
The programs contain modifications like the above to make them accurate for the next five centuries, provided, of course, that the current calendar system is not reformed. (The last calendar reform was in 1752.)

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.

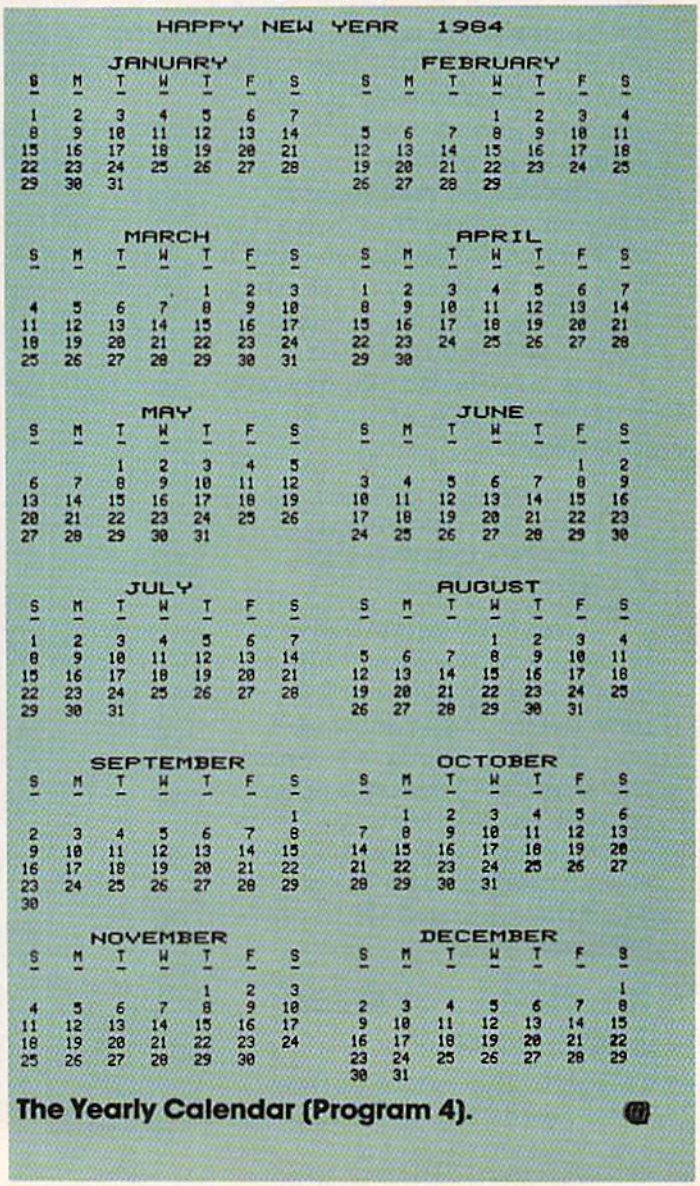
Program 3 also gives you a printed monthly calendar, but in a different format. The program tabulates the days of the month as a list. It can serve as an appointment calendar for your desk, with room for short notes each day. Along with the regular date, you are told what day of the year it is. This 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.

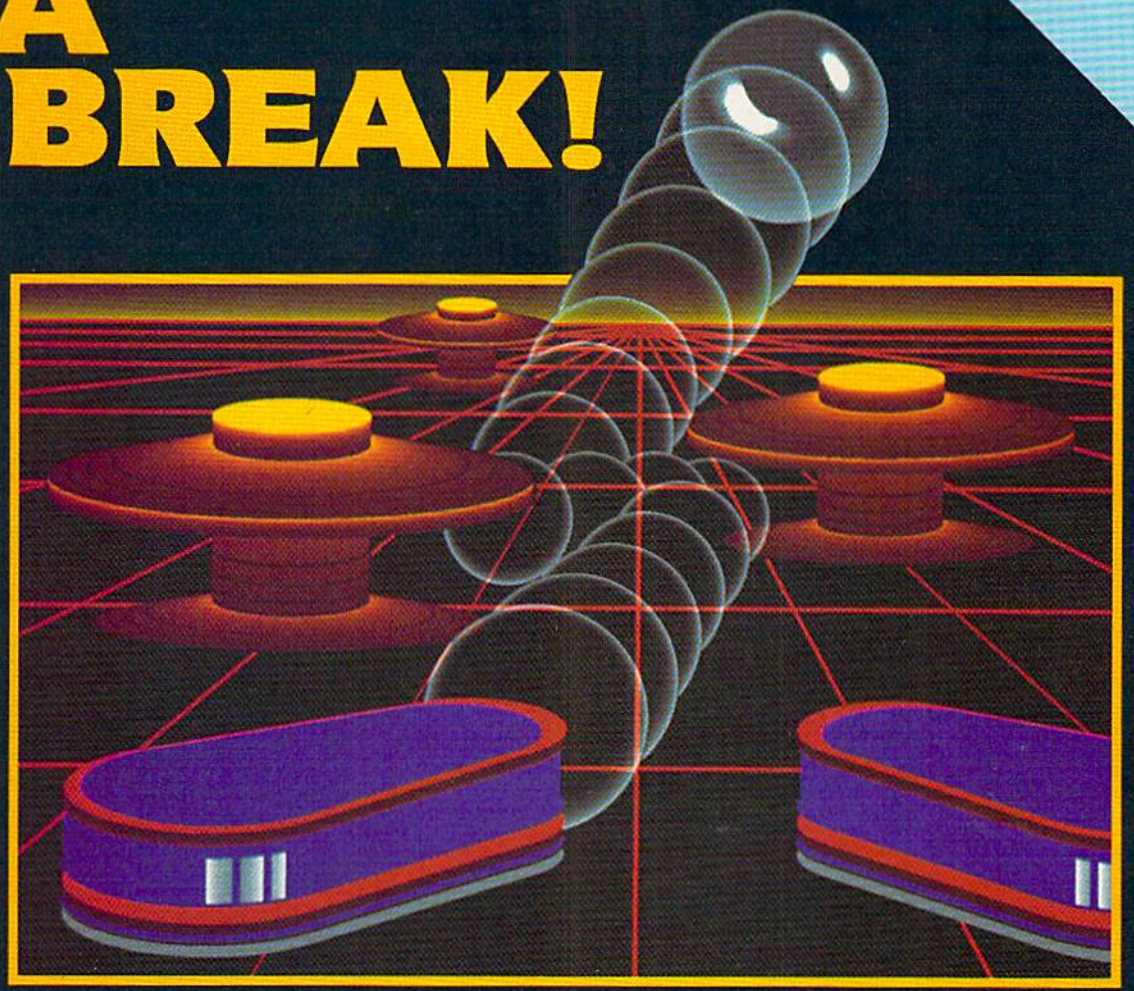
See program listings on page 150.



The Yearly Calendar (Program 4).

TAKE A BREAK!

For Commodore 64



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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.

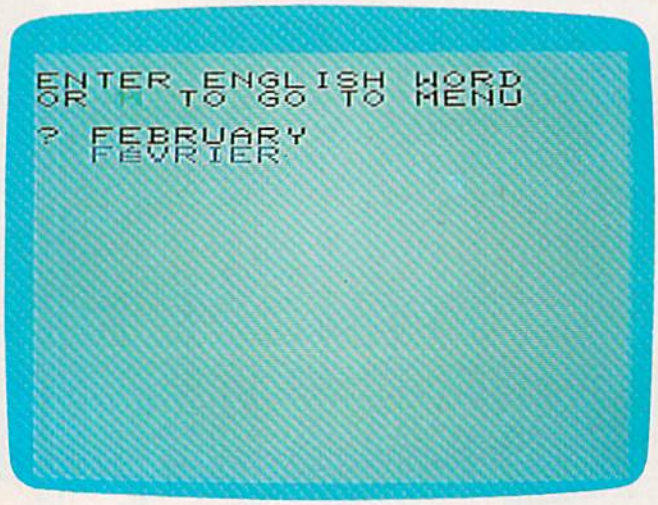
"French Tutor" was suggested by Steve Steinberg's "Language Lab" (COMPUTE!, July 1982), which provided for both drill and translation. It was relatively easy to adapt to the VIC, with a few minor modifications. For example, a dummy word (XX) is needed as the last item in the DATA statements to prevent 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

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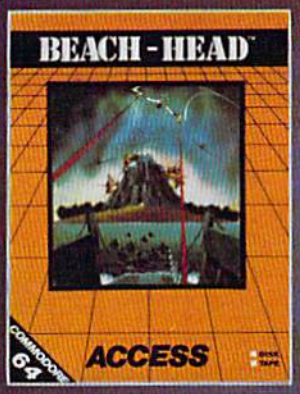

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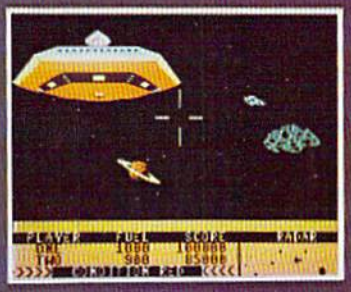

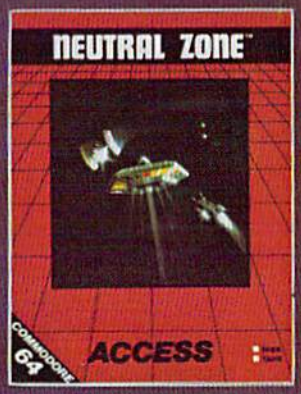

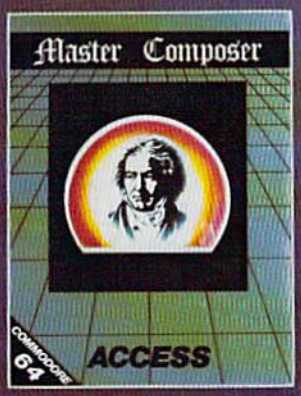

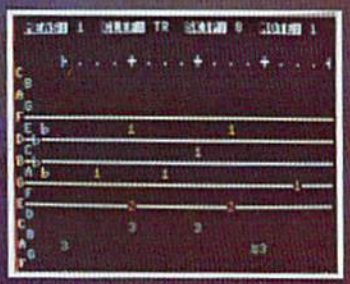

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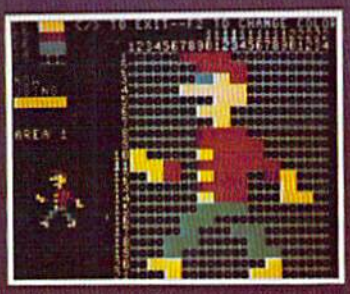

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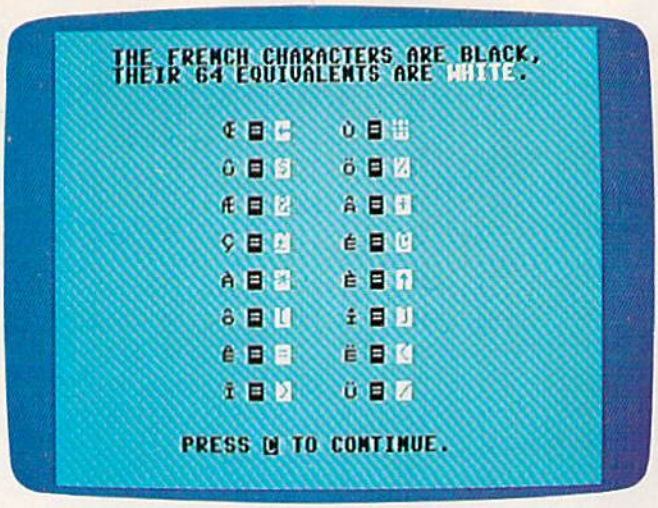

"French Tutor" also includes French accents and symbols (64 version).

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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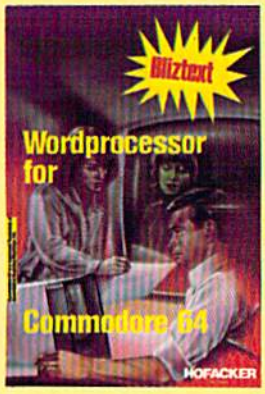

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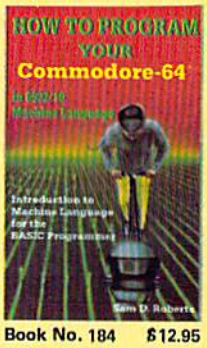

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REVIEWS

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.

Edumate Light Pen
Futurehouse
Box 3470
Chapel Hill, NC
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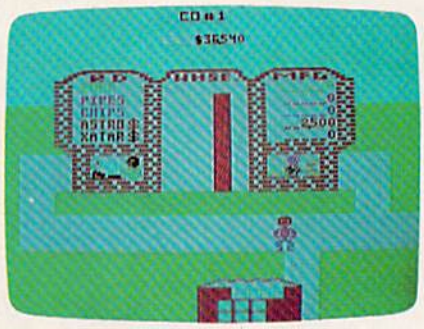
In The Chips: Playing To Win In Business

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
Creative Software
230 East Caribbean Drive
Sunnyvale, CA 94089
(408) 745-1655
$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.

Beach-Head
Access Software
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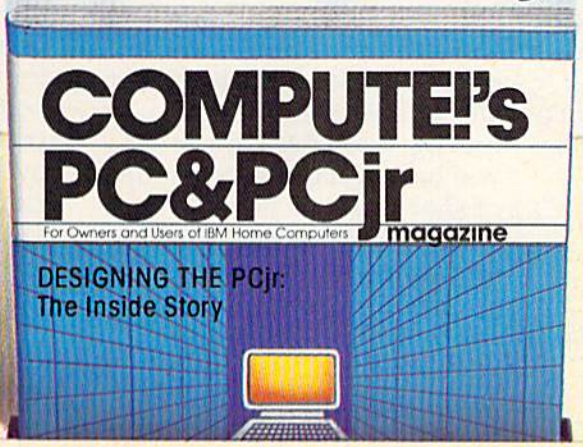

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Lunar Leeper And Cannonball Blitz

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
Cannonball Blitz
Sierra On-Line Building
Coarsegold, CA 93614
(209) 683-6858 *$29.95 each*

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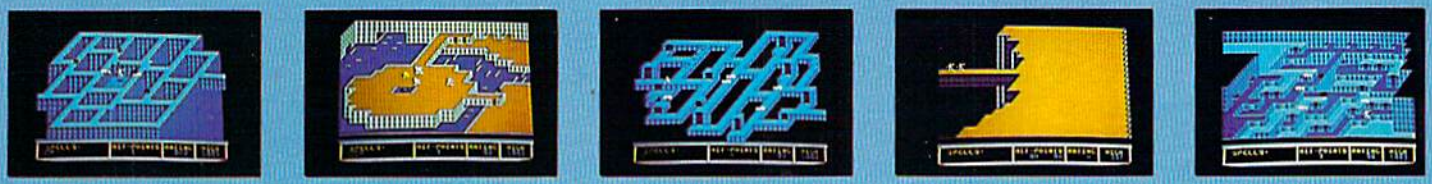

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SIMPLE ANSWERS TO COMMON QUESTIONS

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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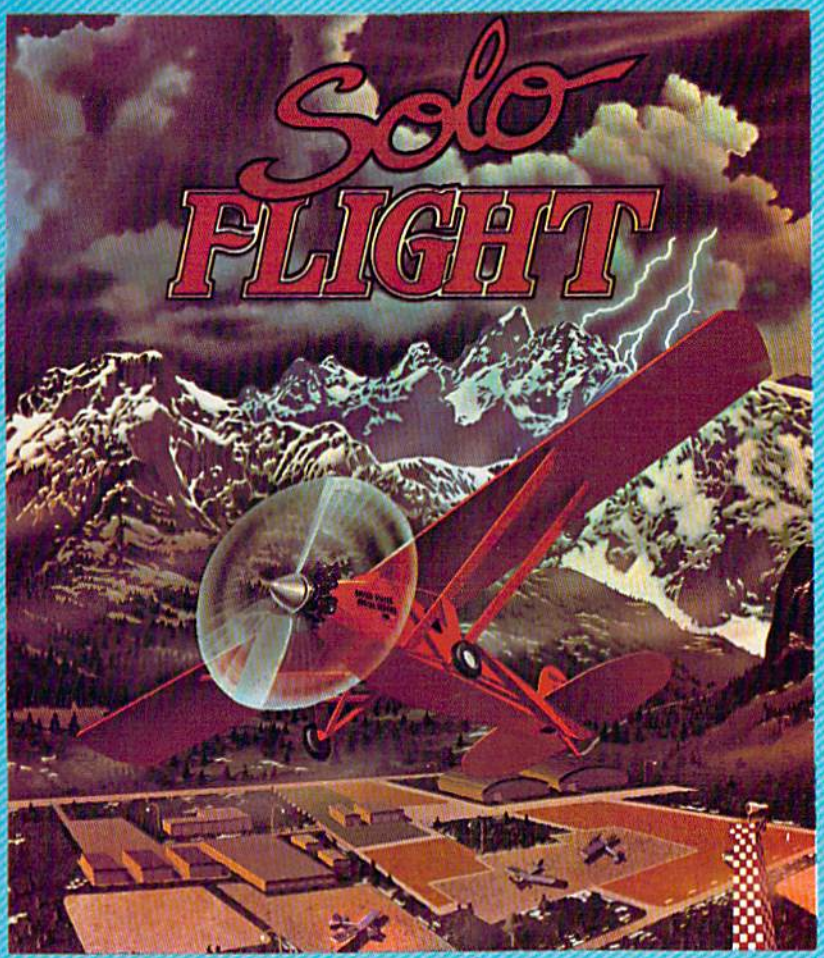

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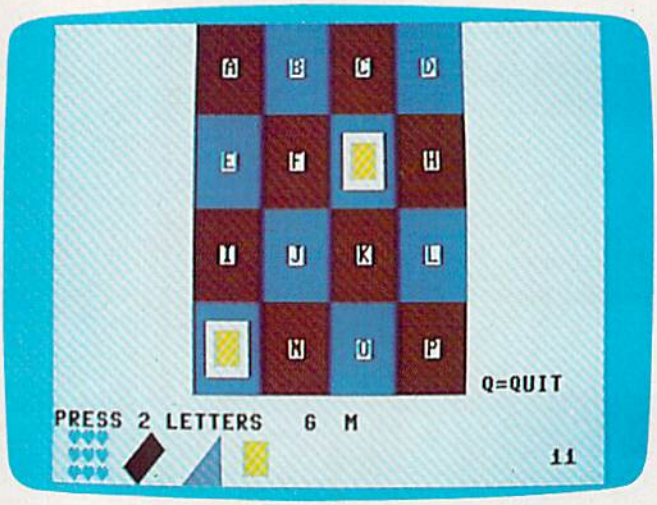
C. REGENA

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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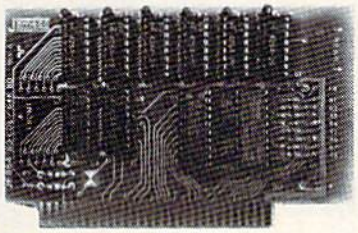

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Little Known BASIC Commands

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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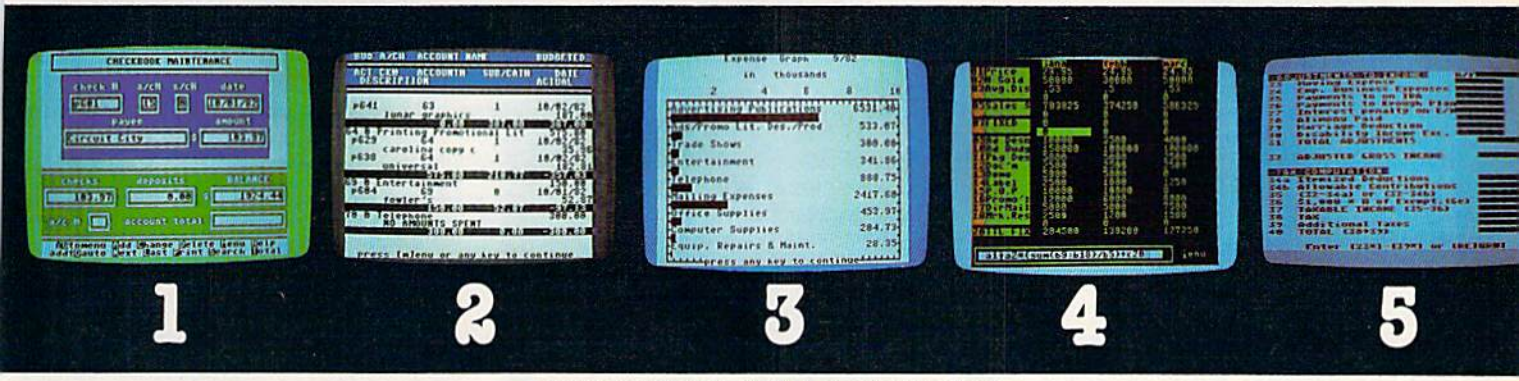

actual screen display *Indicates function being shown

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Summary Budget Analysis
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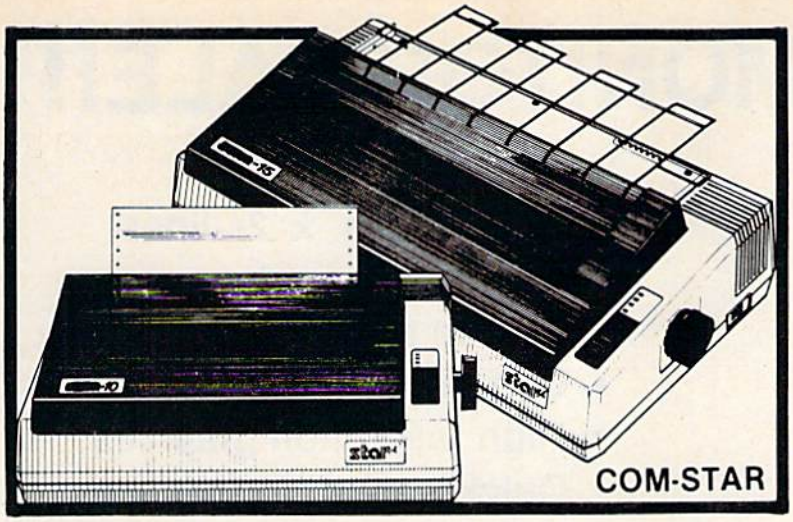

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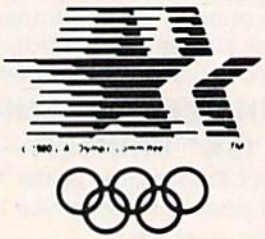

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do the same thing with just one line:

```
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
```

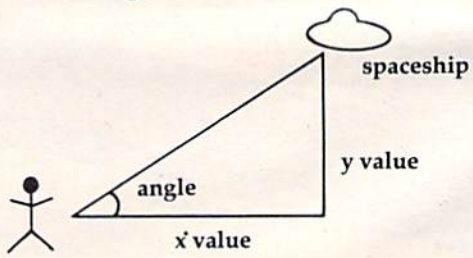
In the program above, line 20 checks the sign of the number. SGN(K) yields –1, 0, or 1. Add two to get 1, 2, or 3. The ON-GOTO then makes the program branch to line 30, 40, or 50. It's a quick way to check for positive or negative numbers and branch accordingly.

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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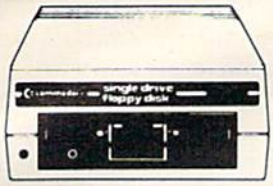

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When you run the above program, you will notice that the angle will always range from $+\pi/2$ to $-\pi/2$ ($+90$ to -90 in degrees). If you want the full range of 0 to 360 degrees, you have to figure out which quadrant you're in and adjust the results. 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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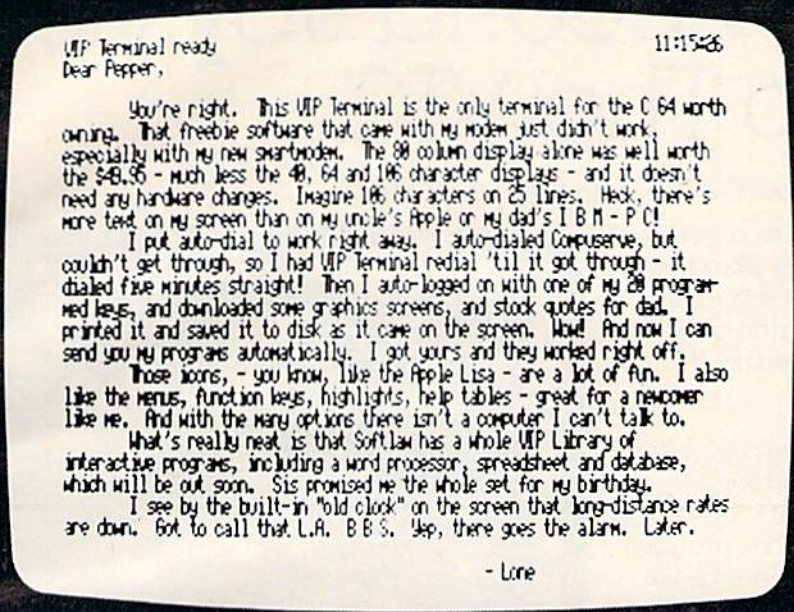

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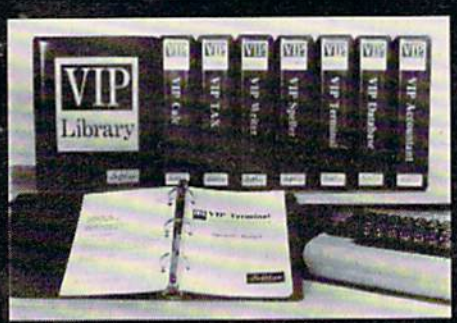

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AUTHOR'S SUBMISSIONS ARE ENCOURAGED.

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

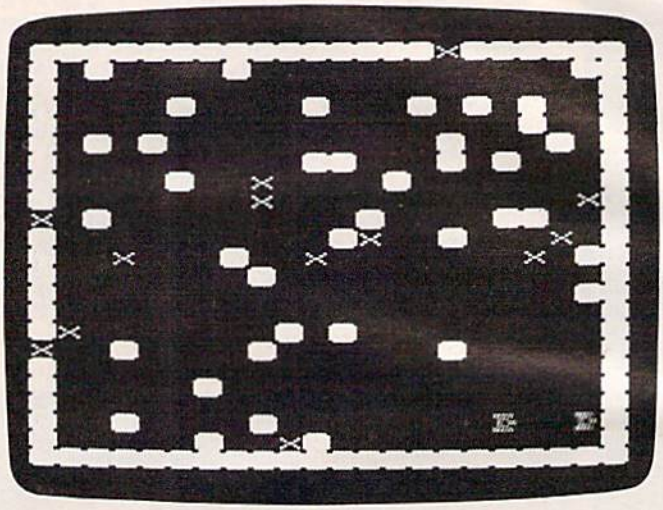
You can use joysticks, paddles, and light pens. with these game ports. The joysticks and paddles are perhaps the most popular, because they are inexpensive, easy to use, and can take the punishment of arcade-type action games.

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.

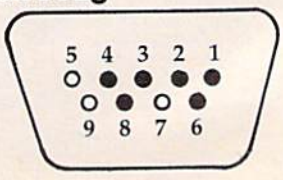


The red tank attacks, while the blue player maneuvers to get out of the corner in "Tank Mania."

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:

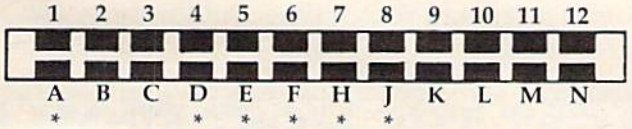
Pin number	Description
1	Up – Joy 0
2	Down – Joy 1
3	Left – Joy 2
4	Right – Joy 3
6	Fire Button
8	Ground

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
```

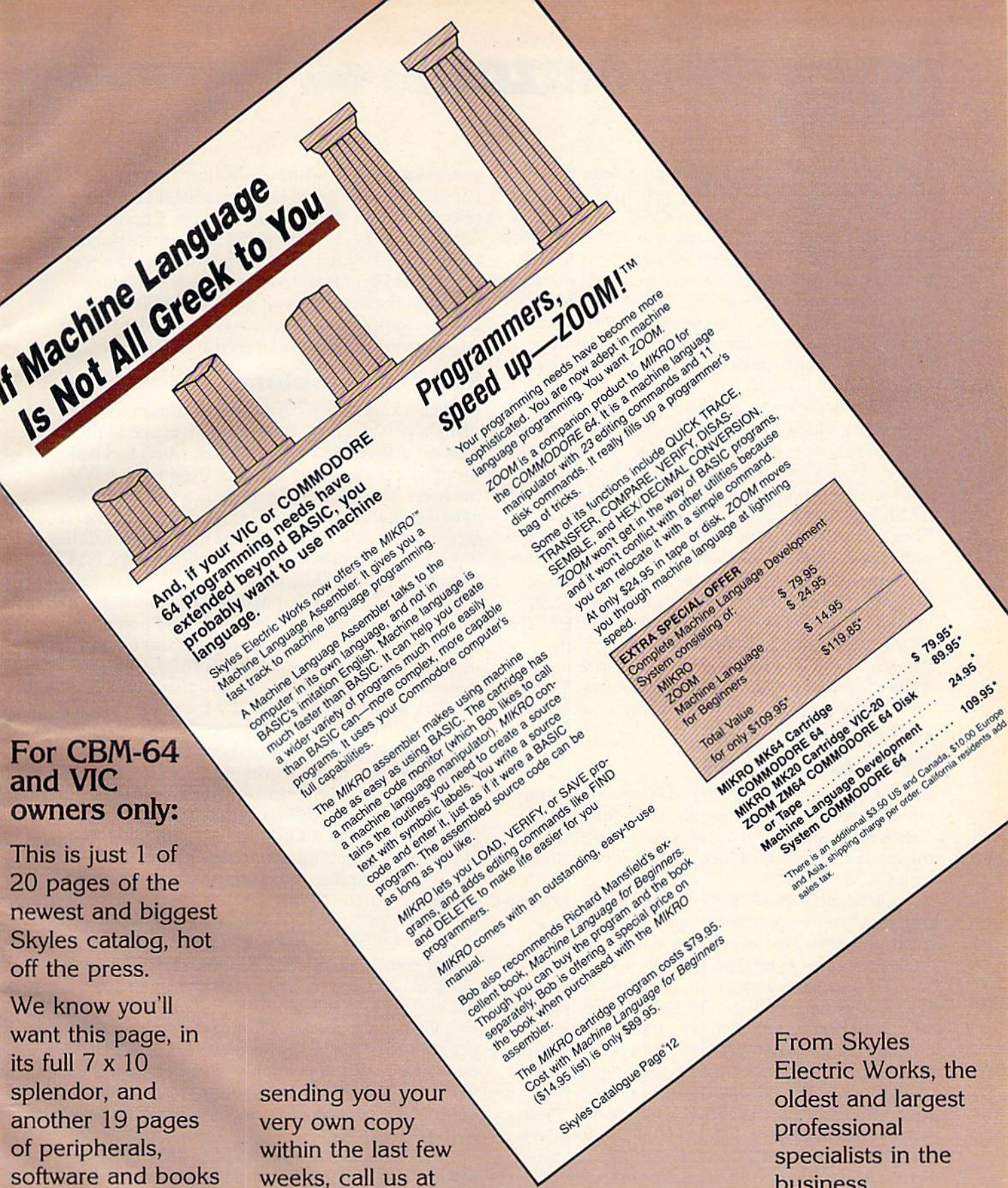
If you RUN the above program, you will get an ?ILLEGAL QUANTITY ERROR IN 40—but there's nothing wrong with line 40. It simply reads a number and tries to POKE screen memory. The real problem is line 510 and the number 999. You can POKE memory locations only with numbers from 0 to 255. The number 999 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.

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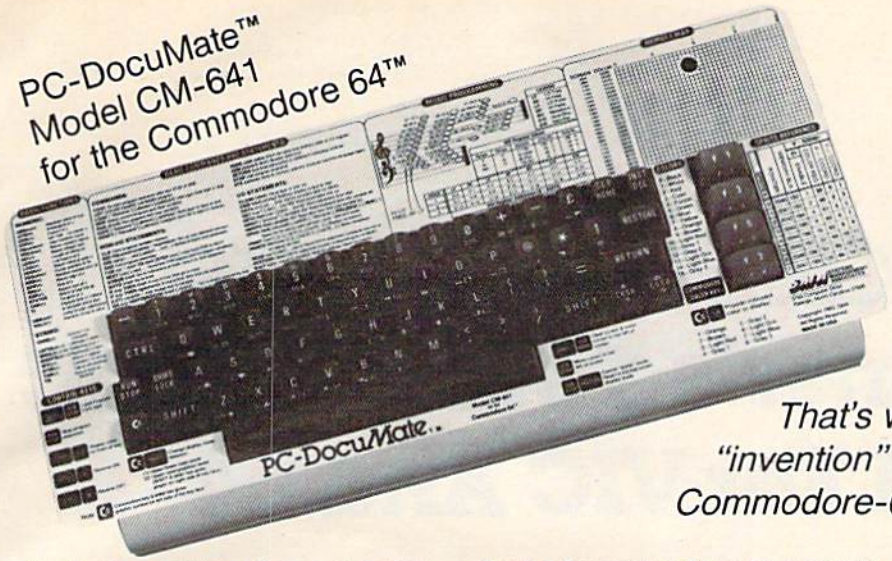
Model CM-641
for the Commodore 64™



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

Now we had organized the most essential information for our VIC and 64 in the most logical way. BASIC, music, color graphics, and sprites all seemed a lot easier. Our initial problem was solved by PC-DocuMate™.

But we have a confession to make.

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We had solved this kind of problem before. In fact, many times before. You see, we at SMA developed the original PC-DocuMate for the IBM PC. We've made templates for IBM BASIC and DOS, for WORDSTAR™, VISICALC™ and other best-selling software packages for the IBM PC.

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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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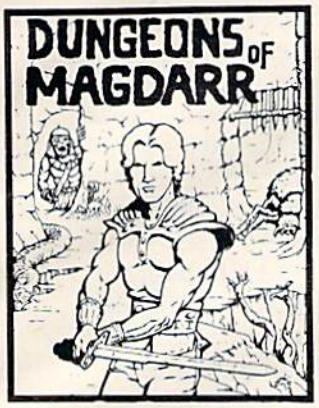

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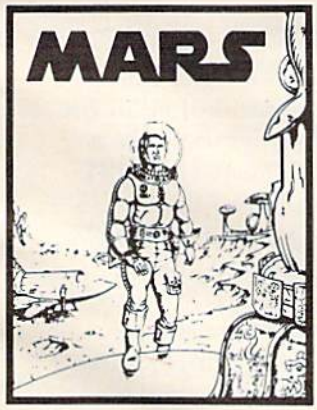

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The Program Looks At Itself

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

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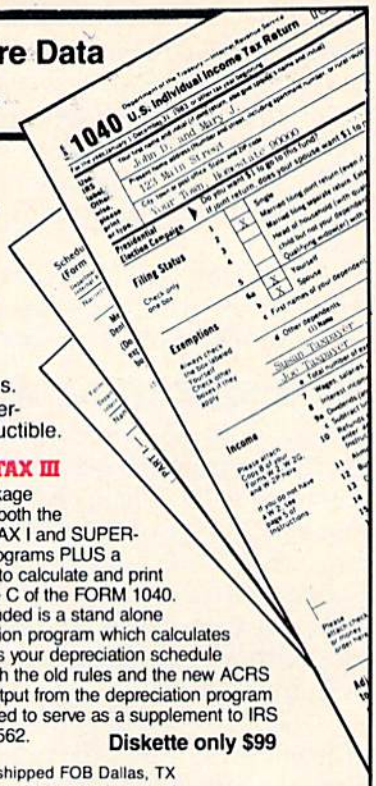

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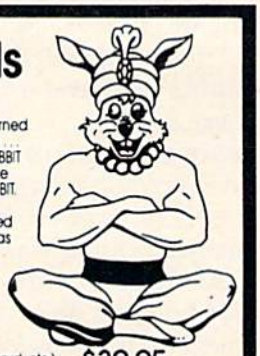

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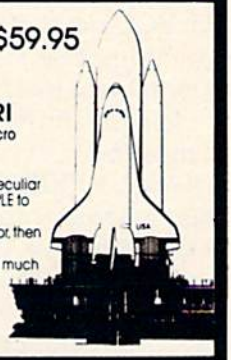

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being updated in address 144. If it isn't zero (BNE, Branch Not Equal to zero), the program is forced down to 49200 which JSR's to the routine in BASIC that stops communication. And we then RTS back to BASIC. A reading error or an end-of-program signal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

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Numeric Keypad

Charles Kluepfel

Turn your keyboard into a "Numeric Keypad" for more efficient numeric input. The program lets you toggle to standard keyboard or numeric keypad. Written for the 64, we've added a version for the VIC.

You could type in numbers much faster and with fewer errors if the VIC-20 and Commodore 64 had a numeric keypad. This program offers this handy feature by redefining a set of keys to represent numbers instead of letters.

VIC Notes On Numeric Keypad

Kevin Martin, Editorial Programmer

The VIC version of "Numeric Keypad" operates the same way as the 64 version, but uses an entirely different technique.

Program 2 is a BASIC loader which POKEs machine language to the top of BASIC and then executes a SYS to start the interrupt. There is one major operating difference from the 64 version: Instead of using CTRL-N to start, it uses CTRL←.

The 64 version POKEs BASIC and the Kernal ROM into RAM and then modifies the Kernal. This luxury isn't available on the VIC, but there is a way around it. The hardware interrupt can be used to change the characters stored in the keyboard buffer to different values.

To use this program with another, first LOAD and RUN. Since it resets the top of BASIC pointers, be sure your program doesn't reset them. If it does, Numeric Keypad will not function correctly.

Technical Modifications

The more technically inclined might be interested in a few tricks used in the VIC version. The program uses the interrupt by pulling the A, X, and Y registers from the stack, storing them in memory, and pushing them back.

Then, it pushes the high and low bytes of the new return from the interrupt address, the processor status byte, and the A, X, and Y registers to the stack. It then jumps to the normal interrupt routine. We push those bytes so that after it executes the RTI in the interrupt routine it will return to the interrupt instead of the main routine.

It then loads the keypress value in 197 to determine if the back arrow is being pressed. If it is, bit 2 of address 653 is checked to see if the CTRL key is being pressed. If it is, we jump to the routine to see if there is a value for any of the U, I, O, J, K, L, or M keys in the keyboard queue. If there is a value for any of these, they are changed to either a 4, 5, 6, 1, 2, 3, or 0, respectively. We then jump to the ending routine.

If either the back arrow or the CTRL key is not pressed, we jump to a routine to determine if the flag at 251 is set. If that flag is set, we go to the routine to change the characters in the keyboard queue. If the flag is not set, we jump to the ending routine, which pulls the A, X, and Y registers off the stack and executes an RTI to get back into the program.

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When you run "Numeric Keypad," your computer will behave normally until CTRL-N is pressed. The cursor will disappear until you press another key. Then the M, J, K, L, U, I, and O keys will be 0, 1, 2, 3, 4, 5, and 6. By using these along with the numeric keys 7, 8, and 9, you have a numeric keypad. Pressing CTRL-N again toggles the keyboard back into its normal mode (again causing the cursor to disappear until you press a key).

You can put press-apply transfer numbers on the affected keys to help you remember which number each key represents. You should use very small ones, so they won't interfere with the normal identification of the keys. (Transfer letters and numbers are available at art supply stores.)

Use Numeric Keypad In A Program

You also can activate and deactivate the numeric keypad from a program, in anticipation of numeric or nonnumeric input, by POKEing location 50216 with 255 or 0 respectively. The user can always override this with CTRL-N. (CTRL-N is never passed to the program, but serves only the toggle function.) Just don't POKE any value other than 0 or 255, as that would prevent you from toggling with CTRL-N.

If you prefer that the keypad start out activated, change the next-to-last DATA item in line 520 from 0 to 255.

Redefining The Keys

To redefine the 64 keys, we transfer the Kernal from ROM into RAM, change it to intercept the M, J, K, L, U, I, and O keys, and convert the data to the appropriate numbers.

Lines 3 and 4 POKE the machine language into an unused area of memory from the DATA statements in lines 500–560.

Lines 10 and 20 transfer the BASIC interpreter *and* the Kernal from ROM to RAM with the same addresses, so we can modify them. The *Commodore 64 Programmer's Reference Guide*, page 261, states that turning off bit 1 in location 1 switches only the Kernal addresses to RAM; actually it affects both the Kernal and BASIC address ranges.

Line 25 merely signals that the transfer is complete (it takes about a minute).

The Intercept Routine

Line 30 sets up the routine which intercepts keyboard characters. It is put at the end of the routine that pulls a character from the keyboard buffer.

Finally, line 40 activates the modified Kernal

by turning off bit 1 of location 1 (changing the value in location 1 from 55 to 53). Once this is done, the change has been made, and pressing CTRL-N toggles between a numeric keypad and the normal usage of the M, J, K, L, U, I, and O keys.

A Color Memory Bonus

A couple of bonuses have been included in lines 31 and 32. Line 31 changes the portion of the Kernal on newer 64s that puts the background color into the color memory for screen locations being cleared. Instead of putting the background color there, it will now put 1 (for white), so that if addresses 1024 to 2023 (decimal) are POKEd, a character will appear. (See "Commodore 64 Video Update," COMPUTE!'s GAZETTE, July 1983, page 44.)

POKEing 1000 locations as suggested there takes a few seconds—not something to do for every PRINT of a screen clear.

Choose A Color

In the normal mode, printed characters will be light blue on a dark blue background, while POKEd characters will be white. Change the POKE to location 58587 in line 31 to some other number if you would like a color different from white for POKEd screen characters. Of course, if you have an older 64 which does not clear color memory to the background color, leave out this patch (line 31).

Line 32 eliminates the printing of a question mark and space in an INPUT statement prompt. This makes it possible to write:

```
100 INPUT "TITLE:";T$
```

and have the resulting screen look like

```
TITLE:COMPUTE!'s GAZETTE
```

In any place where you really want the ? and the space, you can put them inside the quotes.

See program listings on page 143.

Quick Fix For Color RAM

A Fast And Easy Way To Avoid 'Invisible Characters' On The Commodore 64

David Gross

A previous article, "Commodore 64 Video Update" (July 1983), discussed an internal change by Commodore to the 64's operating system. Late-model 64s do not automatically fill color memory with white, so characters POKEd directly into screen memory merge with the background color and are "invisible." This article presents a quick, simple solution.

"Commodore 64 Video Update" in the premier issue of COMPUTE!'s GAZETTE mentions that, when the screen is cleared, late-model Commodore 64s fill color memory with the screen background color. This renders all characters that are POKEd (not PRINTed) onto the screen "invisible," because they are the same color as the screen. Early-model 64s filled color memory with a contrasting color (white) when the screen was cleared.

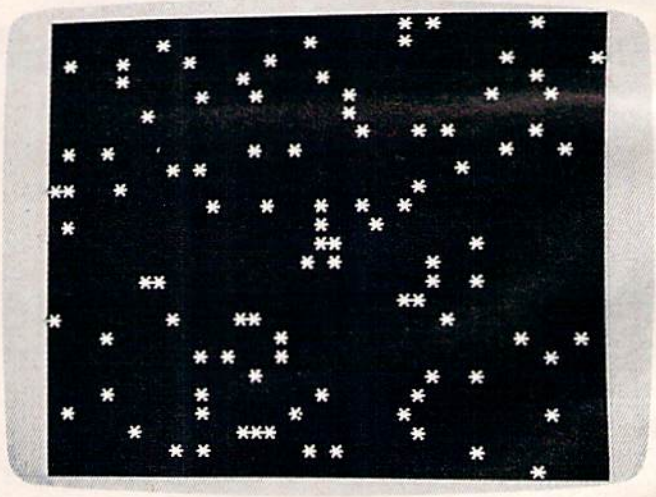
The earlier article suggested an easy one-line programming solution: a FOR-NEXT loop to POKE the appropriate color code (such as 1 for white) into color memory. The line looks like this:

```
FOR X=1 TO 1000: POKE 55295+X,1: NEXT
```

It works fine, but takes about ten seconds to execute. Luckily, there is an even easier and much faster way.

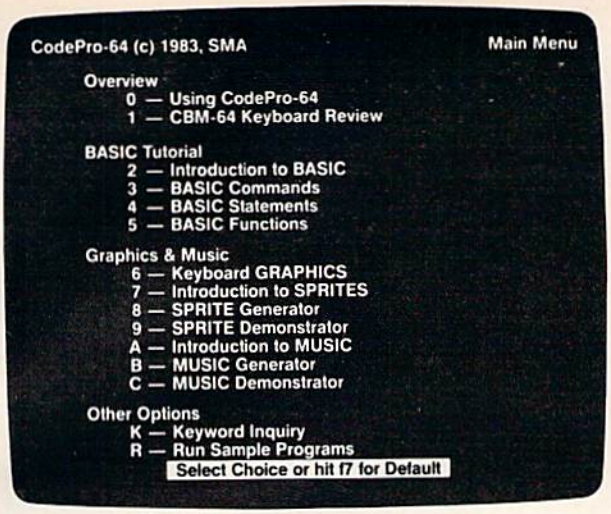
Let The 64 Fill Color RAM

First, simply set the screen to the color you want the characters to be by POKEing the color code into memory address 53281. Next, print a CLR/HOME character or CHR$(147). Last, reset the screen to the background color you want. *Do not clear the screen a second time!* Color memory will be set to give POKEd characters the *first* screen color that you used. That's because whenever you clear the screen, the new 64s automatically fill color memory with the color code found at 53281.



This starfield, POKEd directly into screen memory, will appear on both older- and late-model 64s because of a quick-fill method for color memory.

For example, suppose that you want to create a random starfield, white on black. The answer is the program below. It places 100 white stars at



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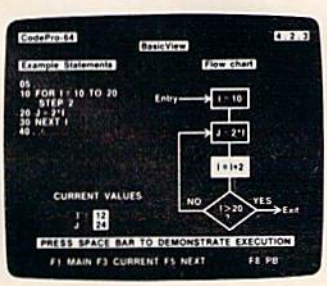
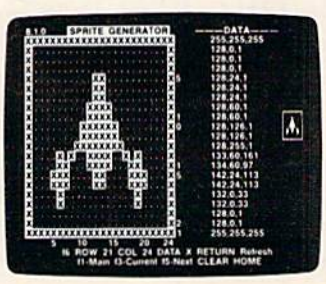
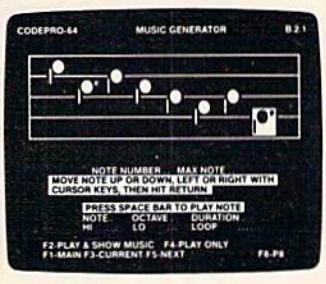
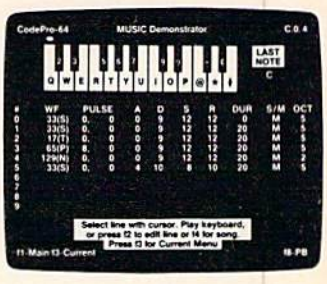








SMA SYSTEMS MANAGEMENT ASSOCIATES

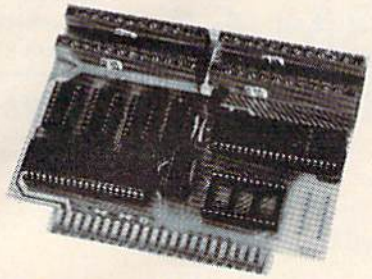
random locations on a black screen. The program runs in half the time it would take if each star's corresponding color memory location were set individually.

This technique can be very useful when converting Commodore PET programs that POKE to the screen. Simply change the screen memory addresses to fit the 64. Then, before any CLR/HOME is printed in the program, add a command to set the screen to the desired character color. Remember to set it back to the screen color immediately after the CLR/HOME is printed each time.

Quick Fix For Color RAM

```
10 POKE 53281,1:REM SET SCREEN COLOR TO D
   ESIRED CHARACTER COLOR          :rem 232
20 PRINT CHR$(147):REM CLEAR SCREEN, SETT
   ING COLOR RAM TO WHITE          :rem 239
30 POKE 53281,0:REM SET SCREEN TO DESIRED
    BACKGROUND COLOR - BLACK       :rem 71
40 FOR C = 1 TO 100:REM PLACE 100 WHITE S
   TARS ON THE SCREEN              :rem 144
50 P = INT(1000*RND(1))+1024:REM SELECT R
   ANDOM SCREEN POSITION           :rem 69
60 POKE P,42:REM PLACE ASTERISK AT LOCATI
   ON P                            :rem 158
70 NEXT C:REM END COUNTER LOOP     :rem 56
80 GOTO 80:REM ENDLESS LOOP SO AS NOT TO
   {SPACE}DISTURB SCREEN           :rem 22
90 REM TO END PROGRAM, PRESS RUN/STOP
                                   :rem 2
```

NEW! Universal Input/Output Board for VIC-20/64



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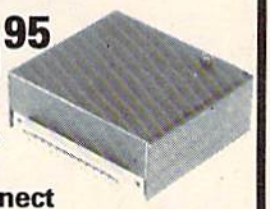

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NEWS & PRODUCTS

Interfaces, Light Pen, Keypad

Cardco, Inc., of Wichita, Kansas, has introduced new products for the VIC-20 and Commodore 64. Included are Printer Interface, a Centronics parallel printer interface with graphics for both the VIC and 64; the Card A and Card B Printer Interfaces, universal parallel printer interfaces for both computers; the Cardboard 6 Expansion Interface and the Cardboard 3s Expansion Interface, both for the VIC-20; the Cardboard 5 Expansion Interface for the Commodore 64; the Cardram 16 16K Memory Expander for the VIC-20; the Cardette 1 Cassette Interface for both machines; the Cardkey 1 16-key Numeric Keypad for both computers; and the Cardriter 1 Light Pen for both the VIC and the 64.

The company also has available the *Write Now!* word processor for the VIC, the *Mail Now* mailing list processor for the 64, and printer utility programs for both computers.

Cardco, Inc.
313 Mathewson
Wichita, KS 67214
(316) 267-6525

64 Music Synthesizer

The Alien Group has developed the *When I'm 64* music synthe-

sizer for the Commodore 64, which is available on disk and on cassette for $29.95. The package includes a machine language text-to-speech program, a similar program that incorporates the "Alien" face whose mouth moves in sync with the words, a spelling program that uses the talking face, and 30 prerecorded songs, with menus and written instructions to help you write and save new songs.

The Alien Group
27 W. 23 St.
New York, NY 10010
(212) 741-1770

PILOT Language For Commodore 64

PILOT II, an advanced PILOT language, has been developed by Tamarack Software for the Commodore 64.

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Other special commands allow the use of joysticks, light pens, and paddles. *PILOT II* is available on diskette for $49.95.

Tamarack Software, Inc.
P.O. Box 247
Darby, MT 59829
(406) 821-4596

COMPUTE!'s GAZETTE *welcomes announcements of new products for VIC-20 and Commodore 64 computers, especially products aimed at beginning to intermediate users. Please send press releases and photos well in advance to: Tony Roberts, Assistant Managing Editor,* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

New product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

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Bug-Swatter:
Modifications And Corrections

• "Budget Planner" (December 1983) uses a Commodore Datassette to store data. The following modifications will allow you to use the program with a disk drive:

```
450 OPEN 1,8,0,F$                    :rem 82
4050 OPEN 1,8,1,"@0:"+F$             :rem 156
7120 OPEN 1,8,0,F$                   :rem 131
```

• The Commodore 64 version of "Tetracrystals" (January) contains a slight error on line 13. To correct it, insert RN between G and BLU. C7$ should be

"BLKWHTREDCYNPURGRNBLUYEL"

• The printer used to generate program listings has burped another pesky question mark. Line 120 of the VIC version of MLX (January and February) is the latest victim. Correct it by removing the ? between RIGHT and OFF.

• Readers who typed in the 64 version of "Canyon Cruiser" (January) may have encountered an ?ILLEGAL QUANTITY ERROR in line 1420 because it is not possible to POKE a number higher than 255 into a memory location. Change line 1420 to

POKE53287, (PEEK(53287)+1)AND255

• "SpeedScript" (January) works as listed, but there are some inconsistencies in the accompanying article. The cursor keys were incorrectly labeled on Figure 1: Keyboard Map, page 48. CRSR Left and CRSR Right will move the cursor left and right. CRSR Up moves to the previous sentence; CRSR Down moves to the next sentence. Table 1, page 52, is missing CTRL-= which returns the amount of free memory. Table 2 is missing the command for line spacing. SpeedScript defaults to double-spacing; if you want single-spaced documents, use CTRL-(English Pound)-S, followed by the number one (1).

Some readers, in trying to enter SpeedScript, discovered an ?UNDEF'D STATEMENT error in line 550 of MLX. If you don't use the POKEs listed on page 39, MLX and SpeedScript will both try to use the same area of memory. The POKEs fence off a section of BASIC for use by SpeedScript. It is necessary to follow the directions on page 39 before you LOAD MLX.

Also, next month look for "SpeedScript Revisited" in which Charles Brannon will answer a variety of questions from readers.

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A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in COMPUTE!'s GAZETTE for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, COMPUTE!'s GAZETTE for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as O for the numeral 0, a lowercase l for the numeral 1, or an uppercase B for the numeral 8. Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Braces And Special Characters

The exception to this typing rule is when you see the braces, such as "{DOWN}". Anything within a set of braces is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to "How To Type In *COMPUTE!'s GAZETTE* Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard and STOP key may seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, *so always SAVE a copy of your program before you RUN it*. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1. Type in the program a line at a time, in order. Press RETURN at the end of each line. Use backspace or the back arrow to correct mistakes.

2. Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3. Make sure you've entered statements in braces as the appropriate control key (see "How To Type *COMPUTE!'s GAZETTE* Programs" elsewhere in the magazine).

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s GAZETTE *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s GAZETTE *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

How To Type In COMPUTE!'s GAZETTE Programs

Many of the programs which are listed in COMPUTE!'s GAZETTE contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, [key], you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: You know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME		{CYN}	CTRL + 4		[7]	C= + 7	
{HOME}	CLR/HOME		{PUR}	CTRL + 5		[8]	C= + 8	
{UP}	SHIFT + CRSR ↑		{GRN}	CTRL + 6		{F1}	f1	
{DOWN}	CRSR ↑		{BLU}	CTRL + 7		{F2}	SHIFT + f1	
{LEFT}	SHIFT + CRSR →		{YEL}	CTRL + 8		{F3}	f3	
{RIGHT}	CRSR →		[1]	C= + 1		{F4}	SHIFT + f3	
{RVS}	CTRL + 9		[2]	C= + 2		{F5}	f5	
{OFF}	CTRL + 0		[3]	C= + 3		{F6}	SHIFT + f5	
{BLK}	CTRL + 1		[4]	C= + 4		{F7}	f7	
{WHT}	CTRL + 2		[5]	C= + 5		{F8}	SHIFT + f7	
{RED}	CTRL + 3		[6]	C= + 6				

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time*. This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a *checksum number* appended to the end of each line, for example ":rem 123". *Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Replace Original Proofreader

If you typed in the original version of the Proofreader (October 1983 issue), you should replace it with the improved version below. We added a POKE to the original version to protect it from being erased when you LOAD another program from tape. The POKE does protect the Proofreader, and the Proofreader itself was not affected. However, a quirk in the VIC-20's operating system means that programs typed in with the Proofreader and SAVEd on tape cannot be LOADed properly later. If you LOAD a program SAVEd while the Proofreader was in memory, you see ?LOAD ERROR. This applies only to VIC tape SAVEs (disk SAVEs work OK, and the quirk was fixed in the Commodore 64).

If you have a program typed in with the original Proofreader and SAVEd on tape, follow this special LOAD procedure:

1. Turn the power off, then on.

2. LOAD the program from tape (disregard the ?LOAD ERROR).

3. Enter: POKE 45,PEEK(174):POKE 46,PEEK(175):CLR

4. ReSAVE the program to tape.

The program will LOAD fine in the future. We strongly recommend that you type in the new version of the Proofreader and discard the old one.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

The Beginner's Corner

(Article on page 86.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Match-Em (VIC Version)

```
1 POKE 36879,27:PRINT"{CLR}{BLU}":DIM A(1
  6),B(16),C(16),P(16)              :rem 81
20 PRINT "{3 SPACES}** MATCH-EM **":PRINT
   "{2 DOWN}CHOOSE TWO LETTERS." :rem 64
40 PRINT "{DOWN}TRY TO MATCH SHAPES.":PRI
   NT "{DOWN}THE BETTER YOU ARE,
   {3 SPACES}THE LOWER YOUR SCORE."
                                     :rem 110
70 PRINT "{DOWN}PRESS THE SPACE BAR
   {3 SPACES}TO CONTINUE."          :rem 46
80 PRINT "{2 DOWN}PRESS 'Q' TO QUIT AND S
   EE ALL SHAPES."                  :rem 232
90 FOR I=1TO16:READ P(I),C(I):NEXT
                                     :rem 211
100 DATA 7705,2,7709,6,7713,2,7717,6,7793
    ,6,7797,2,7801,6,7805,2         :rem 141
120 DATA 7881,2,7885,6,7889,2,7893,6,7969
    ,6,7973,2,7977,6,7981,2         :rem 192
140 CC=30720:A$="{RED}{RVS}{4 SPACES}":B$
    ="{BLU}{RVS}{4 SPACES}"         :rem 244
150 POKE36878,15:F1=36876           :rem 99
170 PRINT "{3 DOWN}{GRN}PRESS F1 TO START
    ."                              :rem 29
180 GET E$:IF E$<>"{F1}" THEN 180   :rem 31
190 PRINT "{CLR}";                  :rem 57
210 FOR I=1TO2:FOR J=1TO4           :rem 182
220 PRINT TAB(2);A$;B$;A$;B$:NEXT J
                                    :rem 192
230 FOR J=1TO4:PRINT TAB(2);B$;A$;B$;A$:N
    EXT J,I                         :rem 230
240 FOR I=1TO16:POKE P(I),I:NEXT    :rem 127
250 PRINT "{BLK}{2 SPACES}Q=QUIT":rem 201
260 FOR I=1TO8:B(I)=I:B(I+8)=I:NEXT
                                    :rem 37
270 FOR I=1TO16                     :rem 65
280 RC=INT(16*RND(0)+1):IF B(RC)=0 THEN 2
    80                              :rem 33
290 A(I)=B(RC):B(RC)=0:NEXT         :rem 35
300 FOR I=1TO16:B(I)=A(I):NEXT      :rem 226
310 FOR I=1TO8                      :rem 13
320 F(I)=INT(8*RND(0)):IF F(I)=1 OR F(I)=
    2 OR F(I)=6 THEN 320            :rem 116
330 NEXT I:SC=0:S=0                 :rem 85
340 FOR I=38879TO38882:POKE I,0:NEXT
                                    :rem 78
350 PRINT "{DOWN}PRESS 2 LETTERS
    {2 SPACES}-{2 SPACES}-"         :rem 182
360 SC=SC+1:SC$=STR$(SC)            :rem 147
370 FOR I=1 TO LEN(SC$):POKE 8158+I,ASC(M
    ID$(SC$,I,1)):NEXT              :rem 32
380 N1=38813:POKE F1,231             :rem 0
390 FOR D=1TO150:NEXT D:POKE F1,0:rem 103
400 POKE N1,1:POKE N1,0:GET K$:IF K$=""TH
    EN 400                          :rem 232
```

```
410 IF (K$<"A") OR (K$>"Q") THEN 400
                                    :rem 156
420 R=ASC(K$)-64:POKE 8093,R:R1=R :rem 90
430 IF K$="Q" THEN 1110           :rem 89
440 N=P(R1):A1=A(R1):IF A(R1)<>0 THEN 470
                                    :rem 151
450 POKE N,24:POKE N+1,24:POKE N+22,24:PO
    KE N+23,24                    :rem 254
470 ON A(R1) GOSUB 850,880,910,940,970,10
    00,1030,1060:GOSUB 780        :rem 186
480 N1=38815                      :rem 97
490 POKE N1,1:POKE N1,0:GET K2$:IF K2$=""
    THEN 490                      :rem 94
500 IF (K2$<"A") OR (K2$>"Q") THEN 490
                                    :rem 9
510 R=ASC(K2$)-64:POKE 8096,R:R2=R
                                    :rem 144
520 IF K2$="Q" THEN 1110          :rem 139
530 IF K2$=K$ THEN POKE 8096,45:GOTO 490
                                    :rem 78
540 N=P(R2):A2=A(R2):IF A(R2)<>0 THEN 570
                                    :rem 157
550 POKE N,24:POKE N+1,24:POKE N+22,24:PO
    KE N+23,24                    :rem 255
570 ON A(R2) GOSUB 850,880,910,940,970,10
    00,1030,1060:GOSUB 780        :rem 188
580 IF A1=0 THEN 600              :rem 208
590 IF A1=A2 THEN 650             :rem 25
600 POKE F1,159:FOR D=1TO100:NEXT:POKE F1
    ,135:FOR D=1TO100:NEXT:POKE F1,0:GOTO
     730                          :rem 245
650 POKE F1,195:FOR D=1TO100:NEXT:POKE F1
    ,207:FOR D=1TO100:NEXT        :rem 177
660 POKE F1,215:FOR D=1TO100:NEXT:POKE F1
    ,225:FOR D=1TO200:NEXT:POKE F1,0
                                    :rem 232
690 S=S+1:N=8140+S*2              :rem 74
700 ON A1 GOSUB 850,880,910,940,970,1000,
    1030,1060:GOSUB 780           :rem 19
710 A(R1)=0:A(R2)=0               :rem 215
720 IF S=8 THEN 1080              :rem 232
730 GET E$:IF E$<>" " THEN 730    :rem 156
740 L=R2:N=P(R2):GOSUB 810        :rem 229
750 L=R1:N=P(R1):GOSUB 810        :rem 228
760 POKE 8093,45:POKE 8096,45:GOTO360
                                    :rem 22
780 NC=N+CC:J=F(B(R)):POKE NC,J:POKE NC+1
    ,J:POKE NC+22,J:POKE NC+23,J:RETURN
                                    :rem 254
810 CL=C(L):POKE N,160:POKE N+CC,CL:POKE
    {SPACE}N+1,160:POKE N+1+CC,CL :rem 55
820 POKE N+22,160:POKE N+22+CC,CL:POKE N+
    23,160:POKE N+23+CC,CL:POKE N,L:RETUR
    N                             :rem 33
850 POKE N,233:POKE N+1,223:POKE N+22,95:
    POKE N+23,105:RETURN          :rem 183
880 POKE N,85:POKE N+1,73:POKE N+22,74:PO
    KE N+23,75:RETURN             :rem 53
910 POKE N,32:POKE N+1,233:POKE N+22,233:
    POKE N+23,160:RETURN          :rem 173
940 POKE N,108:POKE N+1,123:POKE N+22,124
    :POKE N+23,126:RETURN         :rem 227
970 POKE N,98:POKE N+1,98:POKE N+22,226:P
    OKE N+23,226:RETURN           :rem 157
1000 POKE N,225:POKE N+1,97:POKE N+22,225
     :POKE N+23,97:RETURN         :rem 186
1030 POKE N,223:POKE N+1,105:POKE N+22,23
     3:POKE N+23,95:RETURN        :rem 222
1060 POKE N,83:POKE N+1,83:POKE N+22,83:P
     OKE N+23,83:RETURN           :rem 90
1080 FOR I=8076 TO 8096:POKE I,32:NEXT
                                    :rem 65
1090 FOR I=1TO25:POKE F1,INT(60*RND(0)+18
     0)                           :rem 115
1100 FOR D=1TO100:NEXT D,I:POKE F1,0
                                    :rem 253
1110 FOR R=1TO16:N=P(R)           :rem 44
1120 ON B(R) GOSUB 850,880,910,940,970,10
     00,1030,1060                 :rem 90
1130 GOSUB 780:NEXT               :rem 93
1140 PRINT "{UP}TRY AGAIN? (Y/N)
     {7 SPACES}";                 :rem 40
1150 GET E$:IF E$="Y" THEN 190    :rem 229
1160 IF E$<>"N" THEN 1150         :rem 194
1170 END                          :rem 160
```

Program 2: Match-Em (64 Version)

```
1 POKE 53281,6:PRINT"{CLR}{7}" :rem 253
10 DIM A(16),B(16),C(16),P(16)   :rem 181
20 PRINT TAB(13);"** MATCH-EM **":rem 206
30 PRINT "{2 DOWN}CHOOSE TWO LETTERS."
                                    :rem 98
40 PRINT "{DOWN}TRY TO MATCH THE SHAPES."
                                    :rem 40
50 PRINT "{DOWN}THE BETTER YOU ARE, THE L
   OWER YOUR"                    :rem 168
60 PRINT "SCORE WILL BE."        :rem 160
70 PRINT "{DOWN}PRESS THE SPACE BAR TO CO
   NTINUE."                      :rem 46
80 PRINT "{2 DOWN}PRESS 'Q' TO QUIT AND S
   EE ALL SHAPES."               :rem 232
90 FOR I=1TO16:READ P(I),C(I):NEXT
                                    :rem 211
100 DATA 1075,2,1080,6,1085,2,1090,6
                                    :rem 221
110 DATA 1275,6,1280,2,1285,6,1290,2
                                    :rem 230
120 DATA 1475,2,1480,6,1485,2,1490,6
                                    :rem 239
130 DATA 1675,6,1680,2,1685,6,1690,2
                                    :rem 248
140 CC=54272:A$="{RED}{RVS}{5 SPACES}":B$
    ="{BLU}{RVS}{5 SPACES}"       :rem 252
150 POKE54296,15:POKE54291,8:POKE54292,8
                                    :rem 6
160 F1=54287:F2=54286:W=54290     :rem 31
170 PRINT "{3 DOWN}{WHT}PRESS F1 TO START
    ."                             :rem 4
180 GET E$:IF E$<>"{F1}" THEN 180 :rem 31
190 PRINT "{CLR}";                :rem 57
200 POKE 53281,1                  :rem 33
210 FOR I=1TO2:FOR J=1TO5         :rem 183
220 PRINT TAB(10);A$;B$;A$;B$:NEXT J
                                    :rem 239
230 FOR J=1TO5:PRINT TAB(10);B$;A$;B$;A$:
    NEXT J:NEXT I                 :rem 99
240 FOR I=1TO16:POKE P(I)+41,I:NEXT I
                                    :rem 88
250 PRINT TAB(31);"{BLK}{UP}Q=QUIT"
                                    :rem 33
260 FOR I=1TO8:B(I)=I:B(I+8)=I:NEXT I
                                    :rem 110
270 FOR I=1TO16                   :rem 65
280 RC=INT(16*RND(0)+1):IF B(RC)=0 THEN 2
    80                            :rem 33
290 A(I)=B(RC):B(RC)=0:NEXT I     :rem 108
300 FOR I=1TO16:B(I)=A(I):NEXT I  :rem 43
310 FOR I=1TO8                    :rem 13
320 F(I)=INT(16*RND(0)):IF F(I)=1 OR F(I)
    =2 OR F(I)=6 THEN 320         :rem 163
330 NEXT I:SC=0:S=0               :rem 85
340 FOR I=56250 TO 56254:POKE I,0:NEXT I
                                    :rem 127
350 PRINT "{DOWN}PRESS 2 LETTERS
    {3 SPACES}-{2 SPACES}-"       :rem 182
360 SC=SC+1:SC$=STR$(SC)          :rem 147
370 FOR I=1 TO LEN(SC$):POKE 1978+I,ASC(M
    ID$(SC$,I,1)):NEXT I          :rem 108
```

```
380 N1=56154:POKE F1,84:POKE F2,125:POKE
    {SPACE}W,17                          :rem 205
390 FOR D=1TO150:NEXT D:POKE W,0         :rem 71
400 POKE N1,1:POKE N1,0:GET K$:IF K$=""TH
    EN 400                               :rem 232
410 IF (K$<"A") OR (K$>"Q") THEN 400
                                         :rem 156
420 R=ASC(K$)-64:POKE 1882,R:R1=R        :rem 89
430 IF K$="Q" THEN 1110                  :rem 89
440 N=P(R1):A1=A(R1):IF A(R1)<>0 THEN 470
                                         :rem 151
450 FOR I=N TO N+80 STEP 40              :rem 120
460 FOR J=I TO I+2:POKE J,24:NEXT J,I:GOT
    O 480                                :rem 38
470 ON A(R1) GOSUB 850,880,910,940,970,10
    00,1030,1060:GOSUB 780               :rem 186
480 N1=56157                             :rem 96
490 POKE N1,1:POKE N1,0:GET K2$:IF K2$=""
    THEN 490                             :rem 94
500 IF (K2$<"A") OR (K2$>"Q") THEN 490
                                         :rem 9
510 R=ASC(K2$)-64:POKE 1885,R:R2=R
                                         :rem 143
520 IF K2$="Q" THEN 1110                 :rem 139
530 IF K2$=K$ THEN POKE 1885,45:GOTO 490
                                         :rem 77
540 N=P(R2):A2=A(R2):IF A(R2)<>0 THEN 570
                                         :rem 157
550 FOR I=N TO N+80 STEP 40              :rem 121
560 FOR J=I TO I+2:POKE J,24:NEXT J,I:GOT
    O 600                                :rem 33
570 ON A(R2) GOSUB 850,880,910,940,970,10
    00,1030,1060:GOSUB 780               :rem 188
580 IF A1=0 THEN 600                     :rem 208
590 IF A1=A2 THEN 650                    :rem 25
600 POKE F1,21:POKE F2,31:POKE W,17
                                         :rem 144
610 FOR D=1 TO 100:NEXT                  :rem 221
620 POKE F1,16:POKE F2,195:POKE W,17
                                         :rem 209
630 FOR D=1 TO 100:NEXT:POKE W,0         :rem 251
640 GOTO 730                             :rem 109
650 POKE F1,34:POKE F2,75:POKE W,17:FOR D
    =1TO100:NEXT                         :rem 33
660 POKE F1,43:POKE F2,52:POKE W,17:FOR D
    =1TO100:NEXT:POKE W,0                :rem 57
670 POKE F1,51:POKE F2,97:POKE W,17:FOR D
    =1 TO 100:NEXT                       :rem 38
680 POKE F1,68:POKE F2,149:POKE W,17:FOR
    {SPACE}D=1 TO 200:NEXT:POKE W,0
                                         :rem 122
690 S=S+1:N=1901+S*4                     :rem 74
700 ON A1 GOSUB 850,880,910,940,970,1000,
    1030,1060:GOSUB 780                  :rem 19
710 A(R1)=0:A(R2)=0                      :rem 215
720 IF S=8 THEN 1080                     :rem 232
730 GET E$:IF E$<>" " THEN 730           :rem 156
740 L=R2:N=P(R2):GOSUB 810               :rem 229
750 L=R1:N=P(R1):GOSUB 810               :rem 228
760 POKE 1882,45:POKE 1885,45             :rem 8
770 GOTO 360                             :rem 112
780 NC=N+CC:FOR I=NC TO NC+80 STEP 40
                                         :rem 11
790 FOR J=I TO I+2:POKE J,F(B(R)):NEXT J,
    I                                    :rem 51
800 RETURN                               :rem 120
810 CL=C(L)                              :rem 69
820 FOR I=N TO N+80 STEP 40              :rem 121
830 FOR J=I TO I+2:POKE J,160:POKEJ+CC,CL
    :NEXT J,I                            :rem 104
840 POKE P(L)+41,L:RETURN                :rem 218
850 POKE N,32:POKE N+1,32:POKE N+2,233
                                         :rem 39
860 POKE N+40,32:POKE N+41,233:POKE N+42,
    160                                  :rem 81
870 POKE N+80,233:POKE N+81,160:POKE N+82
    ,160:RETURN                          :rem 170
880 POKE N,32:POKE N+1,160:POKE N+2,32
                                         :rem 41
890 POKE N+40,160:POKE N+41,160:POKE N+42
    ,160                                 :rem 133
900 POKE N+80,32:POKE N+81,160:POKE N+82,
    32:RETURN                            :rem 63
910 POKE N,85:POKE N+1,67:POKE N+2,73
                                          :rem 6
920 POKE N+40,66:POKE N+41,32:POKE N+42,9
    3                                    :rem 247
930 POKE N+80,74:POKE N+81,64:POKE N+82,7
    5:RETURN                             :rem 34
940 POKE N,108:POKE N+1,98:POKE N+2,123
                                         :rem 101
950 POKE N+40,225:POKE N+41,160:POKE N+42
    ,97                                  :rem 93
960 POKE N+80,124:POKE N+81,226:POKE N+82
    ,126:RETURN                          :rem 174
970 POKE N,233:POKE N+1,160:POKE N+2,223
                                         :rem 142
980 POKE N+40,160:POKE N+41,160:POKE N+42
    ,160                                 :rem 133
990 POKE N+80,95:POKE N+81,160:POKE N+82,
    105:RETURN                           :rem 130
1000 POKE N,32:POKE N+1,233:POKE N+2,223
                                         :rem 125
1010 POKE N+40,233:POKE N+41,160:POKE N+4
     2,105                               :rem 166
1020 POKE N+80,95:POKE N+81,105:POKE N+82
     ,32:RETURN                          :rem 113
1030 POKE N,112:POKE N+1,114:POKE N+2,110
                                         :rem 168
1040 POKE N+40,107:POKE N+41,91:POKE N+42
     ,115                                :rem 125
1050 POKE N+80,109:POKE N+81,113:POKE N+8
     2,125:RETURN                        :rem 210
1060 FOR I=N TO N+80 STEP 40             :rem 166
1070 FOR J=I TO I+2:POKE J,83:NEXT J,I:RE
     TURN                                :rem 100
1080 FOR I=1864 TO 1885:POKE I,32:NEXT I
                                         :rem 135
1090 FOR I=1TO25:POKE F1,INT(60*RND(0)+34
     ):POKE F2,INT(100*RND(0)+55)        :rem 63
1100 POKE W,17:FOR D=1TO100:NEXT D:POKE W
     ,0:NEXT I                           :rem 126
1110 FOR R=1TO16:N=P(R)                   :rem 44
1120 ON B(R) GOSUB 850,880,910,940,970,10
     00,1030,1060                        :rem 90
1130 GOSUB 780:NEXT R                    :rem 175
1140 PRINT "{UP}TRY AGAIN? (Y/N)
     {7 SPACES}";                        :rem 40
1150 GET E$:IF E$="Y" THEN 190           :rem 229
1160 IF E$<>"N" THEN 1150                :rem 194
1170 END                                 :rem 160
```

Machine Language For Beginners

(Article on page 116.)

Program 2: VIC Slist

```
10 I=12288
20 READ A:IF A=256 THEN 50
30 POKE I,A:CK=CK+A:I=I+1:GOTO 20
40 END
50 IF CK<>7019 THEN PRINT"ERROR IN DATA S
   TATEMENTS":STOP
```

```
12288 DATA 162,1,32,198,255,162
12294 DATA 6,32,207,255,202,208
12300 DATA 250,32,207,255,164,144
12306 DATA 208,28,201,0,240,14
12312 DATA 201,32,144,241,201,128
12318 DATA 176,237,32,210,255,76
12324 DATA 13,48,169,13,32,210
12330 DATA 255,162,3,76,7,48
12336 DATA 32,204,255,96,256
```

Program 3: 64 Slist

```
10 I=49152
20 READ A:IF A=256 THEN 50
30 POKE I,A:CK=CK+A:I=I+1:GOTO 20
40 END
50 IF CK<>7307 THEN PRINT "ERROR IN DATA
   {SPACE}STATEMENTS":STOP
49152 DATA 162,1,32,198,255,162
49158 DATA 6,32,207,255,202,208
49164 DATA 250,32,207,255,164,144
49170 DATA 208,28,201,0,240,14
49176 DATA 201,32,144,241,201,128
49182 DATA 176,237,32,210,255,76
49188 DATA 13,192,169,13,32,210
49194 DATA 255,162,3,76,7,192
49200 DATA 32,204,255,96,256
```

Power BASIC: Numeric Keypad

(Article on page 120.)

Program 1:
Numeric Keypad (64 Version)

```
3 FORI=50176TO50261:READX:POKEI,X :rem 40
4 NEXT                            :rem 115
10 FORI=40960TO49151:POKEI,PEEK(I):NEXT
                                  :rem 142
20 FORI=57344TO65535:POKEI,PEEK(I):NEXT
                                  :rem 151
25 PRINT"TRANSFERRED"             :rem 120
30 POKE 58823,76:POKE58824,0:POKE58825,19
   6                              :rem 70
31 POKE58586,169:POKE58587,1:POKE58588,23
   4                              :rem 134
32 FORI=44029TO44034:POKEI,234:NEXT
                                  :rem 103
40 POKE 1,53                       :rem 88
500 DATA201, 14, 240, 65, 44, 40, 196, 24
    0, 28, 201, 85, 240, 40, 201 :rem 221
510 DATA73, 240, 40, 201, 79, 240, 40, 20
    1, 74, 240, 16, 201, 75, 240 :rem 221
520 DATA16, 201, 76, 240, 16, 201, 77, 24
    0, 28, 88, 24, 96, 0, 169    :rem 103
530 DATA 49, 208, 248, 169, 50, 208, 244,
     169, 51, 208, 240, 169, 52, 208
                                  :rem 163
540 DATA 236, 169, 53, 208, 232, 169, 54,
     208, 228, 169, 48, 208, 224, 169
                                  :rem 224
550 DATA 255, 77, 40, 196, 141, 40, 196,
    {SPACE}88, 165, 198, 240, 252, 120, 7
    6                             :rem 117
560 DATA 180, 229                  :rem 23
```

Program 2:
Numeric Keypad (VIC Version)

```
5 POKE56,PEEK(56)-1:POKE55,0:CLR :rem 132
10 I=PEEK(56)*256                 :rem 143
20 READ A:IF A=256 THEN 40         :rem 54
30 POKE I,A:I=I+1:GOTO 20         :rem 130
40 I=PEEK(56)*256                 :rem 146
41 SH=I/256:SL=17                 :rem 208
42 RH=SH:RL=50                     :rem 82
43 POKEI+2,SL:POKEI+7,SH          :rem 226
44 POKEI+36,RH:POKEI+39,RL         :rem 77
50 SYS(PEEK(56)*256):END          :rem 110
828 DATA 120,169,77,141,20,3      :rem 100
834 DATA 169,3,141,21,3,88          :rem 4
840 DATA 169,0,133,254,96,104     :rem 152
846 DATA 133,251,104,133,252,104   :rem 33
852 DATA 133,253,165,253,72,165     :rem 1
858 DATA 252,72,165,251,72,169    :rem 218
864 DATA 3,72,169,110,72,8          :rem 7
870 DATA 169,0,72,72,72,76         :rem 13
876 DATA 191,234,234,165,197,201   :rem 56
882 DATA 8,208,103,173,141,2       :rem 97
888 DATA 41,4,240,96,165,254      :rem 115
894 DATA 201,0,240,16,169,0         :rem 43
900 DATA 133,254,32,159,255,165   :rem 253
906 DATA 197,201,64,208,247,24    :rem 208
912 DATA 144,68,169,255,133,254     :rem 7
918 DATA 32,159,255,165,197,201     :rem 8
924 DATA 64,208,231,162,0,189     :rem 154
930 DATA 119,2,201,85,208,2         :rem 43
936 DATA 169,52,201,73,208,2      :rem 104
942 DATA 169,53,201,79,208,2      :rem 108
948 DATA 169,54,201,74,208,2      :rem 110
954 DATA 169,49,201,75,208,2      :rem 112
960 DATA 169,50,201,76,208,2      :rem 102
966 DATA 169,51,201,77,208,2      :rem 110
972 DATA 169,48,157,119,2,232     :rem 165
978 DATA 224,10,208,203,104,168   :rem 250
984 DATA 104,170,104,64,165,254   :rem 254
990 DATA 201,0,208,189,24,144     :rem 150
996 DATA 241,256                   :rem 34
```

Nevets

(Article on page 52.)

Program 1: Nevets—VIC Version

```
5 PRINT"{CLR}{BLK}{9 DOWN} WE ARE ON THE
  {SPACE}WAY TO {22 RIGHT}{2 SPACES}THE
  {RVS}LAND OF ADNERB{OFF}"       :rem 171
10 POKE52,28:POKE56,28:CLR         :rem 18
20 X=36879:Y=41.25:FORI=7168TO7679:POKEI,
   PEEK(I+25600):POKEX,Y:Y=Y+.25:NEXT
                                  :rem 60
30 FORC=7432TO7511:READA:POKEC,A:NEXT:POK
   E36869,255                     :rem 117
40 DATA129,66,36,24,24,36,66,129,16,24,28
   ,30,27,25,24,255,8,24,56,120,216,152,2
   4,255                          :rem 91
50 DATA24,24,24,24,24,24,24,255,255,153,1
   53,153,153,153,153             :rem 127
55 DATA255,145,82,0,27,216,0,74,137
                                  :rem 236
60 DATA16,56,56,84,146,56,40,40,16,24,12,
   6,3,1,0,0,8,24,48,96,192,128,0,0
                                  :rem 37
70 DATA129,90,36,90,90,36,90,129   :rem 99
75 PRINT"{CLR}":X=7944:CL=30720:FORA=1TO2
   :FORB=1TO22:POKEX+CL,6:POKEX,37:X=X+1:
   NEXT:X=X+198                   :rem 26
80 NEXT                           :rem 167
90 FORA=7713TO8175STEP22:POKEA+CL,0:POKEA
   ,32:NEXT                       :rem 44
110 FORB=0TO96:READC:POKE831+B,C:NEXT
                                  :rem 45
120 DATA169,0,141,62,3             :rem 94
130 DATA141,60,3,141,61,3,169,0,141,19,14
    5,169,127,141,34,145,173,32,145,41,12
    8                             :rem 82
```

```
140 DATA201,0,208,5,169,1,141,60,3,169,25
    5,141,34,145,173,17              :rem 171
145 DATA145,41,8,201,0,208,5,169,22
                                     :rem 225
150 DATA141,60,3,173,17,145,41,16,201,0,2
    08,5,169,1,141                   :rem 169
155 DATA61,3,173,17,145,41,4,201,0,208,5
                                     :rem 207
160 DATA169,22,141,61,3,173,17,145,41,32,
    201,0,208,5,169,1,141,62,3,96:rem 147
165 V=0:GOTO170                      :rem 106
168 FORI=7680TO7745:POKEI,32:NEXT    :rem 23
170 E=8:J=16:YY=0:W=0:U=0            :rem 205
180 POKEF,32:POKEK,32:POKEQ,32:GOSUB900:G
    OSUB800:FORX=7757TO8175STEP22:POKEX,3
    2:NEXT                           :rem 71
185 GOSUB950:YY=YY+1:IFYY=10THENYY=1:E=E-
    (E*.5):J=J-(J*.5)                :rem 12
190 A=8175:C=36:D=0:I=0:O=0:TI$="000000":
    Y=0:W=W+1:Q=A:AA=36874:POKEAA+4,15:BB
    =200:CC=1                        :rem 163
200 SYS831:M=PEEK(828)-PEEK(829):P=PEEK(8
    30)                              :rem 39
210 D=D+1:IFD=ETHEND=0:POKEF,32:F=F+G:POK
    EF+CL,2:POKEF,39:IFPEEK(F+G)=38THENGO
    SUB700                           :rem 203
215 IFPEEK(F+G+22)<>37THENPOKEF,32:GOSUB9
    00                               :rem 80
220 I=I+1:IFI=JTHENI=0:POKEK,32:K=K+L:POK
    EK+CL,2:POKEK,39:IFPEEK(K+L)=38THENGO
    SUB600                           :rem 12
225 IFPEEK(K+L+22)<>37THENPOKEK,32:GOSUB8
    00                               :rem 95
230 IFR=1THEN245                     :rem 174
235 IFP=1THENQ=A:S=SS:T=TT:R=1:GOTO245
                                     :rem 208
240 GOTO270                          :rem 104
245 IFPEEK(Q+22+S)=37ORPEEK(Q+22+S)=38THE
    NPOKEQ,32:R=0:GOTO270             :rem 7
250 IFPEEK(Q+22+S)=39THENY=Y+1:POKEQ,32:Q
    =Q+22+S:POKEQ+CL,7:POKEQ,42:GOSUB400:
    GOTO260                          :rem 10
255 GOTO265                          :rem 114
260 POKEQ,32:POKEF,32:POKEK,32:GOSUB800:G
    OSUB900:R=0:GOTO270              :rem 216
265 POKEQ,32:Q=Q+22+S:POKEQ,T:POKEAA+1,BB
    +S                               :rem 131
270 IFM=-22THENB=33:GOTO280          :rem 100
275 B=32                             :rem 130
280 IFA+M>8185ORA+M<7746THENM=0:B=32
                                     :rem 107
285 IFM=1THENC=34:M=0:SS=1:TT=40      :rem 196
290 IFM=-1THENC=35:M=0:SS=-1:TT=41:rem 28
295 IFM=21ORM=-21THENM=0             :rem 192
300 POKEA,B:A=A+M:POKEA,C:POKEAA+CC,BB+M
                                     :rem 191
305 PRINT"{HOME}{WHT}TIME{BLK}"60-INT(TI/
    60)"{LEFT} ":PRINT"{HOME}{10 RIGHT}
    {WHT}LEVEL{BLK}";W               :rem 1
310 PRINT"{HOME}{DOWN}{WHT}H.S.{BLK}";V:P
    RINT"{HOME}{DOWN}{10 RIGHT}{WHT}SCORE
    {BLK}";U:IFTI/60>=60THEN500      :rem 56
315 PRINT"{HOME}{2 DOWN}{16 RIGHT}{WHT}HA
    VE{BLK}";Y                       :rem 188
316 PRINT"{HOME}{2 DOWN}{WHT}NEVETS REMAI
    N{BLK}";YY-Y                     :rem 57
320 POKEAA+2,0:POKEAA+1,0:CC=CC+1:IFCC=3T
    HENCC=1                          :rem 99
325 IFY=YYTHENU=U+(10*(60-INT(TI/60))):GO
    TO180                            :rem 236
330 GOTO200                          :rem 97
400 U=U+50:POKEAA+3,BB:FORX=15TO0STEP-1:P
    OKEAA+4,X:FORDD=1TO50:NEXT:NEXT:POKEA
    A+3,0                            :rem 17
410 POKEAA+4,15:RETURN               :rem 81
500 POKEAA+4,0:PRINT"{HOME}{2 DOWN}{BLK}
    {6 SPACES}GAME{2 SPACES}OVER
    {6 SPACES}":FORX=1TO2000:NEXT:rem 236
505 IFU>VTHENV=U                     :rem 41
510 PRINT"{HOME}{2 DOWN}{BLK}PRESS TRIGGE
    R TO START"                      :rem 254
520 P=PEEK(37151):FB=-((PAND32)=0):rem 94
530 IFFB<>1THEN520                   :rem 32
540 GOTO 168                         :rem 113
600 POKEK,32:POKEK+L,32:O=O+1:IFO=4THEN50
    0                                :rem 27
610 GOTO800                          :rem 104
700 POKEF,32:POKEF+G,32:O=O+1:IFO=4THEN50
    0                                :rem 13
710 GOTO900                          :rem 106
800 N=INT(RND(1)*4)+1:ONNGOTO810,820,830,
    840                              :rem 203
810 K=7922:L=+1:RETURN               :rem 46
820 K=7943:L=-1:RETURN               :rem 52
830 K=8142:L=+1:RETURN               :rem 43
840 K=8163:L=-1:RETURN               :rem 49
900 H=INT(RND(1)*4)+1:ONHGOTO910,920,930,
    940                              :rem 196
910 F=7922:G=+1:RETURN               :rem 37
920 F=7943:G=-1:RETURN               :rem 43
930 F=8142:G=+1:RETURN               :rem 34
940 F=8163:G=-1:RETURN               :rem 40
950 X=7932:POKEX+CL,4:POKEX,38:X=X+2:POKE
    X+CL,4:POKEX,38:X=X+218:POKEX+CL,4:PO
    KEX,38                           :rem 18
960 X=X+2:POKEX+CL,4:POKEX,38:RETURN
                                     :rem 54
```

Program 2: Nevets—64 Version

```
2 PRINTCHR$(142):POKE56,48:CLR       :rem 47
3 FORL=54272TO54296:POKEL,0:NEXT:POKE5429
  6,15:POKE54277,72:POKE54278,90 :rem 242
4 HF=54273:LF=54272:VO=54276         :rem 53
5 POKE53281,1:POKE53280,15:PRINT"{CLR}
  {12 DOWN}"TAB(10)"{RED}PLEASE WAIT A MO
  MENT"                              :rem 20
10 PRINTCHR$(142):POKE56334,PEEK(56334)AN
   D254                              :rem 90
11 POKE1,PEEK(1)AND251:FORI=0TO511:POKEI+
   12288,PEEK(I+53248):NEXT          :rem 136
13 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)
   OR1                               :rem 83
20 POKE53272,(PEEK(53272)AND240)OR12
                                     :rem 247
30 FORC=12800TO12879:READA:POKEC,A:NEXT
                                     :rem 156
40 DATA129,66,36,24,24,36,66,129,16,24,28
   ,30,27,25,24,255                  :rem 44
45 DATA8,24,56,120,216,152,24,255:rem 134
50 DATA24,24,24,24,24,24,24,255,255,153,1
   53,153,153,153,153,255            :rem 71
55 DATA145,82,0,27,216,0,74,137   :rem 36
60 DATA16,56,56,84,146,56,40,40,16,24,12,
   6,3,1,0,0,8,24,48,96,192,128,0,0
                                     :rem 37
70 DATA129,90,36,90,90,36,90,129  :rem 99
73 PRINT"{CLR}{12 DOWN}"TAB(16)"{RED}NEVE
   TS":FORI=1TO2000:NEXT             :rem 20
75 PRINT"{CLR}":CL=54272:FORX=1584TO1623:
   POKEX+CL,6:POKEX,68:POKEX+400+CL,6
                                     :rem 165
80 POKEX+400,68:NEXT                 :rem 193
90 GOTO 168                          :rem 65
100 JV=PEEK(56320):P=15-(JVAND15):FR=JVAN
    D16                              :rem 81
101 IFP=0ANDFR=16THENRETURN          :rem 252
105 IFP=0ANDC=65THENS=41:T=71        :rem 247
```

```
106 IFP=0ANDC=66THENS=39:T=72:RETURN
                                        :rem 27
110 IFP=1THENA=A-40:IFA<1164THENA=1164:RE
    TURN                                :rem 3
120 IFP=2THENA=A+40:IFA>2004THENA=2004:RE
    TURN                                :rem 249
130 IFP=4THENC=66:S=39:T=72:RETURN
                                        :rem 131
135 IFP=5THENA=A-40:C=66:S=39:T=72:IFA<11
    64THENA=1164:RETURN                 :rem 158
136 IFP=6THENA=A+40:C=66:S=39:T=72:IFA>20
    04THENA=2004:RETURN                 :rem 148
140 IFP=8THENC=65:S=41:T=71:RETURN:rem 127
145 IFP=9THENA=A-40:C=65:S=41:T=71:IFA<11
    64THENA=1164:RETURN                 :rem 154
146 IFP=10THENA=A+40:C=65:S=41:T=71:IFA>2
    004THENA=2004:RETURN                :rem 183
150 RETURN                              :rem 118
168 V=0                                 :rem 98
170 E=8:J=16:YY=0:W=0:U=0:FORI=1024TO1263
    :POKEI,32:NEXT                      :rem 102
175 POKEF,32:POKEK,32:POKEQ,32          :rem 51
180 F=1944:K=F:G=1:L=G:FORX=1084TO2004STE
    P40:POKEX,32                        :rem 205
185 NEXT:GOSUB950:YY=YY+1:IFYY=10THENYY=1
    :E=E-(E*.5):J=J-(J*.5)              :rem 133
190 A=2004:C=67:D=0:I=0:O=0:TI$="000000":
    Y=0:W=W+1                           :rem 243
195 GOSUB1100                           :rem 225
200 GOSUB100:POKEA+CL,0:POKEA,C:IFA<2004T
    HENPOKEA+40+CL,0:POKEA+40,64        :rem 155
205 IFP=2ORP=6ORP=10THENPOKEA-40+CL,1:POK
    EA+CL,0:POKEA,C                     :rem 248
210 IFFR=0ANDA<2004THENQ=A              :rem 59
211 POKEHF,34:POKELF,75:POKEVO,65:FORI=1T
    O5:NEXT                             :rem 69
212 IFFL=1THENPOKEF,32:GOSUB800:F=KK:G=LL
                                        :rem 84
213 POKEF,32:F=F+G:POKEF+CL,2:POKEF,70
                                        :rem 26
214 IFPEEK(F+G)=73ANDFL=0THENPOKEVO,64:GO
    TO700                               :rem 112
215 IFPEEK(F+40+G)<>68THENPOKEF,32:POKEVO
    ,16:GOSUB800:F=KK:G=LL              :rem 157
222 POKEHF,45:POKELF,198:POKEVO,17:FORI=1
    TO5:NEXT                            :rem 124
223 IFKL=1THENPOKEK,32:GOSUB800:K=KK:L=LL
                                        :rem 106
224 POKEK,32:K=K+L:POKEK+CL,2:POKEK,70
                                        :rem 58
225 IFPEEK(K+L)=73ANDKL=0THENPOKEVO,64:GO
    TO600                               :rem 128
226 IFPEEK(K+40+L)<>68THENPOKEK,32:POKEVO
    ,16:GOSUB800:K=KK:L=LL              :rem 184
230 KL=0:FL=0:IFFR=0THEN235             :rem 105
231 GOSUB1000:POKEA+CL,0:POKEA,C:IFA<2004
    THENPOKEA+40+CL,0:POKEA+40,64:rem 207
232 IFP=2THENPOKEA-40+CL,1:POKEA+CL,0:POK
    EA,C                                :rem 5
235 IFFR=0ANDQ<2004ANDC<>67THENPOKEQ,32:G
    OTO242                              :rem 156
240 GOTO305                             :rem 103
242 POKEHF,100:POKELF,85:POKEVO,17:FORI=1
    TO10:NEXT                           :rem 157
245 IFPEEK(Q+S)=70THENPOKEQ,32:Q=Q+S:POKE
    Q+CL,11:POKEQ,69:GOSUB400:GOTO305
                                        :rem 154
246 IFPEEK(Q+S)=73THENPOKEQ+S+CL,2:POKEQ+
    S,73:GOTO305                        :rem 53
250 IFPEEK(Q+S)=68ORPEEK(Q+S)=69THENPOKEQ
    ,32:POKEVO,16:FR=16:GOTO305         :rem 10
265 IFC<>67THENQ=Q+S:POKEQ+CL,0:POKEQ,T
                                        :rem 236
305 POKEVO,16:PRINT"{HOME}{BLU}TIME{BLK}"
    60-INT(TI/60)"{LEFT} ";             :rem 24
306 PRINTTAB(30)"{BLU}LEVEL{BLK}";W:rem 174
310 PRINT"{HOME}{DOWN}{BLU}HIGH SCORE
    {BLK}";V;                           :rem 160
311 PRINTTAB(30)"{BLU}SCORE{BLK}";U:IFTI/
    60>=60THEN500                       :rem 76
315 PRINT"{HOME}{2 DOWN}{BLU}NEVETS REMAI
    NING{BLK}";YY-Y;SPC(11)"{BLU}HAVE
    {BLK}";Y                            :rem 175
320 IFY=YYTHENU=U+(10*(60-INT(TI/60))):GO
    TO175                               :rem 235
321 GOSUB1000:POKEA+CL,0:POKEA,C:IFA<2004
    THENPOKEA+40+CL,0:POKEA+40,64:rem 207
322 IFP=2THENPOKEA-40+CL,1:POKEA+CL,0:POK
    EA,C                                :rem 5
323 IFFL=1ORKL=1THEN200                 :rem 142
324 IFFR<>0THEN200                      :rem 43
325 IFPEEK(Q+S)=70THENPOKEQ,32:Q=Q+S:POKE
    Q+CL,11:POKEQ,69:GOSUB400:GOTO200
                                        :rem 147
326 IFPEEK(Q+S)=73THENPOKEQ+S+CL,2:POKEQ+
    S,73:GOTO200                        :rem 46
327 IFPEEK(Q+S)=68ORPEEK(Q+S)=69THENPOKEQ
    ,32:POKEVO,16:FR=16:GOTO200         :rem 9
328 IFC<>67THENPOKEQ,32:Q=Q+S:POKEQ+CL,0:
    POKEQ,T:GOTO211                     :rem 62
330 GOTO200                             :rem 97
400 U=U+50:Y=Y+1:FR=15:KL=1:POKEVO,16:POK
    EHF,68:POKELF,200:POKEVO,129        :rem 5
405 IFPEEK(F)=69THENFL=1                :rem 191
406 IFPEEK(K)=69THENKL=1                :rem 202
410 FORI=1TO50:NEXT:POKEVO,128:POKEQ,32:R
    ETURN                               :rem 238
500 PRINT"{HOME}{3 DOWN}{BLK}{15 SPACES}G
    AME{2 SPACES}OVER":FORX=1TO2000:NEXT
                                        :rem 87
505 IFU>VTHENV=U                        :rem 41
510 PRINT"{DOWN}{BLK}{10 SPACES}PRESS TRI
    GGER TO START"                      :rem 218
520 P=PEEK(56320):FR=PAND16             :rem 51
530 IFFR<>0THEN520                      :rem 47
540 GOTO 170                            :rem 106
600 POKEK,32:POKEK+L,32:O=O+1:IFO=4THEN50
    0                                   :rem 27
610 GOSUB800:K=KK:L=LL:GOTO235          :rem 111
700 POKEF,32:POKEF+G,32:O=O+1:IFO=4THEN50
    0                                   :rem 13
710 GOSUB800:F=KK:G=LL:GOTO222          :rem 98
800 N=INT(RND(1)*4)+1:ONNGOTO810,820,830,
    840                                 :rem 203
810 KK=1544:LL=+1:RETURN                :rem 191
820 KK=1583:LL=-1:RETURN                :rem 197
830 KK=1944:LL=+1:RETURN                :rem 197
840 KK=1983:LL=-1:RETURN                :rem 203
950 X=1563:POKEX+CL,2:POKEX,73:X=X+2:POKE
    X+CL,2:POKEX,73:X=1963:POKEX+CL,2
                                        :rem 97
960 POKEX,73:X=X+2:POKEX+CL,2:POKEX,73:RE
    TURN                                :rem 138
1000 JV=PEEK(56320):P=15-(JVAND15)
                                        :rem 152
1005 IFP=0THENRETURN                    :rem 33
1010 IFP=1THENA=A-40:IFA<1164THENA=1164:R
     ETURN                              :rem 51
1020 IFP=2THENA=A+40:IFA>2004THENA=2004:R
     ETURN                              :rem 41
1030 IFP=4THENC=66:RETURN               :rem 73
1040 IFP=8THENC=65:RETURN               :rem 77
1050 RETURN                             :rem 166
1100 PRINT"{HOME}{20 DOWN}"TAB(17)"{RED}L
     EVEL{BLK}";W:FORI=1TO1000:NEXT:PRINT
     "{HOME}"                           :rem 87
1110 FORI=1824TO1863:POKEI,32:NEXT:RETURN
                                        :rem 74
```

French Tutor

(Article on page 70.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: VIC French Tutor, Part 1: Redefined Characters

```
10 POKE36879,237                        :rem 105
20 PRINT"{CLR}{4 RIGHT}{4 DOWN}{BLK}"CHR$
   (122)                                :rem 245
30 FORT=1TO8                            :rem 231
40 PRINTTAB(4)"{BLK}"CHR$(125)"{BLU}{RVS}
   {4 SPACES}{WHT}{4 SPACES}{RED}
   {4 SPACES}"                          :rem 161
50 NEXT                                 :rem 164
60 PRINTTAB(4)"{BLK}"CHR$(125)           :rem 13
70 PRINTTAB(4)"{BLK}"CHR$(125)           :rem 14
80 S1=36876:V=36878:POKEV,10             :rem 96
90 READN,D                              :rem 67
100 IFN=-2THEN170                       :rem 209
110 POKES1,(ABS(N))                      :rem 55
120 FORT=1TO(ABS(D))                    :rem 155
130 NEXTT                                :rem 39
140 POKES1,0                            :rem 164
150 FORN=1TO20:NEXTN                      :rem 5
160 GOTO90                               :rem 57
170 FORT=1TO2000:NEXTT                  :rem 115
180 GOTO210                             :rem 101
190 DATA-201,-125,-201,-187,-201,-62,-215
    ,-250,-215,-250,-219,-250,-219,-250,-
    228,-375                            :rem 112
200 DATA-223,-125,-215,-1000,-2          :rem 247
210 POKE36879,26:PRINT"{CLR}{BLK}{9 DOWN}
    "TAB(6)"VIC FRENCH":PRINTTAB(7)"TUTOR
    IAL"                                :rem 70
220 PRINTTAB(7)"[8 T]"                  :rem 220
230 PRINT"{7 DOWN}{RIGHT}DEFINING CHARACT
    ERS"                                :rem 30
260 X=PEEK(56)-2:POKE52,X:POKE56,X:POKE51
    ,PEEK(55):CLR                       :rem 15
270 CS=256*PEEK(52)+PEEK(51)            :rem 23
280 FORI=CSTOCS+511:POKEI,PEEK(I+32768-CS
    ):NEXT                              :rem 166
290 READX                                :rem 15
300 IFX=-1THEN370                       :rem 222
310 IFX<0THEN290                        :rem 177
320 FORI=XTOX+7:READJ                    :rem 87
330 IFJ<0THEN320                        :rem 159
340 POKEI,J:NEXT                        :rem 254
350 GOTO290                             :rem 108
370 PRINT"{CLR}{BLK}{10 DOWN}"SPC(5)"INST
    RUCTIONS?":PRINT:PRINTSPC(7)"{RED}Y
    {BLK}ES OR {RED}N{BLK}O"            :rem 163
380 GETA$:IFA$<>"N"ANDA$<>"Y"THEN380
                                        :rem 51
390 IFA$="N"THENPOKE36869,255:GOTO555
                                        :rem 167
400 PRINT"{CLR}{BLK}{6 DOWN}IN ORDER TO C
    REATE","FRENCH ACCENTS IN","THIS PROG
    RAM, CERTAIN"                        :rem 8
410 PRINT"LETTERS HAVE BEEN","RE-DEFINED
    {SPACE}USING","PROGRAMMABLE","CHARACT
    ERS."                               :rem 215
420 PRINT:PRINT"PRESS {RED}C{BLK} TO CONT
    INUE."                              :rem 224
430 GETA$:IFA$<>"C"THEN430              :rem 209
440 PRINT"{CLR}{DOWN}{BLK}THE FRENCH CHAR
    ACTERS":PRINT"ARE {BLU}BLUE{BLK}, THE
    IR VIC";                            :rem 147
450 PRINT"{3 SPACES}EQUIVALENTS {GRN}GREE
    N{BLK}. ":PRINT                     :rem 207
460 POKE36869,255                       :rem 161
470 PRINTTAB(4)"{BLU}< {BLK}{RVS}= {GRN}
    <{OFF}"SPC(4)"{BLU}# {BLK}{RVS}=
    {GRN}#"                             :rem 69
480 PRINT:PRINTTAB(4)"{BLU}$ {BLK}{RVS}=
    {SPACE}{GRN}${OFF}"SPC(4)"{BLU}%
    {BLK}{RVS}= {GRN}%"                 :rem 155
490 PRINT:PRINTTAB(4)"{BLU}& {BLK}{RVS}=
    {SPACE}{GRN}&{OFF}"SPC(4)"{BLU}+
    {BLK}{RVS}= {GRN}+"                 :rem 172
500 PRINT:PRINTTAB(4)"{BLU}£ {BLK}{RVS}=
     {GRN}£{OFF}"SPC(4)"{BLU}@ {BLK}
    {RVS}= {GRN}@"                      :rem 58
510 PRINT:PRINTTAB(4)"{BLU}* {BLK}{RVS}=
    {SPACE}{GRN}*{OFF}"SPC(4)"{BLU}↑
    {BLK}{RVS}= {GRN}↑"                 :rem 19
520 PRINT:PRINTTAB(4)"{BLU}[ {BLK}{RVS}=
    {SPACE}{GRN}[{OFF}"SPC(4)"{BLU}]
    {BLK}{RVS}= {GRN}]"                 :rem 116
530 PRINT:PRINTTAB(4)"{BLU}= {BLK}{RVS}=
    {SPACE}{GRN}={OFF}"SPC(4)"{BLU}<
    {BLK}{RVS}= {GRN}<"                 :rem 247
535 PRINT:PRINTTAB(4)"{BLU}> {BLK}{RVS}=
    {SPACE}{GRN}>{OFF}"SPC(4)"{BLU}/
    {BLK}{RVS}= {GRN}/"                 :rem 228
540 PRINT:PRINT"{BLK}PRESS {RED}C{BLK} TO
     CONTINUE."                         :rem 115
550 GETA$:IFA$<>"C"THEN550              :rem 215
555 POKE36879,237                       :rem 167
560 PRINT"{CLR}{8 DOWN}{2 RIGHT}{BLK}ONE
    {SPACE}MOMENT PLEASE."              :rem 235
570 PRINT:PRINTTAB(6)"UN MOMENT,":PRINTTA
    B(3)"S'IL VOUS PLA]T.{WHT}"         :rem 180
580 POKE198,5:POKE631,78:POKE632,69:POKE6
    33,87:POKE634,13:POKE635,131:END
                                        :rem 27
600 DATA7168,8,16,126,64,126,64,126,0
                                        :rem 84
610 DATA7168,8,16,126,64,126,64,126,0
                                        :rem 85
620 DATA7384,24,36,0,60,66,66,60,0
                                       :rem 187
630 DATA7392,28,34,64,64,34,28,8,16
                                       :rem 253
640 DATA7400,8,20,0,62,8,8,62,0          :rem 25
650 DATA7408,16,8,126,64,126,64,126,0
                                        :rem 86
660 DATA7416,30,40,72,78,72,40,30,0
                                       :rem 231
670 DATA7448,16,8,66,66,66,66,60,0
                                       :rem 211
680 DATA7456,24,36,0,66,66,66,60,0
                                       :rem 199
690 DATA7464,36,0,60,66,66,66,60,0
                                       :rem 199
695 DATA7472,30,40,72,126,72,72,78,0
                                        :rem 44
700 DATA7504,16,8,60,66,126,66,66,0
                                       :rem 243
710 DATA7504,16,8,60,66,126,66,66,0
                                       :rem 244
720 DATA7512,24,36,0,60,66,126,66,0
                                       :rem 232
```

```
725 DATA7544,36,0,66,66,66,66,60,0
                                   :rem 203
730 DATA7648,36,0,126,64,126,64,126,0
                                   :rem 85
740 DATA7656,24,36,126,64,126,64,126,0
                                  :rem 139
750 DATA7664,20,0,62,8,8,8,62,0    :rem 39
760 DATA-1                         :rem 21
```

Program 2: VIC French Tutor, Part 2: Vocabulary Drill And Translator

```
1 POKE36879,27:PRINT"{CLR}":L$="FRENCH":K
  $="ENGLISH":R$="{23 SPACES}":POKE36869,
  240                              :rem 37
2 PRINT"{CLR}{BLU}{RVS}"R$"ENTER DESIRED
  {SPACE}NUMBER"R$                 :rem 62
3 PRINT:PRINT"{GRN}1){BLK} "L$" TO "K$SPC
  (5)"VOCABULARY DRILL":PRINT:PRINT"{GRN}
  2) {BLK}"K$" TO "L$SPC(5)"VOCABULARY";
                                   :rem 60
4 PRINT" DRILL":PRINT:PRINT"{GRN}3) {BLK}
  "L$" TO "K$SPC(5)"TRANSLATOR":PRINT:PRI
  NT"{GRN}4) {BLK}"K$" TO "L$SPC(5)"TRANS
  LATOR"                           :rem 53
5 PRINT:PRINT:PRINT"{3 RIGHT}{RVS}{CYN}PU
  SH {RED}RETURN{CYN} AFTER"SPC(5)" EACH
  {SPACE}WORD INPUT "SPC(5)" IN THIS PROG
  RAM {OFF}"                       :rem 159
6 GETMQ$:IFVAL(MQ$)<1ORVAL(MQ$)>4THEN6
                                   :rem 114
8 POKE36869,255:ONVAL(MQ$)GOTO9,18,27,35
                                   :rem 60
9 CO=0:SC=0:PRINT"{CLR}{BLK}{DOWN}HOW MAN
  Y WORDS?"                        :rem 165
10 GETA$:IFVAL(A$)<1THEN10          :rem 5
11 LETN=VAL(A$):IFCO=NTHEN14       :rem 229
12 PRINT"{CLR}{DOWN}{GRN}TRANSLATE":PRINT
   "INTO "K$;                      :rem 147
13 PRINT"{HOME}{2 DOWN}{RED}"TAB(13)CO+1"
   {LEFT} OF"N:GOSUB43             :rem 229
14 IFCO=NTHENGOSUB44:GOTO9         :rem 212
15 PRINT"{HOME}{BLK}{5 DOWN}"W$;:INPUTT$
                                   :rem 39
16 IFT$=E$THENSC=SC+1:CO=CO+1:PRINT"{BLU}
   CORRECT":FORL=1TO1500:NEXTL:GOTO11
                                   :rem 25
17 IFT$<>E$THENCO=CO+1:PRINT"{BLU}WRONG!
   {SPACE}IT'S {PUR}";E$:FORT=1TO1500:NEX
   TT:GOTO11                       :rem 91
18 CO=0:SC=0:PRINT"{CLR}{BLK}{DOWN}HOW MA
   NY WORDS?"                      :rem 213
19 GETA$:IFVAL(A$)<1THEN19          :rem 23
20 LETN=VAL(A$):IFCO=NTHEN23       :rem 229
21 PRINT"{CLR}{DOWN}{GRN}TRANSLATE":PRINT
   "INTO "L$;                      :rem 148
22 PRINT"{HOME}{2 DOWN}{RED}"TAB(13)CO+1"
   {LEFT} OF"N:GOSUB43             :rem 229
23 IFCO=NTHENGOSUB44:GOTO18         :rem 4
24 PRINT"{HOME}{BLK}{5 DOWN}"E$;:INPUTT$
                                   :rem 21
25 IFT$=W$THENSC=SC+1:CO=CO+1:PRINT"{BLU}
   CORRECT":FORL=1TO1500:NEXTL:GOTO20
                                   :rem 43
26 IFT$<>W$THENCO=CO+1:PRINT"{BLU}WRONG!
   {SPACE}IT'S {PUR}";W$:FORT=1TO1500:NEX
   TT:GOTO20                       :rem 127
27 PRINT"{CLR}{DOWN}{BLK}ENTER "L$" WORD
   {5 SPACES}OR {GRN}M{BLK} TO GO TO MENU
   "                               :rem 137
28 X$="XX":PRINT"{BLK}":INPUTT$    :rem 244
29 IFT$="M"THENRUN                 :rem 100
30 READE$,W$                       :rem 143
31 IFW$=T$THENPRINT"{2 RIGHT}{BLU}"E$:FOR
   T=1TO1500:NEXTT:PRINT:RESTORE:GOTO27
                                   :rem 255
32 IFW$=X$THENPRINT"{2 RIGHT}{BLU}TRY AGA
   IN.":RESTORE:GOTO28             :rem 73
33 IFE$<>T$THEN30                  :rem 226
34 PRINT"{BLU}{2 RIGHT}TRY AGAIN.":RESTOR
   E:GOTO28                        :rem 89
35 PRINT"{CLR}{DOWN}{BLK}ENTER "K$" WORD
   {4 SPACES}OR {GRN}M{BLK} TO GO TO MENU
   "                               :rem 135
36 X$="XX":PRINT"{BLK}":INPUTT$    :rem 243
37 IFT$="M"THENRUN                 :rem 99
38 READE$,W$                       :rem 151
39 IFE$=T$THENPRINT"{2 RIGHT}{BLU}"W$:FOR
   T=1TO1500:NEXTT:PRINT:RESTORE:GOTO35
                                   :rem 6
40 IFE$=X$THENPRINT"{2 RIGHT}{BLU}TRY AGA
   IN.":RESTORE:GOTO36             :rem 53
41 IFW$<>T$THEN38                  :rem 251
42 PRINT"{BLU}{2 RIGHT}TRY AGAIN.":RESTOR
   E:GOTO36                        :rem 87
43 X=INT(RND(1)*101)+1:RESTORE:FORM=1TOX:
   READE$,W$:NEXTM:RETURN          :rem 49
44 PRINT:PRINT"{CLR}{BLK}{4 DOWN}OUT OF";
   N;"WORDS YOU {3 RIGHT}HAVE CORRECTLY"S
   PC(8)"TRANSLATED";SC;"{LEFT}.":rem 122
45 PRINT:PRINT"YOUR SCORE IS";INT((SC/N)*
   100);SPC(6)"PER CENT."          :rem 41
46 PRINT:PRINT"GO AGAIN?":PRINT"{DOWN}
   {2 RIGHT}{RED}Y{BLK} - YES":PRINT"
   {DOWN}{2 RIGHT}{RED}M {BLK}- RETURN TO
    MENU"                          :rem 228
47 GETQ$:IFQ$<>"Y"ANDQ$<>"M"THEN47 :rem 2
48 IFQ$="Y"THENRETURN              :rem 89
49 IFQ$="M"THENRUN                 :rem 99
51 DATASUMMER,@T@,APPLE,POMME,HERE,ICI,TH
   ERE,L*,NEST,NID                 :rem 165
52 DATAHOUSE,MAISON,FARM,FERME,WHERE,O#,S
   AME,M=ME,BOX,BO]TE,FRENCH,FRAN£AIS,CA
   KE,G+TEAU                       :rem 7
53 DATACOW,VACHE,HORSE,CHEVAL,BIRD,OISEAU
   ,CHRISTMAS,NO<L,EGG,<UF,EYE,<IL,WORK
   ,<UVRE                          :rem 132
54 DATACOST,CO$T,TASTE,GO$T,RATHER,PLUT[T
   ,BELIEVE,CRO]RE,HEAD,T=TE,BEAST,B=TE,K
   EY,CL@                          :rem 154
55 DATANAME,NOM,YES,OUI,NO,NON,NOSE,NEZ,C
   OFFEE,CAF@,BOY,GAR£ON,DAY,JOUR,CASTLE
   ,CH+TEAU                        :rem 217
56 DATABLACK,NOIR,BLUE,BLEU,RED,ROUGE,GRE
   EN,VERT,WHITE,BLANC,PURPLE,VIOLET,YELL
   OW,JAUNE                        :rem 144
57 DATAFEBRUARY,F@VRIER,KNOT,N<UD,TASK,T
   +CHE,PUPIL,@L↑VE,PASTE,P+TE,FOREST,FOR
   =T,OR,OU                        :rem 100
58 DATACHOIR,CH<UR,BONE,OS,BEAR,OURS,GOA
   T,CH↑VRE,CITY,CIT@,NUT,NOIX,MOON,LUNE,
   BEEF,B<UF                       :rem 148
59 DATAFATHER,P↑RE,MOTHER,M↑RE,BABY,B@B@,
   FAIRY,F@E,IRON,FER,FIRE,FEU,WINDOW,FEN
   =TRE                            :rem 48
60 DATARULE,R↑GLE,RICE,RIZ,CORN,MA>S,MAST
   ER,MA]TRE,WHEAT,BL@,VERY,TR↑S,SOON,T[T
   ,WINE,VIN                       :rem 37
61 DATALIFE,VIE,JUNE,JUIN,TAIL,QUEUE,FOOT
   ,PIED,ARM,BRAS,WORD,MOT,LEG,JAMBE,CHIL
   D,ENFANT                        :rem 21
62 DATASTRONG,FORT,BUILD,B+TIR,AT,*,SWORD
   ,@P@E,FINGER,DOIGT,HEART,C<UR,SKY,CIE
```

```
L,BEAK,BEC                              :rem 61
63 DATAHOUSE,MAISON,DOOR,PORTE,SOAP,SAVON
,CUT,COUP,LIP,L↑VRE,SCHOOL,@COLE,SUN,S
OLEIL                                   :rem 10
64 DATAMILK,LAIT,TEA,TH@,WATER,EAU,ARROW,
FL↑CHE,END,FIN,AUNT,TANTE,TOOTH,DENT,X
X,XX                                    :rem 79
```

Program 3: 64 French Tutor

```
100 DATA SUMMER,@T@,APPLE,POMME,HERE,ICI,
THERE,L*,NEST,NID                       :rem 208
110 DATAHOUSE,MAISON,FARM,FERME,WHERE,O#,
SAME,M=ME,BOX,BO]TE                     :rem 183
120 DATAFRENCH,FRAN£AIS,CAKE,G+TEAU
                                        :rem 252
130 DATACOW,VACHE,HORSE,CHEVAL,BIRD,OISEA
U,CHRISTMAS,NO<L                        :rem 32
140 DATAEGG,←UF,EYE,←IL,WORK,←UVRE
                                        :rem 19
150 DATACOST,CO$T,TASTE,GO$T,RATHER,PLUT[
T,BELIEVE,CRO]RE                        :rem 68
160 DATAHEAD,T=TE,BEAST,B=TE,KEY,CL@
                                        :rem 8
170 DATANAME,NOM,YES,OUI,NO,NON,NOSE,NEZ,
COFFEE,CAF@,BOY,GAR£ON                  :rem 152
180 DATA DAY,JOUR,CASTLE,CH+TEAU        :rem 246
190 DATABLACK,NOIR,BLUE,BLEU,RED,ROUGE,GR
EEN,VERT,WHITE,BLANC                    :rem 21
200 DATAPURPLE,VIOLET,YELLOW,JAUNE:rem 42
210 DATAFEBRUARY,F@VRIER,KNOT,N←UD,TASK,
T+CHE,PUPIL,@L↑VE                       :rem 98
220 DATAPASTE,P+TE,FOREST,FOR=T,OR,OU
                                        :rem 171
230 DATACHOIR,CH←UR,BONE,OS,BEAR,OURS,GO
AT,CH↑VRE                               :rem 19
240 DATACITY,CIT@,NUT,NOIX,MOON,LUNE,BEEF
,B←UF                                   :rem 45
250 DATAFATHER,P↑RE,MOTHER,M↑RE,BABY,B@B@
,FAIRY,F@E,IRON                         :rem 193
260 DATAFER,FIRE,FEU,WINDOW,FEN=TRE
                                        :rem 30
270 DATARULE,R↑GLE,RICE,RIZ,CORN,MA>S,MAS
TER,MA]TRE,WHEAT,BL@                    :rem 81
280 DATAVERY,TR↑S,SOON,T[T,WINE,VIN
                                        :rem 143
290 DATALIFE,VIE,JUNE,JUIN,TAIL,QUEUE,FOO
T,PIED,ARM,BRAS                         :rem 190
300 DATAWORD,MOT,LEG,JAMBE,CHILD,ENFANT
                                        :rem 12
310 DATASTRONG,FORT,BUILD,B+TIR,AT,*,SWOR
D,@P@E,FINGER,DOIGT                     :rem 179
320 DATAHEART,C←UR,SKY,CIEL,BEAK,BEC
                                        :rem 57
330 DATAHOUSE,MAISON,DOOR,PORTE,SOAP,SAVO
N,CUT,COUP,LIP,L↑VRE                    :rem 158
340 DATASCHOOL,@COLE,SUN,SOLEIL         :rem 30
350 DATAMILK,LAIT,TEA,TH@,WATER,EAU,ARROW
,FL↑CHE,END,FIN,AUNT,TANTE              :rem 180
360 DATATOOTH,DENT,XX,XX                :rem 80
365 POKE53280,6                         :rem 49
370 POKE53281,12:CH=54272:FORT=CHTOCH+24:
POKET,Ø:NEXT:PRINTCHR$(142)             :rem 159
375 POKECH+24,15                        :rem 124
380 POKECH+5,17:POKECH+6,241:POKECH,100
                                        :rem 18
390 PRINT"{CLR}{8 RIGHT}{6 DOWN}{BLK}"CHR
$(122)                                  :rem 197
400 FORT=1TO10                          :rem 65
410 PRINTTAB(8)"{BLK}"CHR$(125)"{BLU}
{RVS}{8 SPACES}{WHT}{8 SPACES}{RED}
{8 SPACES}"                             :rem 214
420 NEXT                                :rem 213
430 PRINTTAB(8)"{BLK}"CHR$(125)         :rem 66
440 PRINTTAB(8)"{BLK}"CHR$(125)         :rem 67
450 FORT=ØTO1STEP Ø :READA$:IF A$="XX"THE
NT=1:READA$                             :rem 71
451 NEXT                                :rem 217
460 READN,D                             :rem 116
470 IFD=-2THEN560                       :rem 212
480 POKECH+1,(ABS(N)):POKECH+4,33:rem 137
490 FORT=1TO(ABS(D)):NEXT               :rem 30
510 POKECH+4,32                         :rem 64
520 FORN=1TO20:NEXTN                    :rem 6
530 GOTO460                             :rem 107
560 PRINTCHR$(14):GOTO590               :rem 240
570 DATA-16,-125,-16,-187,-16,-62,-22,-25
Ø,-22,-250,-25,-250,-25,-250,-33,-375
                                        :rem 230
580 DATA-28,-93,-22,-375,-2,-2          :rem 222
590 PRINT"{CLR}{BLK}{11 DOWN}"TAB(15)"64
{SPACE}FRENCH{DOWN}":PRINTTAB(15)"TUT
ORIAL"                                  :rem 93
600 PRINTTAB(15)"[8 T]"                 :rem 13
605 PRINT"{3 DOWN}{3 RIGHT}PLEASE WAIT...
DEFINING CHARACTERS"                    :rem 19
610 PRINT:PRINT                         :rem 235
620 X=48:POKE56,X                       :rem 241
630 CS=12288                            :rem 113
640 POKE56334,PEEK(56334)AND254:POKE1,PEE
K(1)AND251                              :rem 187
650 FORI=CSTOCS+4095:POKEI,PEEK(I+40960):
NEXT                                    :rem 24
660 READX                               :rem 16
670 IFX=-1THEN740                       :rem 233
680 IFX<ØTHEN660                        :rem 188
690 FORI=XTOX+7:READJ                   :rem 97
700 IFJ<ØTHEN690                        :rem 170
710 POKEI+5120,J:NEXT                   :rem 242
720 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334
)OR1                                    :rem 136
730 GOTO660                             :rem 111
740 PRINT"{CLR}{BLK}{10 DOWN}"SPC(13)"INS
TRUCTIONS?{DOWN}":PRINTSPC(15)"{RVS}Y
{OFF}ES OR {RVS}N{OFF}O"                :rem 188
750 GETA$:IFA$<>"N"ANDA$<>"Y"THEN750
                                        :rem 53
760 IFA$="N"THEN1150                    :rem 86
770 PRINT"{CLR}{BLK}{6 DOWN}{2 RIGHT}IN O
RDER TO CREATE FRENCH ACCENTS IN
{DOWN}"                                 :rem 123
780 PRINT"{8 RIGHT}THIS PROGRAM, CERTAIN
{DOWN}"                                 :rem 235
790 PRINT"{2 RIGHT}LETTERS HAVE BEEN RE-D
EFINED USING{DOWN}"                     :rem 86
800 PRINT"{8 RIGHT}PROGRAMMABLE CHARACTER
S.{DOWN}"                               :rem 233
810 PRINT"{10 RIGHT}{5 DOWN}PRESS {RVS}C
{OFF} TO CONTINUE."                     :rem 139
820 GETA$:IFA$<>"C"THEN820              :rem 215
830 PRINT"{CLR}{DOWN}{4 RIGHT}{BLK}THE FR
ENCH CHARACTERS ARE BLACK,"             :rem 236
840 PRINT"{4 RIGHT}THEIR 64 EQUIVALENTS A
RE {WHT}WHITE{BLK}.{2 DOWN}"            :rem 86
850 POKE53272,29                        :rem 102
860 PRINTTAB(12)"← {RVS}={OFF} {RVS}
{WHT}←{OFF}{BLK}"SPC(4)"# {RVS}=
{OFF} {RVS}{WHT}#{OFF}{BLK}"            :rem 225
870 PRINT:PRINTTAB(12)"$ {RVS}={OFF}
{RVS}{WHT}${OFF}{BLK}"SPC(4)"% {RVS}=
{OFF} {RVS}{WHT}%{OFF}{BLK}"            :rem 55
880 PRINT:PRINTTAB(12)"& {RVS}={OFF}
{RVS}{WHT}&{OFF}{BLK}"SPC(4)"+ {RVS}=
{OFF} {RVS}{WHT}+{OFF}{BLK}"            :rem 72
```

```
890 PRINT:PRINTTAB(12)"£ {RVS}={OFF}
    {RVS}{WHT}£{OFF}{BLK}"SPC(4)"@ {RVS}
    ={OFF} {RVS}{WHT}@{OFF}{BLK}":rem 223
900 PRINT:PRINTTAB(12)"* {RVS}={OFF}
    {RVS}{WHT}*{OFF}{BLK}"SPC(4)"↑ {RVS}=
    {OFF} {RVS}{WHT}↑{OFF}{BLK}" :rem 175
910 PRINT:PRINTTAB(12)"[ {RVS}={OFF}
    {RVS}{WHT}[{OFF}{BLK}"SPC(4)"] {RVS}=
    {OFF} {RVS}{WHT}]{OFF}{BLK}"  :rem 16
920 PRINT:PRINTTAB(12)"= {RVS}={OFF}
    {RVS}{WHT}={OFF}{BLK}"SPC(4)"< {RVS}=
    {OFF} {RVS}{WHT}<{OFF}{BLK}" :rem 147
930 PRINT:PRINTTAB(12)"> {RVS}={OFF}
    {RVS}{WHT}>{OFF}{BLK}"SPC(4)"/ {RVS}=
    {OFF} {RVS}{WHT}/{OFF}{BLK}" :rem 124
940 PRINTTAB(9)"{2 DOWN}{BLK}PRESS {RVS}C
    {OFF} TO CONTINUE."           :rem 43
950 GETA$:IFA$<>"C"THEN950        :rem 223
952 DATA7168,8,16,126,64,126,64,126,0
                                  :rem 94
955 DATA7168,8,16,126,64,126,64,126,0
                                  :rem 97
960 DATA7384,24,36,0,60,66,66,60,0
                                  :rem 194
965 DATA7392,28,34,64,64,34,28,8,16:rem 8
970 DATA7400,8,20,0,62,8,8,62,0   :rem 31
975 DATA7408,16,8,126,64,126,64,126,0
                                  :rem 96
980 DATA7416,30,40,72,78,72,40,30,0
                                  :rem 236
985 DATA7448,16,8,66,66,66,66,60,0
                                  :rem 220
990 DATA7456,24,36,0,66,66,66,60,0
                                  :rem 203
995 DATA7464,36,0,60,66,66,66,60,0
                                  :rem 207
1000 DATA7472,30,40,72,126,72,72,78,0
                                  :rem 73
1005 DATA7504,16,8,60,66,126,66,66,0
                                  :rem 34
1010 DATA7504,16,8,60,66,126,66,66,0
                                  :rem 30
1015 DATA7512,24,36,0,60,66,126,66,0
                                  :rem 22
1020 DATA7544,36,0,66,66,66,66,60,0
                                  :rem 240
1025 DATA7648,36,0,126,64,126,64,126,0
                                  :rem 131
1030 DATA7656,24,36,126,64,126,64,126,0
                                  :rem 180
1035 DATA7664,20,0,62,8,8,8,62,0  :rem 84
1040 DATA-1                       :rem 61
1150 POKE53272,29:CLR:RESTORE      :rem 9
1160 PRINT"{CLR}":L$="FRENCH":K$="ENGLISH
    "                             :rem 65
1165 R$="{23 SPACES}"             :rem 196
1170 POKE53280,7                  :rem 93
1180 PRINT"{CLR}{DOWN}{WHT}{RVS}"SPC(10)"
    ENTER DESIRED NUMBER"         :rem 121
1190 PRINT"{2 DOWN}{WHT}1){BLK} "L$" TO "
    K$" {WHT}-{BLK} VOCABULARY DRILL"
                                  :rem 232
1200 PRINT"{2 DOWN}{WHT}2) {BLK}"K$" TO "
    L$" {WHT}-{BLK} VOCABULARY DRILL"
                                  :rem 225
1210 PRINT"{2 DOWN}{WHT}3) {BLK}"L$" TO "
    K$" {WHT}-{BLK} TRANSLATOR" :rem 126
1220 PRINT"{2 DOWN}{WHT}4) {BLK}"K$" TO "
    L$" {WHT}-{BLK} TRANSLATOR" :rem 128
1225 PRINT"{2 DOWN}{WHT}5) {BLK}END THE P
    ROGRAM"                       :rem 128
1230 PRINT"{4 DOWN}{3 RIGHT}{RVS}{WHT}PUS
    H {BLK}RETURN{WHT} AFTER EACH WORD I
    NPUT{DOWN}";                  :rem 153
1240 PRINTSPC(16)"IN THIS PROGRAM":rem 29
1250 GETMQ$:IFVAL(MQ$)<1ORVAL(MQ$)>5THEN1
    250                           :rem 151
1255 IFVAL(MQ$)=5THENSYS2048      :rem 192
1260 POKE53272,29:ONVAL(MQ$)GOTO1270,1360
    ,1450,1530                    :rem 67
1270 CO=0:SC=0:PRINT"{CLR}{BLK}{2 DOWN}
    {3 RIGHT}HOW MANY WORDS?"     :rem 158
1280 GETA$:IFVAL(A$)<1THEN1280    :rem 217
1290 LETN=VAL(A$):IFCO=NTHEN1320  :rem 176
1300 PRINT"{CLR}{4 DOWN}{3 RIGHT}TRANSLAT
    E":PRINT"{3 RIGHT}INTO "K$    :rem 124
1310 PRINT"{2 UP}"TAB(24)CO+1"{LEFT} OF"N
    :GOSUB1610                    :rem 122
1320 IFCO=NTHENGOSUB1620:GOTO1270 :rem 39
1330 PRINT"{3 DOWN}{7 RIGHT}"W$;:INPUTT$
                                  :rem 142
1340 IFT$=E$THENSC=SC+1:CO=CO+1:PRINT"
    {7 RIGHT}{2 DOWN}{WHT}CORRECT !{BLK}
    ":FORL=1TO2E2:NEXTL           :rem 12
1345 IFT$=E$THENT$="":GOTO1290    :rem 225
1350 CO=CO+1:PRINT"{7 RIGHT}{2 DOWN}{WHT}
    WRONG !{2 SPACES}IT'S {BLK}";E$:FORT
    =1TO1500:NEXTT:GOTO1290       :rem 212
1360 CO=0:SC=0:PRINT"{CLR}{2 DOWN}
    {3 RIGHT}{BLK}HOW MANY WORDS?"
                                  :rem 158
1370 GETA$:IFVAL(A$)<1THEN1370    :rem 217
1380 LETN=VAL(A$):IFCO=NTHEN1410  :rem 176
1390 PRINT"{CLR}{4 DOWN}{3 RIGHT}TRANSLAT
    E":PRINT"{3 RIGHT}INTO "L$;   :rem 193
1400 PRINT"{UP}"TAB(24)CO+1"{LEFT} OF"N:G
    OSUB1610                      :rem 233
1410 IFCO=NTHENGOSUB1620:GOTO1360 :rem 39
1420 PRINT"{3 DOWN}{7 RIGHT}"E$;:INPUTT$
                                  :rem 124
1430 IFT$=W$THENSC=SC+1:CO=CO+1:PRINT"
    {WHT}{2 DOWN}{7 RIGHT}CORRECT !{BLK}
    ":FORL=1TO1500:NEXTL          :rem 59
1435 IFT$=W$THEN1380              :rem 135
1440 CO=CO+1:PRINT"{WHT}{2 DOWN}{7 RIGHT}
    WRONG ! IT'S {BLK}";W$:FORT=1TO1500:
    NEXTT:GOTO1380                :rem 230
1450 PRINT"{CLR}{DOWN}{RIGHT}{BLK}ENTER "
    L$" WORD OR {RVS}M{OFF} TO GO TO MEN
    U"                            :rem 253
1460 X$="XX":PRINT"{DOWN}{RIGHT}";:INPUTT
    $                              :rem 46
1470 IFT$="M"THEN1160             :rem 152
1480 READE$,W$                    :rem 249
1490 IFW$=T$THENPRINT"{DOWN}{2 RIGHT}"E$:
    FORT=1TO1500:NEXTT:PRINT:RESTORE:GOT
    O1450                         :rem 188
1500 IFW$=X$THENPRINT"{DOWN}{2 RIGHT}TRY
    {SPACE}AGAIN.":RESTORE:GOTO1460
                                  :rem 253
1510 IFE$<>T$THEN1480             :rem 173
1520 PRINT"{DOWN}{2 RIGHT}TRY AGAIN.":RES
    TORE:GOTO1460                 :rem 13
1530 PRINT"{CLR}{DOWN}{RIGHT}{BLK}ENTER "
    K$" WORD OR {RVS}M{OFF} TO GO TO MEN
    U"                            :rem 251
1540 X$="XX":PRINT"{DOWN}{RIGHT}";:INPUTT
    $                              :rem 45
1550 IFT$="M"THEN1170             :rem 152
1560 READE$,W$                    :rem 248
1570 IFE$=T$THENPRINT"{DOWN}{2 RIGHT}"W$:
    FORT=1TO1500:NEXTT:PRINT:RESTORE:GOT
    O1530                         :rem 186
```

```
1580 IFE$=X$THENPRINT"{DOWN}{2 RIGHT}TRY
     {SPACE}AGAIN.":RESTORE:GOTO1540
                                    :rem 242
1590 IFW$<>T$THEN1560               :rem 198
1600 PRINT"{DOWN}{2 RIGHT}TRY AGAIN.":RES
     TORE:GOTO1540                  :rem 11
1610 X=INT(RND(1)*101)+1:RESTORE:FORM=1TO
     X:READE$,W$:NEXTM:RETURN       :rem 146
1620 PRINT:PRINT"{CLR}{BLK}{4 DOWN}
     {3 RIGHT}OUT OF";N;"WORDS, YOU HAVE
     {SPACE}CORRECTLY"              :rem 71
1625 PRINT"{12 RIGHT}TRANSLATED";SC;"
     {LEFT}."                       :rem 8
1630 PRINT:PRINT"{6 RIGHT}YOUR SCORE IS";
     INT((SC/N)*100);"PER CENT." :rem 203
1640 PRINTTAB(15)"{2 DOWN}GO AGAIN?"
                                    :rem 129
1645 PRINT"{DOWN}"TAB(16)"{RVS}Y{OFF} - Y
     ES":PRINT"{DOWN}"TAB(11)"{RVS}M{OFF}
      - RETURN TO MENU"             :rem 96
1650 GETQ$:IFQ$<>"Y"ANDQ$<>"M"THEN1650
                                    :rem 196
1660 IFQ$="Y"THENRETURN             :rem 186
1670 IFQ$="M"THEN1170               :rem 152
```

Making Calendars

(Article on page 67.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Monthly Screen Calendar

```
80 DIMM$(12):FORI=1TO12:READM$(I):NEXTI
                                    :rem 104
90 SYS65517:A=PEEK(781):IFA=40THENPOKE532
   81,1                             :rem 167
100 PRINT"{CLR}{3 DOWN}{2 RIGHT}THIS IS A
     PROGRAM":PRINT"{6 RIGHT}TO SHOW A"
                                    :rem 109
105 PRINT"{3 RIGHT}{PUR}MONTHLY CALENDAR
    {BLU}":PRINT"{4 RIGHT}ON THE SCREEN"
                                    :rem 155
110 PRINT"{2 DOWN}{2 RIGHT}PLEASE TYPE IN
     THE":PRINT"{3 RIGHT}{RED}MONTH{BLU}
    {SPACE}AND {RED}YEAR{BLU}"      :rem 149
111 PRINT"{RIGHT}THAT YOU WISH TO SEE":PR
    INT"{DOWN}{2 RIGHT}(EXAMPLE: {RED}12,
    1983{BLU}){PUR}{2 DOWN}"        :rem 180
130 PRINT"{5 RIGHT}";:INPUTM0,Y:PRINT"
    {2 DOWN}{5 RIGHT}{PUR}THANK YOU!{BLU}
    {DOWN}":FORI=1TO800:NEXT        :rem 167
292 IFM0=1ORM0=3ORM0=5ORM0=7ORM0=8ORM0=10
    ORM0=12THENE1=31                :rem 26
293 IFM0=4ORM0=6ORM0=9ORM0=11THENE1=30
                                    :rem 66
294 IFM0=2ANDY/4<>INT(Y/4)THENE1=28
                                    :rem 103
295 IFM0=2ANDY/4=INT(Y/4)THENGOSUB1400
                                    :rem 83
297 PRINT"{CLR}{DOWN}{RIGHT}{RED}";M$(M0)
    ;" ";Y;"{BLU}"                  :rem 123
298 GOSUB1350:IFA=40THENPRINT       :rem 83
300 PRINT"{2 RIGHT}{RED}S{BLU}{2 RIGHT}M
    {2 RIGHT}T{2 RIGHT}W{2 RIGHT}T
    {2 RIGHT}F{2 RIGHT}S"           :rem 109
305 GOSUB1360                       :rem 226
310 D=1:GOSUB1050                   :rem 198
320 IFD1=7THENFORI=1TO19:PRINT"{RIGHT}";:
    NEXT:PRINTD:IFA=40THENPRINT     :rem 53
321 IFD1=7THEN330                   :rem 211
322 IFD1=6THENFORI=1TO16:PRINT"{RIGHT}";:
    NEXT:PRINTD;:GOTO330            :rem 16
323 IFD1=5THENFORI=1TO13:PRINT"{RIGHT}";:
    NEXT:PRINTD;:GOTO330            :rem 13
324 IFD1=4THENFORI=1TO10:PRINT"{RIGHT}";:
    NEXT:PRINTD;:GOTO330            :rem 10
325 IFD1=3THENFORI=1TO7:PRINT"{RIGHT}";:N
    EXT:PRINTD;:GOTO330             :rem 224
326 IFD1=2THENFORI=1TO4:PRINT"{RIGHT}";:N
    EXT:PRINTD;:GOTO330             :rem 221
327 IFD1=1THENPRINT"{RIGHT}{RED}";D;"
    {BLU}";:GOTO330                 :rem 168
330 FORD=2TOE1:GOSUB1050            :rem 201
331 IFD1=1ANDD<=9THENPRINT"{RIGHT}{RED}";
    D;"{BLU}";:GOTO345              :rem 114
332 IFD1=1ANDD>9THENPRINT"{RED}";D;"{BLU}
    ";:GOTO345                      :rem 27
333 IFD1=7THEN340                   :rem 215
334 IFD<=9THENPRINTD;:GOTO345       :rem 105
335 PRINT"{LEFT}";D;:GOTO345        :rem 210
340 IFD>9THENPRINT"{LEFT}";D:GOTO345
                                    :rem 12
341 PRINTD                          :rem 105
345 IFA=40ANDD1=7THENPRINT          :rem 133
346 NEXTD                           :rem 32
1045 PRINT:PRINT:FL=1:GOSUB1350:IFA=22THE
     NPRINT"{3 UP}"                 :rem 57
1049 END                            :rem 165
1050 IFM0=1THENM0=13:Y=Y-1:GOTO1080
                                    :rem 80
1060 IFM0=2THENM0=14:Y=Y-1          :rem 23
1080 M=M0-2                         :rem 47
1100 D1=INT(2.6*M-0.2)+D+Y-1900+INT((Y-19
     00)/4)                         :rem 207
1150 D1=D1+INT(19/4)-2*19           :rem 21
1200 D1=D1-INT(D1/7)*7+1            :rem 235
1210 IFM0=4ORM0=9THEND1=D1+1        :rem 135
1230 IFM0=13THENM0=1:Y=Y+1:GOTO1245
                                    :rem 81
1240 IFM0=14THENM0=2:Y=Y+1:D1=D1+1
                                    :rem 210
1244 IFD1=8THEND1=1                 :rem 86
1245 IF(Y=2100ANDM0>=3)OR(Y>2100)THEND1=D
     1-1:IFD1=0THEND1=7             :rem 198
1247 IF(Y=2200ANDM0>=3)OR(Y>2200)THEND1=D
     1-1:IFD1=0THEND1=7             :rem 202
1249 IF(Y=2300ANDM0>=3)OR(Y>2300)THEND1=D
     1-1:IFD1=0THEND1=7             :rem 206
1250 RETURN                         :rem 168
1350 IFFL=0THENPRINT:FORI=1TO22:PRINT"*";
     :NEXT:PRINT:RETURN             :rem 188
1355 IFD1=7THENPRINT"{3 UP}":FORI=1TO22:P
     RINT"*";:NEXT:PRINT"{UP}":RETURN
                                    :rem 119
1358 FORI=1TO22:PRINT"*";:NEXT:PRINT"{UP}
     ":RETURN                       :rem 21
1360 PRINT"{2 SPACES}[T]{2 SPACES}[T]
     {2 SPACES}[T]{2 SPACES}[T]
     {2 SPACES}[T]{2 SPACES}[T]
     {2 SPACES}[T]":RETURN      :rem 42
1400 IF(Y/100=INT(Y/100))AND(Y/400<>INT(Y
     /400))THENE1=28:GOTO1410       :rem 231
1405 E1=29                          :rem 232
1410 RETURN                         :rem 166
1420 DATA"{3 SPACES}JANUARY","{3 SPACES}F
     EBRUARY","{4 SPACES}MARCH","
     {4 SPACES}APRIL"               :rem 210
```

```
1430 DATA"{5 SPACES}MAY","{5 SPACES}JUNE"
     ,"{5 SPACES}JULY","{4 SPACES}AUGUST"
                                   :rem 172
1440 DATA"{2 SPACES}SEPTEMBER","
     {3 SPACES}OCTOBER","{3 SPACES}NOVEMB
     ER","{3 SPACES}DECEMBER"     :rem 193
```

Program 2:

Monthly Calendar For Printer

```
1 GOTO10                           :rem 203
5 E1=1:E2=1:E3=1:E4=1:E5=1:E6=1:E7=1
                                   :rem 226
6 GOSUB1109:D8=D7-1:RETURN         :rem 103
10 OPEN1,4:SYS65517:A=PEEK(781):IFA=40THE
   NPOKE53281,1                    :rem 156
20 GOSUB4000:GOSUB3200:PRINT#1,"":rem 176
30 ONM0GOSUB3010,3020,3030,3040,3050,3060
   ,3070,3080,3090,3100,3110,3120 :rem 56
40 PRINT#1,"":PRINT#1,"":GOSUB1610:GOSUB1
   650:GOSUB1660                   :rem 207
80 OND9GOSUB1811,1821,1831,1841,1851,1861
   ,1871                           :rem 172
99 PRINT#1,"":PRINT#1,""           :rem 78
100 G1=D8                          :rem 194
105 G=G1:GOSUB1720:D1=D:E1=E       :rem 120
110 G2=G+1:G=G2:GOSUB1720:D2=D:E2=E
                                   :rem 10
115 G3=G+1:G=G3:GOSUB1720:D3=D:E3=E
                                   :rem 19
120 G4=G+1:G=G4:GOSUB1720:D4=D:E4=E
                                   :rem 19
125 G5=G+1:G=G5:GOSUB1720:D5=D:E5=E
                                   :rem 28
130 G6=G+1:G=G6:GOSUB1720:D6=D:E6=E
                                   :rem 28
135 G7=G+1:G=G7:GOSUB1720:D7=D:E7=E
                                   :rem 37
140 G1=G7+1:GOSUB1109:PRINT#1,"":PRINT#1,
    "":IFG1<=E9THEN105             :rem 188
155 PRINT#1,""                     :rem 236
1000 GOTO5000                      :rem 191
1109 GOSUB2000:X=E1:X1=D1:GOSUB11000
                                   :rem 115
1120 X=E2:X1=D2:GOSUB11000         :rem 242
1130 X=E3:X1=D3:GOSUB11000         :rem 245
1140 X=E4:X1=D4:GOSUB11000         :rem 248
1150 X=E5:X1=D5:GOSUB11000         :rem 251
1160 X=E6:X1=D6:GOSUB11000         :rem 254
1170 X=E7:X1=D7:FL=1:GOSUB11000    :rem 59
1209 GOSUB2000:X=E1:X1=D1:GOSUB12000
                                   :rem 117
1220 X=E2:X1=D2:GOSUB12000         :rem 244
1230 X=E3:X1=D3:GOSUB12000         :rem 247
1240 X=E4:X1=D4:GOSUB12000         :rem 250
1250 X=E5:X1=D5:GOSUB12000         :rem 253
1260 X=E6:X1=D6:GOSUB12000           :rem 0
1270 X=E7:X1=D7:FL=1:GOSUB12000    :rem 61
1309 GOSUB2000:X=E1:X1=D1:GOSUB13000
                                   :rem 119
1320 X=E2:X1=D2:GOSUB13000         :rem 246
1330 X=E3:X1=D3:GOSUB13000         :rem 249
1340 X=E4:X1=D4:GOSUB13000         :rem 252
1350 X=E5:X1=D5:GOSUB13000         :rem 255
1360 X=E6:X1=D6:GOSUB13000           :rem 2
1370 X=E7:X1=D7:FL=1:GOSUB13000    :rem 63
1409 GOSUB2000:X=E1:X1=D1:GOSUB14000
                                   :rem 121
1420 X=E2:X1=D2:GOSUB14000         :rem 248
1430 X=E3:X1=D3:GOSUB14000         :rem 251
1440 X=E4:X1=D4:GOSUB14000         :rem 254
1450 X=E5:X1=D5:GOSUB14000           :rem 1
1460 X=E6:X1=D6:GOSUB14000           :rem 4
1470 X=E7:X1=D7:FL=1:GOSUB14000    :rem 65
1509 GOSUB2000:X=E1:X1=D1:GOSUB15000
                                   :rem 123
1520 X=E2:X1=D2:GOSUB15000         :rem 250
1530 X=E3:X1=D3:GOSUB15000         :rem 253
1540 X=E4:X1=D4:GOSUB15000           :rem 0
1550 X=E5:X1=D5:GOSUB15000           :rem 3
1560 X=E6:X1=D6:GOSUB15000           :rem 6
1570 X=E7:X1=D7:FL=1:GOSUB15000    :rem 67
1600 RETURN                        :rem 167
1610 PRINT#1,"{5 SPACES}";:PRINT#1,CHR$(1
     4)"SUN";:PRINT#1,CHR$(15)"{5 SPACES}
     ";                            :rem 69
1611 PRINT#1,CHR$(14)"MON";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 116
1612 PRINT#1,CHR$(14)"TUE";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 121
1613 PRINT#1,CHR$(14)"WED";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 108
1614 PRINT#1,CHR$(14)"THU";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 126
1615 PRINT#1,CHR$(14)"FRI";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 111
1616 PRINT#1,CHR$(14)"SAT":PRINT#1,CHR$(1
     5)" "                          :rem 1
1620 PRINT#1,"{5 SPACES}";:PRINT#1,CHR$(1
     4)"---";:PRINT#1,CHR$(15)"{5 SPACES}
     ";                            :rem 215
1621 PRINT#1,CHR$(14)"---";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 18
1622 PRINT#1,CHR$(14)"---";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 19
1623 PRINT#1,CHR$(14)"---";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 20
1624 PRINT#1,CHR$(14)"---";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 21
1625 PRINT#1,CHR$(14)"---";:PRINT#1,CHR$(
     15)"{5 SPACES}";              :rem 22
1626 PRINT#1,CHR$(14)"---":PRINT#1,CHR$(1
     5)" ":RETURN                  :rem 187
1650 IFM0=1ORM0=3ORM0=5ORM0=7ORM0=8ORM0=1
     0ORM0=12THENE9=31             :rem 81
1652 IFM0=4ORM0=6ORM0=9ORM0=11THENE9=30
                                   :rem 122
1654 IFM0=2ANDY/4<>INT(Y/4)THENE9=28
                                   :rem 160
1656 IFM0=2ANDY/4=INT(Y/4)THENE9=29
                                   :rem 102
1658 RETURN                        :rem 180
1660 IFM0=1THENM0=13:Y=Y-1:GOTO1670
                                    :rem 92
1665 IFM0=2THENM0=14:Y=Y-1          :rem 34
1670 M=M0-2                         :rem 52
1675 D9=INT(2.6*M-0.2)+D+Y-1900+INT((Y-19
     00)/4)                        :rem 232
1680 D9=D9+INT(19/4)-2*19           :rem 45
1685 D9=D9-INT(D9/7)*7+1            :rem 20
1690 IFM0=4ORM0=9THEND9=D9+1       :rem 163
1695 IFM0=13THENM0=1:Y=Y+1:GOTO1710
                                    :rem 93
1700 IFM0=14THENM0=2:Y=Y+1:D9=D9+1
                                   :rem 227
1705 IFD9=8THEND9=1                :rem 104
1710 IF(Y=2100ANDM0>=3)OR(Y>2100)THEND9=D
     9-1:IFD9=0THEND9=7            :rem 227
1711 IF(Y=2200ANDM0>=3)OR(Y>2200)THEND9=D
     9-1:IFD9=0THEND9=7            :rem 230
1712 IF(Y=2300ANDM0>=3)OR(Y>2300)THEND9=D
     9-1:IFD9=0THEND9=7            :rem 233
1715 RETURN                        :rem 174
1720 IFG>E9THENGOTO1740            :rem 144
1722 IFG<10THENGOTO1742            :rem 117
1726 IFG>=10ANDG<20THENGOTO1746    :rem 116
1728 IFG>=20ANDG<30THENGOTO1748    :rem 122
```

```
1730 IFG>=30THENGOTO1750                :rem 180
1740 D=1:E=1:GOTO1755                   :rem 176
1742 D=G+2:E=1:GOTO1755                  :rem 37
1746 D=G-10+2:E=2:GOTO1755              :rem 184
1748 D=G-20+2:E=3:GOTO1755              :rem 188
1750 D=G-30+2:E=4                       :rem 114
1755 RETURN                             :rem 178
1811 D1=1:D2=3:D3=4:D4=5:D5=6:D6=7:D7=8:G
     OSUB5:RETURN                       :rem 149
1821 D1=1:D2=1:D3=3:D4=4:D5=5:D6=6:D7=7:G
     OSUB5:RETURN                       :rem 143
1831 D1=1:D2=1:D3=1:D4=3:D5=4:D6=5:D7=6:G
     OSUB5:RETURN                       :rem 138
1841 D1=1:D2=1:D3=1:D4=1:D5=3:D6=4:D7=5:G
     OSUB5:RETURN                       :rem 134
1851 D1=1:D2=1:D3=1:D4=1:D5=1:D6=3:D7=4:G
     OSUB5:RETURN                       :rem 131
1861 D1=1:D2=1:D3=1:D4=1:D5=1:D6=1:D7=3:G
     OSUB5:RETURN                       :rem 129
1871 D1=3:D2=4:D3=5:D4=6:D5=7:D6=8:D7=9:G
     OSUB5:RETURN                       :rem 163
2000 PRINT#1,"{4 SPACES}";:RETURN:rem 104
2001 PRINT#1," £2 +₰ ";:RETURN :rem 181
2002 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 182
2003 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 183
2004 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 184
2005 PRINT#1," £2 +₰ ";:RETURN :rem 185
2011 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 16
2012 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 17
2013 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 18
2014 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 19
2015 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 20
2021 PRINT#1," £2 +₰ ";:RETURN :rem 183
2022 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 184
2023 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 19
2024 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 20
2025 PRINT#1,"£4 +₰";:RETURN      :rem 7
2031 PRINT#1,"£3 +₰ ";:RETURN    :rem 94
2032 PRINT#1,"{3 SPACES}£+₰";:RETURN
                                        :rem 19
2033 PRINT#1," £2 +₰ ";:RETURN :rem 186
2034 PRINT#1,"{3 SPACES}£+₰";:RETURN
                                        :rem 21
2035 PRINT#1,"£3 +₰ ";:RETURN    :rem 98
2041 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 19
2042 PRINT#1," £2 +₰ ";:RETURN :rem 186
2043 PRINT#1,"£+₰ £+₰ ";:RETURN
                                        :rem 187
2044 PRINT#1,"£4 +₰";:RETURN      :rem 8
2045 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 23
2051 PRINT#1,"£4 +₰";:RETURN      :rem 6
2052 PRINT#1,"£+₰{3 SPACES}";:RETURN
                                        :rem 21
2053 PRINT#1,"£3 +₰ ";:RETURN    :rem 98
2054 PRINT#1,"{3 SPACES}£+₰";:RETURN
                                        :rem 23
2055 PRINT#1,"£3 +₰ ";:RETURN   :rem 100
2061 PRINT#1," £2 +₰ ";:RETURN :rem 187
2062 PRINT#1,"£+₰{3 SPACES}";:RETURN
                                        :rem 22
2063 PRINT#1,"£3 +₰ ";:RETURN    :rem 99
2064 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 190
2065 PRINT#1," £2 +₰ ";:RETURN :rem 191
2071 PRINT#1,"£4 +₰";:RETURN      :rem 8
2072 PRINT#1,"{3 SPACES}£+₰";:RETURN
                                        :rem 23
2073 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 24
2074 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 25
2075 PRINT#1," £+₰{2 SPACES}";:RETURN
                                        :rem 26
2081 PRINT#1," £2 +₰ ";:RETURN :rem 189
2082 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 190
2083 PRINT#1," £2 +₰ ";:RETURN :rem 191
2084 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 192
2085 PRINT#1," £2 +₰ ";:RETURN :rem 193
2091 PRINT#1," £2 +₰ ";:RETURN :rem 190
2092 PRINT#1,"£+₰{2 SPACES}£+₰";:RETU
     RN                                 :rem 191
2093 PRINT#1," £3 +₰";:RETURN  :rem 102
2094 PRINT#1,"{3 SPACES}£+₰";:RETURN
                                        :rem 27
2095 PRINT#1," £2 +₰ ";:RETURN :rem 194
2111 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 17
2112 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 18
2113 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 19
2114 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 20
2115 PRINT#1,"{2 SPACES}£+₰ ";:RETURN
                                        :rem 21
3010 GOSUB2000:PRINT#1," £3 +₰
     {3 SPACES}£3 +₰{2 SPACES}£+₰
     {3 SPACES}£+₰"              :rem 193
3011 GOSUB2000:PRINT#1,"{2 SPACES}£+₰
     {3 SPACES}£+₰{3 SPACES}£+₰
     £2 +₰{2 SPACES}£+₰"      :rem 118
3012 GOSUB2000:PRINT#1,"{2 SPACES}£+₰
     {3 SPACES}£+₰{3 SPACES}£+₰ £+₰
      £+₰ £+₰"                 :rem 119
3013 GOSUB2000:PRINT#1,"£+₰ £+₰
     {3 SPACES}£5 +₰ £+₰{2 SPACES}
     £2 +₰"                     :rem 16
3014 GOSUB2000:PRINT#1,"£3 +₰{3 SPACES}
     £+₰{3 SPACES}£+₰ £+₰{3 SPACES}
     £+₰"                       :rem 31
3015 RETURN                      :rem 169
3020 GOSUB2000:PRINT#1,"£5 +₰ £5 +₰
     £4 +₰ "                    :rem 166
3021 GOSUB2000:PRINT#1,"£+₰{5 SPACES}
     £+₰{5 SPACES}£+₰{3 SPACES}£+₰"
                                :rem 43
3022 GOSUB2000:PRINT#1,"£3 +₰{3 SPACES}
     £4 +₰{2 SPACES}£4 +₰ "  :rem 182
3023 GOSUB2000:PRINT#1,"£+₰{5 SPACES}
     £+₰{5 SPACES}£+₰{3 SPACES}£+₰"
                                :rem 45
3024 GOSUB2000:PRINT#1,"£+₰{5 SPACES}
     £5 +₰ £4 +₰ "             :rem 18
3025 RETURN                      :rem 170
3030 GOSUB2000:PRINT#1,"£+₰{3 SPACES}
     £+₰{2 SPACES}£3 +₰{2 SPACES}
     £4 +₰ "                    :rem 105
3031 GOSUB2000:PRINT#1,"£2 +₰ £2 +₰
     £+₰{3 SPACES}£+₰ £+₰{3 SPACES}
     £+₰"                       :rem 196
```

```
3032 GOSUB2000:PRINT#1,"{+}  {+}  {+}
     {+}{3 SPACES}{+}  {4 +}  "    :rem 107
3033 GOSUB2000:PRINT#1,"{+}  {+}  {+}
     {5 +}  {+}{2 SPACES}{+}  "
                                   :rem 18
3034 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{3 SPACES}{+}  {+}
     {3 SPACES}{+}"                :rem 123
3035 RETURN                        :rem 171
3040 GOSUB2000:PRINT#1," {3 +}
     {2 SPACES}{4 +}{2 SPACES}{4 +}  "
                                   :rem 182
3041 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{3 SPACES}{+}  {+}
     {3 SPACES}{+}"                :rem 121
3042 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {4 +}{2 SPACES}{4 +}  "
                                   :rem 18
3043 GOSUB2000:PRINT#1,"{5 +}  {+}
     {5 SPACES}{+}{2 SPACES}{+}  "
                                   :rem 199
3044 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{5 SPACES}{+}{3 SPACES}
     {+}"                          :rem 214
3045 RETURN                        :rem 172
3050 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}{2 SPACES}{3 +}{2 SPACES}
     {+}{3 SPACES}{+}"             :rem 31
3051 GOSUB2000:PRINT#1,"{2 +}  {2 +}
     {+}{3 SPACES}{+}  {+}{3 SPACES}
     {+}"                          :rem 198
3052 GOSUB2000:PRINT#1,"{+}  {+}  {+}
     {+}{3 SPACES}{+}{2 SPACES}{+}
     {+}  "                        :rem 33
3053 GOSUB2000:PRINT#1,"{+}  {+}  {+}
     {5 +}{3 SPACES}{+}{2 SPACES}"
                                   :rem 110
3054 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{3 SPACES}{+}{3 SPACES}
     {+}{2 SPACES}"                :rem 215
3055 RETURN                        :rem 173
3060 GOSUB2000:PRINT#1," {3 +}
     {2 SPACES}{+}{3 SPACES}{+}  {+}
     {3 SPACES}{+}"                :rem 32
3061 GOSUB2000:PRINT#1,"{2 SPACES}{+}
     {3 SPACES}{+}{3 SPACES}{+}
     {2 +}{2 SPACES}{+}"           :rem 123
3062 GOSUB2000:PRINT#1,"{2 SPACES}{+}
     {3 SPACES}{+}{3 SPACES}{+}  {+}
     {+}  {+}"                     :rem 124
3063 GOSUB2000:PRINT#1,"{+}  {+}
     {3 SPACES}{+}{3 SPACES}{+}  {+}
     {2 SPACES}{2 +}"              :rem 35
3064 GOSUB2000:PRINT#1,"{3 +}{4 SPACES}
     {3 +}{2 SPACES}{+}{3 SPACES}
     {+}"                          :rem 202
3065 RETURN                        :rem 174
3070 GOSUB2000:PRINT#1," {3 +}
     {2 SPACES}{+}{3 SPACES}{+}  {+}
     {4 SPACES}"                   :rem 123
3071 GOSUB2000:PRINT#1,"{2 SPACES}{+}
     {3 SPACES}{+}{3 SPACES}{+}  {+}
     {4 SPACES}"                   :rem 48
3072 GOSUB2000:PRINT#1,"{2 SPACES}{+}
     {3 SPACES}{+}{3 SPACES}{+}  {+}
     {4 SPACES}"                   :rem 49
3073 GOSUB2000:PRINT#1,"{+}  {+}
     {3 SPACES}{+}{3 SPACES}{+}  {+}
     {4 SPACES}"                   :rem 216
3074 GOSUB2000:PRINT#1,"{3 +}{4 SPACES}
     {3 +}{2 SPACES}{5 +}"         :rem 189
3075 RETURN                        :rem 175
3080 GOSUB2000:PRINT#1," {3 +}
     {2 SPACES}{+}{3 SPACES}{+}
     {2 SPACES}{3 +}  "            :rem 200
3081 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{3 SPACES}{+}  {+}
     {4 SPACES}"                   :rem 215
3082 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{3 SPACES}{+}  {+}
     {2 SPACES}{2 +}"              :rem 36
3083 GOSUB2000:PRINT#1,"{5 +}  {+}
     {3 SPACES}{+}  {+}{3 SPACES}{+}
     "                             :rem 113
3084 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}{2 SPACES}{3 +}{3 SPACES}
     {3 +}  "                      :rem 204
3085 RETURN                        :rem 176
3090 GOSUB2000:PRINT#1," {4 +}  {5 +}
     {SPACE}{4 +}  "               :rem 7
3091 GOSUB2000:PRINT#1,"{+}{5 SPACES}
     {+}{5 SPACES}{+}{3 SPACES}{+}"
                                   :rem 50
3092 GOSUB2000:PRINT#1," {3 +}
     {2 SPACES}{4 +}{2 SPACES}{4 +}  "
                                   :rem 189
3093 GOSUB2000:PRINT#1,"{4 SPACES}{+}
     {+}{5 SPACES}{+}{4 SPACES}"
                                   :rem 142
3094 GOSUB2000:PRINT#1,"{4 +}{2 SPACES}
     {5 +}  {+}{4 SPACES}"         :rem 25
3095 RETURN                        :rem 177
3100 GOSUB2000:PRINT#1," {3 +}
     {3 SPACES}{3 +}{2 SPACES}{5 +}"
                                   :rem 179
3101 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{3 SPACES}{+}{3 SPACES}
     {+}{2 SPACES}"                :rem 208
3102 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{7 SPACES}{+}{2 SPACES}
     "                             :rem 43
3103 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{3 SPACES}{+}{3 SPACES}
     {+}{2 SPACES}"                :rem 210
3104 GOSUB2000:PRINT#1," {3 +}
     {3 SPACES}{3 +}{4 SPACES}{+}
     {2 SPACES}"                   :rem 31
3105 RETURN                        :rem 169
3110 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}{2 SPACES}{3 +}{2 SPACES}
     {+}{3 SPACES}{+}"             :rem 28
3111 GOSUB2000:PRINT#1,"{2 +}{2 SPACES}
     {+}  {+}{3 SPACES}{+}  {+}
     {3 SPACES}{+}"                :rem 29
3112 GOSUB2000:PRINT#1,"{+}  {+}  {+}
     {+}{3 SPACES}{+}  {+}
     {3 SPACES}{+}"                :rem 30
3113 GOSUB2000:PRINT#1,"{+}{2 SPACES}
     {2 +}  {+}{3 SPACES}{+}
     {2 SPACES}{+}  {+}  "         :rem 31
3114 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}{2 SPACES}{3 +}{4 SPACES}
     {+}{2 SPACES}"                :rem 122
3115 RETURN                        :rem 170
3120 GOSUB2000:PRINT#1,"{4 +}{2 SPACES}
     {5 +}{2 SPACES}{3 +}  "       :rem 91
3121 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{5 SPACES}{+}{3 SPACES}
     {+}"                          :rem 210
3122 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {4 +}{2 SPACES}{+}
     {4 SPACES}"                   :rem 31
3123 GOSUB2000:PRINT#1,"{+}{3 SPACES}
     {+}  {+}{5 SPACES}{+}{3 SPACES}
     {+}"                          :rem 212
3124 GOSUB2000:PRINT#1,"{4 +}{2 SPACES}
```

```
    §5 +∃{2 SPACES}§3 +∃ "    :rem 95
3125 RETURN                          :rem 171
3200 I1=INT(Y/1000):J1=Y-I1*1000:I2=INT(J
     1/100):J2=J1-I2*100:I3=INT(J2/10)
                                     :rem 83
3210 I4=J2-I3*10                     :rem 48
3211 IFI2=0THENI2=10                 :rem 134
3212 IFI3=0THENI3=10                 :rem 137
3213 IFI4=0THENI4=10                 :rem 140
3214 GOSUB2000:X=I1:GOSUB6000:GOSUB2000:X
     =I2:GOSUB6000:GOSUB2000:X=I3:GOSUB60
     00                              :rem 98
3215 GOSUB2000:X=I4:FL=1:GOSUB6000:rem 19
3314 GOSUB2000:X=I1:GOSUB7000:GOSUB2000:X
     =I2:GOSUB7000:GOSUB2000:X=I3:GOSUB70
     00                              :rem 102
3315 GOSUB2000:X=I4:FL=1:GOSUB7000:rem 21
3414 GOSUB2000:X=I1:GOSUB8000:GOSUB2000:X
     =I2:GOSUB8000:GOSUB2000:X=I3:GOSUB80
     00                              :rem 106
3415 GOSUB2000:X=I4:FL=1:GOSUB8000:rem 23
3514 GOSUB2000:X=I1:GOSUB9000:GOSUB2000:X
     =I2:GOSUB9000:GOSUB2000:X=I3:GOSUB90
     00                              :rem 110
3515 GOSUB2000:X=I4:FL=1:GOSUB9000:rem 25
3614 GOSUB2000:X=I1:GOSUB10000:GOSUB2000:
     X=I2:GOSUB10000:GOSUB2000:X=I3
                                     :rem 60
3615 GOSUB10000:GOSUB2000:X=I4:FL=1:GOSUB
     10000:RETURN                    :rem 7
4000 PRINT"{CLR}{DOWN}{2 SPACES}THIS IS A
      PROGRAM":PRINT"{5 RIGHT}TO PRINT A"
                                     :rem 115
4020 PRINT"{2 SPACES}{PUR}MONTHLY CALENDA
     R{BLU}":PRINT"{3 RIGHT}ON THE PRINTE
     R"                              :rem 187
4030 PRINT"{DOWN}{2 RIGHT}PLEASE TYPE IN
     {SPACE}THE":PRINT"{3 RIGHT}{RED}MONT
     H{BLU} AND {RED}YEAR{BLU}"      :rem 185
4035 PRINT" THAT YOU WISH TO SEE":PRINT"
     {2 SPACES}(EXAMPLE: {RED}12,1983
     {BLU}){PUR}{DOWN}":PRINTTAB(5);
                                     :rem 211
4060 INPUTM0,Y                       :rem 92
4080 PRINT"{2 DOWN}{2 SPACES}{BLU}THANK Y
     OU! NOW--":PRINT" PLEASE {PUR}TURN O
     N{BLU} THE"                     :rem 7
4085 PRINT"PRINTER AND THEN TYPE":PRINTTA
     B(8)"{PUR}OK{DOWN}":INPUTR$     :rem 252
4110 IFR$<>"OK"THEN4080              :rem 30
4130 PRINT"{BLU}PRINTING{DOWN}":FORI=1TO8
     00:NEXT:RETURN                  :rem 218
4999 PRINT#1,CHR$(15)" "             :rem 232
5000 GOSUB1620                       :rem 14
5001 CLOSE1:END                      :rem 126
6000 ONXGOSUB2011,2021,2031,2041,2051,206
     1,2071,2081,2091,2001           :rem 146
6010 IFFL<>1THENPRINT#1," ";:RETURN
                                     :rem 104
6020 PRINT#1,"":FL=0:RETURN          :rem 108
7000 ONXGOSUB2012,2022,2032,2042,2052,206
     2,2072,2082,2092,2002           :rem 157
7010 IFFL<>1THENPRINT#1," ";:RETURN
                                     :rem 105
7020 PRINT#1,"":FL=0:RETURN          :rem 109
8000 ONXGOSUB2013,2023,2033,2043,2053,206
     3,2073,2083,2093,2003           :rem 168
8010 IFFL<>1THENPRINT#1," ";:RETURN
                                     :rem 106
8020 PRINT#1,"":FL=0:RETURN          :rem 110
9000 ONXGOSUB2014,2024,2034,2044,2054,206
     4,2074,2084,2094,2004           :rem 179
9010 IFFL<>1THENPRINT#1," ";:RETURN
                                     :rem 107
9020 PRINT#1,"":FL=0:RETURN          :rem 111
10000 ONXGOSUB2015,2025,2035,2045,2055,20
      65,2075,2085,2095,2005         :rem 229
10010 IFFL<>1THENPRINT#1," ";:RETURN
                                     :rem 147
10020 PRINT#1,"":FL=0:RETURN         :rem 151
11000 ONXGOSUB2000,2111,2021,2031:PRINT#1
      ," ";                          :rem 195
11010 ONX1GOSUB2000,2001,2011,2021,2031,2
      041,2051,2061,2071,2081,2091
                                     :rem 222
11020 IFFL<>1THENPRINT#1,"{2 SPACES}";:RE
      TURN                           :rem 149
11030 FL=0:PRINT#1,"":RETURN         :rem 153
12000 ONXGOSUB2000,2112,2022,2032:PRINT#1
      ," ";                          :rem 199
12010 ONX1GOSUB2000,2002,2012,2022,2032,2
      042,2052,2062,2072,2082,2092
                                     :rem 233
12020 IFFL<>1THENPRINT#1,"{2 SPACES}";:RE
      TURN                           :rem 150
12030 FL=0:PRINT#1,"":RETURN         :rem 154
13000 ONXGOSUB2000,2113,2023,2033:PRINT#1
      ," ";                          :rem 203
13010 ONX1GOSUB2000,2003,2013,2023,2033,2
      043,2053,2063,2073,2083,2093
                                     :rem 244
13020 IFFL<>1THENPRINT#1,"{2 SPACES}";:RE
      TURN                           :rem 151
13030 FL=0:PRINT#1,"":RETURN         :rem 155
14000 ONXGOSUB2000,2114,2024,2034:PRINT#1
      ," ";                          :rem 207
14010 ONX1GOSUB2000,2004,2014,2024,2034,2
      044,2054,2064,2074,2084,2094
                                     :rem 255
14020 IFFL<>1THENPRINT#1,"{2 SPACES}";:RE
      TURN                           :rem 152
14030 FL=0:PRINT#1,"":RETURN         :rem 156
15000 ONXGOSUB2000,2115,2025,2035:PRINT#1
      ," ";                          :rem 211
15010 ONX1GOSUB2000,2005,2015,2025,2035,2
      045,2055,2065,2075,2085,2095:rem 10
15020 IFFL<>1THENPRINT#1,"{2 SPACES}";:RE
      TURN                           :rem 153
15030 FL=0:PRINT#1,"":RETURN         :rem 157
```

Program 3:

Monthly Appointment Calendar For Printer

```
80 DIMM$(12),W$(7):FORI=1TO12:READM$(I):N
   EXTI:FORI=1TO7:READW$(I):NEXTI:rem 118
90 SYS65517:A=PEEK(781):IFA=40THENPOKE532
   81,1                              :rem 167
100 PRINT"{CLR}{DOWN}{2 SPACES}THIS IS A
    {SPACE}PROGRAM":PRINT"{6 RIGHT}TO SHO
    W A"                             :rem 17
105 PRINT"{2 RIGHT}{PUR}MONTHLY CALENDAR
    {BLU}":PRINT"{3 RIGHT}ON THE PRINTER
    {DOWN}"                          :rem 214
110 PRINT"{RIGHT}PLEASE TYPE IN THE":PRIN
    T"{3 RIGHT}{RED}MONTH{BLU} AND {RED}Y
    EAR{BLU}"                        :rem 86
111 PRINT"THAT YOU WISH TO SEE":PRINT"
    {RIGHT}(EXAMPLE: {RED}12,1983{BLU})
    {PUR}{2 DOWN}"                   :rem 105
120 PRINTTAB(5);:INPUTM0,Y           :rem 132
130 PRINT"{2 DOWN}{2 SPACES}{BLU}THANK YO
    U! NOW--":PRINT" PLEASE {PUR}TURN ON
    {BLU} THE"                       :rem 207
```

```
131 PRINT"PRINTER AND THEN TYPE":PRINTTAB
    (9)"{PUR}OK{DOWN}":INPUTR$    :rem 193
151 IFR$<>"OK"THEN130             :rem 183
154 PRINT"{BLU}PRINTING{DOWN}":FORI=1TO80
    0:NEXT:GOSUB1292:OPEN1,4      :rem 23
202 PRINT#1,CHR$(14)"{3 SPACES}";M$(M0);"
     ";Y:GOSUB1600:GOSUB1700:FORD=1TOE1:J
    1=J1+1                        :rem 225
210 GOSUB1050:IFD<10THENG$=" "    :rem 158
213 IFD>=10THENG$=""              :rem 96
214 IFD1=1THENPRINT#1,CHR$(15)"{3 SPACES}
    "W$(D1);CHR$(14)G$;"{RVS}"D"{OFF}";CH
    R$(15)"(";J1;")"              :rem 71
215 IFD1=1THENGOSUB1600           :rem 128
217 IFD1=1THENGOTO220              :rem 8
219 PRINT#1,CHR$(15)"{3 SPACES}"W$(D1);CH
    R$(14)G$;D;CHR$(15)"(";J1;")":GOSUB16
    00                             :rem 0
220 NEXTD                         :rem 23
1000 CLOSE1:END                   :rem 121
1050 IFM0=1THENM0=13:Y=Y-1:GOTO1080
                                  :rem 80
1060 IFM0=2THENM0=14:Y=Y-1        :rem 23
1080 M=M0-2                       :rem 47
1100 D1=INT(2.6*M-0.2)+D+Y-1900+INT((Y-19
    00)/4)                        :rem 207
1150 D1=D1+INT(19/4)-2*19         :rem 21
1200 D1=D1-INT(D1/7)*7+1          :rem 235
1210 IFM0=4ORM0=9THEND1=D1+1      :rem 135
1230 IFM0=13THENM0=1:Y=Y+1:GOTO1245
                                  :rem 81
1240 IFM0=14THENM0=2:Y=Y+1:D1=D1+1
                                  :rem 210
1244 IFD1=8THEND1=1               :rem 86
1245 IF(Y=2100ANDM0>=3)OR(Y>2100)THEND1=D
    1-1:IFD1=0THEND1=7            :rem 198
1247 IF(Y=2200ANDM0>=3)OR(Y>2200)THEND1=D
    1-1:IFD1=0THEND1=7            :rem 202
1249 IF(Y=2300ANDM0>=3)OR(Y>2300)THEND1=D
    1-1:IFD1=0THEND1=7            :rem 206
1250 RETURN                       :rem 168
1292 IFM0=1ORM0=3ORM0=5ORM0=7ORM0=8ORM0=1
    0ORM0=12THENE1=31              :rem 75
1293 IFM0=4ORM0=6ORM0=9ORM0=11THENE1=30
                                  :rem 115
1294 IFM0=2ANDY/4<>INT(Y/4)THENE1=28
                                  :rem 152
1295 IFM0=2ANDY/4=INT(Y/4)THENGOSUB1400
                                  :rem 132
1296 RETURN                       :rem 178
1400 IF(Y/100=INT(Y/100))AND(Y/400<>INT(Y
    /400))THENE1=28:GOTO1410      :rem 231
1405 E1=29                        :rem 232
1410 RETURN                       :rem 166
1600 FORI=1TO20:PRINT#1,CHR$(15)" ";:NEXT
    I                             :rem 170
1605 FORK=1TO18:PRINT#1,".";" ";" ";:NEXT
    K:PRINT#1,"."                 :rem 231
1610 RETURN                       :rem 168
1700 IFM0=1THENJ1=0                :rem 89
1702 IFM0=2THENJ1=31              :rem 144
1704 IFM0=3THENJ1=59              :rem 157
1706 IFM0=4THENJ1=90              :rem 155
1707 IFM0=5THENJ1=120             :rem 199
1709 IFM0=6THENJ1=151             :rem 206
1711 IFM0=7THENJ1=181             :rem 203
1713 IFM0=8THENJ1=212             :rem 201
1715 IFM0=9THENJ1=243             :rem 208
1717 IFM0=10THENJ1=273            :rem 253
1719 IFM0=11THENJ1=304            :rem 251
1721 IFM0=12THENJ1=334            :rem 248
1723 IFY/4<>INT(Y/4)THENGOTO1730  :rem 189
1725 IF(Y/100=INT(Y/100))AND(Y/400<>INT(Y
    /400))THENGOTO1730            :rem 159
1727 IF(Y/4=INT(Y/4))AND(M0>=3)THENJ1=J1+
    1                             :rem 175
1730 RETURN                       :rem 171
2000 DATA "{2 SPACES}JANUARY"," FEBRUARY"
    ,"{4 SPACES}MARCH","{4 SPACES}APRIL"
    ,"{6 SPACES}MAY"              :rem 36
2010 DATA "{5 SPACES}JUNE","{5 SPACES}JUL
    Y","{3 SPACES}AUGUST","SEPTEMBER","
    {2 SPACES}OCTOBER"            :rem 229
2020 DATA " NOVEMBER"," DECEMBER" :rem 39
2030 DATA "{4 SPACES}{RVS}SUNDAY{OFF}","
    {4 SPACES}MONDAY","{3 SPACES}TUESDAY
    "," WEDNESDAY","{2 SPACES}THURSDAY"
                                  :rem 90
2040 DATA "{4 SPACES}FRIDAY","{2 SPACES}S
    ATURDAY"                      :rem 192
```

Program 4:

Yearly Calendar For Printer

```
3 SYS65517:A=PEEK(781):IFA=40THENPOKE5328
  1,1                             :rem 113
5 OPEN1,4:DIMW4(3):GOSUB1510:I=1:J=2
                                  :rem 128
7 PRINT#1,CHR$(14)SPC(13)"HAPPY NEW YEAR
  {SPACE}";Y:PRINT#1              :rem 38
10 PRINT#1,CHR$(14)SPC(8)"JANUARY"SPC(13)
   "FEBRUARY"                     :rem 49
12 GOSUB1009:GOSUB1000:GOSUB1012:C0=6:GOS
   UB1019:GOSUB1000:GOSUB1022     :rem 69
15 M0=I:M8=1:GOSUB292:GOSUB20:GOTO35
                                  :rem 228
20 D=1:GOSUB1050:W2=8-D1:W4(M8)=W2+1:GOSU
   B321                           :rem 123
22 IFD1=7THENGOTO30               :rem 167
25 FORD=2TOW2:GOSUB1050:GOSUB331:NEXTD
                                  :rem 187
30 RETURN                          :rem 67
35 GOSUB990:M0=J:M8=2:GOSUB292:GOSUB20
                                  :rem 105
44 W3=1                            :rem 96
45 M0=I:M8=1:GOSUB292:GOSUB200     :rem 60
46 IFW4(2)=9THENPRINT#1,CHR$(15)SPC(1);
                                  :rem 20
50 GOSUB991:M0=J:M8=2:GOSUB292:GOSUB200
                                  :rem 151
56 IFW3=1ANDW4(1)>9THENPRINT#1,CHR$(15)SP
   C(0);                          :rem 223
57 IFW3=1ANDW4(1)<10THENPRINT#1,CHR$(15)S
   PC(1);                          :rem 7
58 IFW3=4ANDW4(2)>30THENPRINT#1,CHR$(15)S
   PC(0);                         :rem 15
65 W3=W3+1                        :rem 24
70 IFW3<C0THENGOTO45               :rem 0
71 PRINT#1," "                    :rem 185
72 IFI=1THENGOTO86                :rem 133
73 IFI=3THENGOTO96                :rem 137
74 IFI=5THENGOTO106               :rem 180
75 IFI=7THENGOTO116               :rem 184
76 IFI=9THENGOTO126               :rem 188
77 IFI=11THENGOTO199              :rem 240
86 PRINT#1,CHR$(14)SPC(9)"MARCH"SPC(16)"A
   PRIL"                          :rem 171
88 I=3:J=4:GOTO12                 :rem 244
96 PRINT#1,CHR$(14)SPC(10)"MAY"SPC(17)"JU
   NE"                            :rem 11
98 I=5:J=6:GOTO12                 :rem 249
106 PRINT#1,CHR$(14)SPC(9)"JULY"SPC(16)"A
    UGUST"                        :rem 14
108 I=7:J=8:GOTO12                 :rem 37
116 PRINT#1,CHR$(14)SPC(7)"SEPTEMBER"SPC(
    13)"OCTOBER"                  :rem 162
118 I=9:J=10:GOTO12                :rem 81
```

```
126 PRINT#1,CHR$(14)SPC(7)"NOVEMBER"SPC(1
    3)"DECEMBER"                    :rem 131
128 I=11:J=12:GOTO12                :rem 125
199 PRINT#1,CHR$(15)SPC(1):CLOSE1:END
                                    :rem 194
200 D4=W4(M8):D7=W4(M8)+6           :rem 92
205 D=D4:GOSUB1050                  :rem 16
210 IFD1<>1THENPRINT"WHY D1=";D1    :rem 156
212 IFM8=1AND(D+1)<10THENGOSUB528:rem 198
213 IFM8=1AND(D+1)>9THENGOSUB530    :rem 154
214 IFM8=2AND(D+1)<10THENGOSUB428:rem 200
215 IFM8=2ANDD4>=30ANDD4<=E1THENGOSUB433:
    GOTO217                         :rem 212
216 IFM8=2AND(D+1)>9THENGOSUB430    :rem 157
217 FORD=D4+1TOD7:GOSUB1050:GOSUB331:NEXT
    D                               :rem 130
220 W4(M8)=D7+1                      :rem 9
225 RETURN                          :rem 121
292 IFM0=1ORM0=3ORM0=5ORM0=7ORM0=8ORM0=10
    ORM0=12THENE1=31                 :rem 26
293 IFM0=4ORM0=6ORM0=9ORM0=11THENE1=30
                                    :rem 66
294 IFM0=2ANDY/4<>INT(Y/4)THENE1=28
                                    :rem 103
295 IFM0=2ANDY/4=INT(Y/4)THENGOSUB1400
                                    :rem 83
296 RETURN                          :rem 129
321 IFD1=7THENPRINT#1,CHR$(15)SPC(36);D;:
    GOTO330                         :rem 101
322 IFD1=6THENPRINT#1,CHR$(15)SPC(31);D;:
    GOTO330                          :rem 96
323 IFD1=5THENPRINT#1,CHR$(15)SPC(26);D;:
    GOTO330                         :rem 100
324 IFD1=4THENPRINT#1,CHR$(15)SPC(21);D;:
    GOTO330                          :rem 95
325 IFD1=3THENPRINT#1,CHR$(15)SPC(16);D;:
    GOTO330                          :rem 99
326 IFD1=2THENPRINT#1,CHR$(15)SPC(11);D;:
    GOTO330                          :rem 94
327 IFD1=1THENPRINT#1,CHR$(15)SPC(6);D;:G
    OTO330                           :rem 50
328 PRINT#1,CHR$(15)SPC(3);D;:GOTO330
                                    :rem 143
329 PRINT#1,CHR$(15)SPC(2);D;       :rem 134
330 RETURN                          :rem 118
331 IFD>E1THENPRINT#1,CHR$(15)SPC(5);:GOT
    O350                            :rem 196
332 IFD1=1ANDD<=9THENPRINT#1,D;:GOTO350
                                    :rem 153
333 IFD1=1ANDD>9THENPRINT#1,D;:GOTO350
                                     :rem 95
335 IFD<=9THENPRINT#1,CHR$(15)SPC(2);D;:G
    OTO350                           :rem 66
336 PRINT#1,CHR$(15)SPC(1);D;       :rem 131
350 RETURN                          :rem 120
428 IFD>E1THENPRINT#1,CHR$(15)SPC(9);:GOT
    O435                            :rem 211
429 GOTO328                         :rem 117
430 IFD>E1THENPRINT#1,CHR$(15)SPC(9);:GOT
    O435                            :rem 204
431 GOTO329                         :rem 111
433 PRINT#1,CHR$(15)SPC(1);D;       :rem 129
435 RETURN                          :rem 124
528 IFD>E1THENPRINT#1,CHR$(15)SPC(9);:GOT
    O535                            :rem 213
529 GOTO532                         :rem 115
530 IFD>E1THENPRINT#1,CHR$(15)SPC(9);:GOT
    O535                            :rem 206
531 GOTO533                         :rem 109
532 PRINT#1,CHR$(15)SPC(5);D;:GOTO535
                                    :rem 149
533 PRINT#1,CHR$(15)SPC(4);D;       :rem 133
535 RETURN                          :rem 125
990 PRINT#1,CHR$(15)SPC(3);:GOTO992
                                     :rem 35
991 PRINT#1,CHR$(15)SPC(6);          :rem 16
992 RETURN                          :rem 132
1000 PRINT#1,CHR$(15)SPC(7);         :rem 47
1001 RETURN                         :rem 162
1009 PRINT#1,CHR$(15)SPC(3);         :rem 52
1010 PRINT#1,"{4 SPACES}S{4 SPACES}M
     {4 SPACES}T{4 SPACES}W{4 SPACES}T
     {4 SPACES}F{4 SPACES}S";       :rem 134
1011 RETURN                         :rem 163
1012 PRINT#1,"{4 SPACES}S{4 SPACES}M
     {4 SPACES}T{4 SPACES}W{4 SPACES}T
     {4 SPACES}F{4 SPACES}S"        :rem 77
1013 RETURN                         :rem 165
1019 PRINT#1,CHR$(15)SPC(3);         :rem 53
1020 PRINT#1,"{4 SPACES}£T3{4 SPACES}
     £T3{4 SPACES}£T3{4 SPACES}£T3
     {4 SPACES}£T3{4 SPACES}£T3
     {4 SPACES}£T3";              :rem 196
1021 RETURN                          :rem 164
1022 PRINT#1,"{4 SPACES}£T3{4 SPACES}
     £T3{4 SPACES}£T3{4 SPACES}£T3
     {4 SPACES}£T3{4 SPACES}£T3
     {4 SPACES}£T3"               :rem 139
1023 RETURN                          :rem 166
1050 IFM0=1THENM0=13:Y=Y-1:GOTO1080
                                     :rem 80
1060 IFM0=2THENM0=14:Y=Y-1           :rem 23
1080 M=M0-2                          :rem 47
1100 D1=INT(2.6*M-0.2)+D+Y-1900+INT((Y-19
     00)/4)                         :rem 207
1150 D1=D1+INT(19/4)-2*19            :rem 21
1200 D1=D1-INT(D1/7)*7+1            :rem 235
1210 IFM0=4ORM0=9THEND1=D1+1        :rem 135
1230 IFM0=13THENM0=1:Y=Y+1:GOTO1250
                                     :rem 77
1240 IFM0=14THENM0=2:Y=Y+1:D1=D1+1
                                    :rem 210
1244 IFD1=8THEND1=1                  :rem 86
1245 IF(Y=2100ANDM0>3)OR(Y>2100)THEND1=D1
     -1:IFD1=0THEND1=7              :rem 137
1247 IF(Y=2200ANDM0>3)OR(Y>2200)THEND1=D1
     -1:IF{K}{RVS}=0THEND1=7         :rem 53
1249 IF(Y=2300ANDM0>3)OR(Y>2300)THEND1=D1
     -1:IFD1=0THEND1=7              :rem 145
1250 RETURN                         :rem 168
1400 IF(Y/100=INT(Y/100))AND(Y/400<>INT(Y
     /400))THENE1=28:GOTO1410       :rem 231
1405 E1=29                          :rem 232
1410 RETURN                         :rem 166
1510 PRINT"{CLR}{DOWN}{2 RIGHT}THIS IS A
     {SPACE}PROGRAM":PRINT"{6 RIGHT}TO SH
     OW A"                          :rem 129
1520 PRINT"{3 RIGHT}{PUR}YEARLY CALENDAR
     {BLU}":PRINT"{3 RIGHT}ON THE PRINTER
     {DOWN}"                        :rem 208
1530 PRINT"{RIGHT}PLEASE TYPE IN THE":PRI
     NT"{3 RIGHT}YEAR THAT YOU":PRINT"
     {4 RIGHT}WISH TO SEE"           :rem 38
1535 PRINT"{3 RIGHT}(EXAMPLE:{PUR}1984
     {BLU}){2 DOWN}":PRINTTAB(6);:INPUTY
                                    :rem 195
1570 PRINT"{DOWN}{3 RIGHT}THANK YOU! NOW-
     -":PRINT"{RIGHT}PLEASE TURN ON THE"
                                    :rem 145
1573 PRINT"PRINTER AND THEN TYPE"   :rem 9
1575 PRINTTAB(8)"{PUR}OK{BLU}{DOWN}"
                                    :rem 105
1580 INPUTR$                        :rem 212
1585 IFR$<>"OK"THEN1570              :rem 44
1590 PRINT"PRINTING{DOWN}":FORI=1TO800:NE
     XT:RETURN                      :rem 194
```

Bingo 64

(Article on page 54.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
150 POKE53281,1:POKE 53280,1      :rem 237
160 SS=54272:V=53248:D0=56323:D1=56320:D2
    =56321:POKE V+21,0            :rem 194
170 PRINT CHR$(147),CHR$(17),CHR$(17)
                                  :rem 223
180 PRINTSPC(14);CHR$(18);CHR$(31);"MODES
     OF PLAY":PRINT               :rem 50
190 PRINTSPC(14);CHR$(28);"**************"
    :PRINT                        :rem 34
200 PRINTSPC(4);CHR$(144);"1- AUTO BALL F
    EED{3 SPACES}- AUTO COVER"    :rem 218
210 PRINTSPC(4);"2- MANUAL BALL FEED - AU
    TO COVER"                     :rem 59
220 PRINTSPC(4);"3- MANUAL BALL FEED - MA
    NUAL COVER"                   :rem 194
230 PRINTSPC(4);"4- AUTO BALL FEED
    {3 SPACES}- MANUAL COVER"     :rem 63
240 PRINT:PRINT"{5 SPACES}ENTER MODE SELE
    CTED:"                        :rem 84
250 GET A$:IF A$=""THEN 250       :rem 81
260 AU=VAL(A$)-1:IF AU<0 OR AU>3 THEN 170
                                  :rem 156
270 M1$="-CHIME RINGS FOR NUMBER ON CARD"
                                  :rem 57
280 M2$="-GONG RINGS FOR NUMBER ON NO CAR
    D"                            :rem 157
290 M3$="-HIT ANY KEY FOR BALL FEED"
                                  :rem 185
300 M4$="-USE JOYSTICK (PORT 2)-FIRE TO C
    OVER"                         :rem 128
310 PRINTCHR$(147),CHR$(17),CHR$(17)
                                  :rem 219
320 PRINT SPC(2);M1$:PRINT SPC(2);M2$
                                  :rem 118
330 IF AU=1 OR AU=2 THEN PRINT SPC(2);M3$
                                  :rem 211
340 IF AU=2 OR AU=3 THEN PRINT SPC(2);M4$
                                  :rem 215
350 PRINT:PRINT SPC(10);"HIT ANY KEY TO S
    TART"                         :rem 234
360 GET A$:IF A$=""THEN 360       :rem 85
370 PRINT CHR$(147)               :rem 21
380 REM*** READ THE ML CODE TO SET A BLOC
    K OF MEMORY ***               :rem 213
390 FOR I=0TO11:READ X%:POKE 28672+I,X%:N
    EXTI                          :rem 98
400 REM*** SET THE COLOR MEMORY TO BLACK
    {SPACE}***                    :rem 153
410 FOR I=0TO3:HB=216+I           :rem 22
420 POKE 251,0:POKE252,HB:POKE253,0:POKE2
    54,0:SYS 28672:NEXT           :rem 235
430 DIM SD(4,62),CO(5),X(5),Y(5),FL(21),F
    H(21),DU(21),C(3,4,4),N(4,14) :rem 22
440 CO(0)=0:CO(1)=14:CO(2)=4:CO(3)=2:CO(4
    )=7:CO(5)=0                   :rem 11
450 L(0)=130:L(1)=137:L(2)=142:L(3)=135:L
    (4)=143                       :rem 180
460 S(0)=1104:S(1)=1127:S(2)=1624:S(3)=16
    47                            :rem 194
470 F(0)=1271+SS:F(1)=1294+SS:F(2)=1791+S
    S:F(3)=1814+SS                :rem 222
480 GOSUB 640:REM*** MAKE THE BOX ***
                                  :rem 184
490 GOSUB 1470:REM*** MAKE BINGO SPRITES
    {SPACE}***                    :rem 186
500 REM*** BLANK OUT THE FREE-BOXES ***
                                  :rem 134
510 FORI=0TO3:POKE F(I),1:POKEF(I)+1,1:NE
    XT                            :rem 42
520 GOSUB 840:REM*** CHOOSE THE NUMBERS F
    OR THE CARDS ***              :rem 192
530 REM*** PUT RED COVER-TOKEN ON FREE-BO
    XES ***                       :rem 230
540 FOR I=0TO3:POKEF(I)-SS,160:POKEF(I)+1
    -SS,160:POKEF(I),8:POKEF(I)+1,8:NEXT
                                  :rem 85
550 FORCD=0TO3:C(CD,2,2)=0:NEXT:REM SET C
    ENTER BOX TO ILLEGAL VALUE (FREE BOX)
                                  :rem 108
560 REM*** DRAW THE PASS LINE ***:rem 233
570 FORLI=0TO6:POKE(1520+LI),64:NEXT LI
                                  :rem 68
580 REM*** START OF PLAY ***      :rem 214
590 GOSUB 1100:REM*** GET THE NEXT NUMBER
     ***                          :rem 195
600 GOSUB 1170:REM*** CHECK THE CARDS FOR
     A MATCH ***                  :rem 58
610 IF AU=0 OR AU=3 THEN 590:REM*** CHECK
     FOR AUTO BALL-FEED ***       :rem 145
620 GET A$:IF A$=""THEN 620 :REM*** WAIT
    {SPACE}FOR NEXT BALL ***      :rem 227
630 GOTO 590                      :rem 112
640 REM *** BOX MAKER ***         :rem 211
650 T0$=" B{2 SPACES}I{2 SPACES}N
    {2 SPACES}G{SHIFT-SPACE} O " :rem 211
660 A1=176:A2=96:A3=178:A4=174:GOSUB710:T
    1$=A$                         :rem 44
670 A1=98:A2=32:A3=98:A4=98:GOSUB710:T2$=
    A$                            :rem 157
680 A1=171:A2=96:A3=123:A4=179:GOSUB710:T
    3$=A$                         :rem 38
690 A1=173:A2=96:A3=177:A4=189:GOSUB710:T
    4$=A$                         :rem 52
700 GOTO750                       :rem 108
710 A$=CHR$(A2)+CHR$(A3)+CHR$(A2):rem 224
720 A$=CHR$(A1)+CHR$(A2)+A$+A$+A$+A$+CHR$
    (A2)+CHR$(A4)                 :rem 17
730 A$=A$+"{7 SPACES}"+A$         :rem 160
740 RETURN                        :rem 123
750 PRINT CHR$(18)CHR$(31)T0$CHR$(146)SPC
    (8)CHR$(18)CHR$(31)T0$CHR$(146)
                                  :rem 164
760 PRINT CHR$(144);T1$           :rem 249
770 FOR I=1TO4:PRINTT2$:PRINTT3$:NEXT
                                  :rem 111
780 PRINTT2$:PRINTT4$:PRINT       :rem 16
790 PRINT CHR$(18)CHR$(31)T0$CHR$(146)SPC
    (8)CHR$(18)CHR$(31)T0$CHR$(146)
                                  :rem 168
800 PRINT CHR$(144);T1$           :rem 244
810 FOR I=1TO4:PRINTT2$:PRINTT3$:NEXT
                                  :rem 106
820 PRINTT2$:PRINTT4$;            :rem 127
830 RETURN                        :rem 123
840 REM*** CHOOSE THE CARD NUMBERS ***
                                  :rem 84
850 REM*** FIRST ZERO THE CALLED NUMBER A
    RRAY ***                      :rem 19
860 FOR CL=0TO4:FORNN=0TO14:N(CL,NN)=0:NE
    XT:NEXT                       :rem 25
```

```
870 CD=0{2 SPACES}:REM*** CARD LOOP ***
                                    :rem 1
880 CL=0{2 SPACES}:REM*** COLUMN LOOP ***
                                   :rem 190
890 FOR I=0TO4:C(CD,CL,I)=0:NEXT:REM*** Z
    ERO COL OF NUMBERS ON CARD ***:rem 32
900 RN=0{2 SPACES}:REM*** ROW LOOP ***
                                   :rem 242
910 Z=INT(RND(0)*15)+1+15*CL        :rem 8
920 REM*** TEST FOR THE NUMBER IN USE ***
                                   :rem 208
930 J=0                             :rem 83
940 IF C(CD,CL,J)=Z THEN 910 :REM*** NUMB
    ER HAS BEEN USED ***           :rem 226
950 IF J<RN THEN J=J+1:GOTO 940    :rem 191
960 C(CD,CL,RN)=Z                  :rem 216
970 REM*** PRINT NUMBER IN THE BOX ***
                                    :rem 55
980 N$=STR$(Z)                      :rem 24
990 LN=LEN(N$)                      :rem 27
1000 FORQ=1TOLN-1                    :rem 2
1010 SN=S(CD)+CL*3+RN*80+Q+(3-LN) :rem 49
1020 PN=ASC(MID$(N$,Q+1,1))        :rem 189
1030 POKE SN,PN                     :rem 94
1040 NEXTQ                          :rem 85
1050 IF RN<4 THEN RN=RN+1:GOTO 910
                                   :rem 122
1060 IF CL<4 THEN CL=CL+1:GOTO 890:rem 79
1070 IF CD<3 THEN CD=CD+1:GOTO 880:rem 54
1080 RETURN                        :rem 169
1090 REM *** SELECT THE NEXT BALL NUMBER*
     **                            :rem 110
1100 GOSUB 1730 :REM*** FIRST CHOOSE THE
    {SPACE}LETTER ***              :rem 33
1110 REM*** NEXT THE NUMBER ***    :rem 140
1120 NU=INT(RND(0)*15):NM=NU+1+NC*15
                                    :rem 50
1130 REM*** HAS IT ALREADY BEEN USED? ***
                                   :rem 170
1140 IF N(NC,NU)=1 THEN 1110:REM*** YES-G
    ET ANOTHER ***                 :rem 221
1150 N(NC,NU)=1                     :rem 52
1160 RETURN                        :rem 168
1170 REM*** PRINT THE NUMBER ON THE BIG B
    ALL ***                         :rem 75
1180 N1=INT(NM/10):N2=NM-N1*10     :rem 182
1190 IF N1=0THEN N1=-16            :rem 197
1200 POKE 1282,L(NC):POKE1283,N1+176:POKE
    1284,N2+176                    :rem 113
1210 POKEV+44,CO(NC)               :rem 124
1220 REM*** CHECK FOR NUMBER ON THE CARDS
     ***                           :rem 158
1230 NN=0                          :rem 207
1240 BO=0                          :rem 197
1250 CD=0{4 SPACES}:REM *** CARD LOOP ***
                                    :rem 42
1260 CR=0{4 SPACES}:REM *** ROW LOOP ***
                                   :rem 23
1270 IF C(CD,NC,CR)<>NM THEN 1390  :rem 3
1280 IF AU>1 THEN{2 SPACES}2270    :rem 89
1290 NN=1 :REM*** FOUND A MATCH ***
                                   :rem 26
1300 REM*** PUT THE RED COVER-TOKEN ON TH
    E NUMBER ***                   :rem 205
1310 P1=S(CD)+CR*80+NC*3+1         :rem 117
1320 POKE P1+SS,8                  :rem 171
1330 POKE P1+1+SS,8                  :rem 8
1340 POKE P1+1,N2+176               :rem 73
1350 POKE P1,N1+176                :rem 237
1360 GOSUB 1890 :REM*** RING THE CHIME **
     *                             :rem 173
1370 GOSUB 2000:REM*** CHECK FOR A WINNER
     ***                           :rem 128
1380 GOTO1400                      :rem 202
1390 IF CR<4 THEN CR=CR+1:GOTO1270
                                   :rem 144
1400 IF CD<3 THEN CD=CD+1:GOTO1260:rem 92
1410 IF NN=0THEN GOSUB 1950:REM*** NO MAT
    CH-SOUND THE GONG ***          :rem 194
1420 Y(NC)=230                     :rem 212
1430 POKE V+1+NC*2,Y(NC):REM SET INIT Y
                                   :rem 191
1440 IF BO=0 THEN RETURN:REM*** NO WINNER
    - GET NEXT BALL ***            :rem 86
1450 GET A$:IF A$=""THEN 1450:REM*** WINN
    ER-WAIT FOR A RESTART ***      :rem 83
1460 POKE V+21,0:RESTORE:CLR:GOTO150
                                   :rem 188
1470 REM*** MAKE THE BINGO SPRITES ***
                                    :rem 68
1480 REM*** ZERO THE SPRITES MEMORY ***
                                   :rem 209
1490 FORI=0TO3                      :rem 65
1500 POKE 251,I*64:POKE252,57:POKE253,63:
    POKE 254,00:SYS 28672:NEXTI    :rem 92
1510 POKE 251,00:POKE252,58:POKE253,63:PO
    KE 254,00:SYS 28672            :rem 31
1520 REM*** SET UP TO ZERO SOUND ***
                                   :rem 165
1530 POKE 251,00:POKE252,212:POKE253,24:P
    OKE 254,00                      :rem 4
1540 REM*** READ IN THE BIG BALL SPRITE *
     **                             :rem 2
1550 FORI=0TO4:FORJ=22TO46:READ SD:rem 69
1560 POKE (14592+I*64+J),SD:NEXT:NEXT
                                   :rem 131
1570 FOR I=0TO63:READ SD:POKE 14912+I,SD:
    NEXT                           :rem 125
1580 POKE V+21,63:REM ENABLE THE SPRITES
                                    :rem 70
1590 FORI=0TO5                      :rem 68
1600 POKE 2040+I,228+I             :rem 108
1610 REM*** SET UP THE SPRITES ***:rem 68
1620 POKE V+39+I,CO(I):REM*** SET THE SPR
    ITE COLOR ***                  :rem 238
1630 X(I)=145+I*12                 :rem 148
1640 Y(I)=230                      :rem 144
1650 X(5)=156:Y(5)=83:REM*** LARGE SPRITE
     LOCATION ***                  :rem 249
1660 POKE V+I*2,X(I):REM*** SET INITIAL X
    -POSITION ***                  :rem 74
1670 POKE V+1+I*2,Y(I):REM*** SET INITIAL
     Y ***                          :rem 7
1680 NEXTI                         :rem 87
1690 POKE V+23,32:POKE V+29,32     :rem 92
1700 REM*** READ IN THE BINGO SONG ***
                                   :rem 226
1710 FORI=0TO21:READFL(I),FH(I),DU(I):NEX
    T                              :rem 26
1720 RETURN                        :rem 170
1730 NC=INT(RND(1)*5):REM*** SELECT THE B
    ALL LETTER ***                 :rem 64
1740 YM=INT(RND(0)*13):IF YM<5 THEN YM=5:
    REM*** GET THE MAXIMUM HEIGHT ***
                                   :rem 183
1750 J=0                           :rem 132
1760 Y=J↑2-2*YM*J+230              :rem 161
1770 POKE (V+NC*2),X(NC):POKE(V+1+NC*2),I
    NT(Y)                          :rem 104
1780 IF Y<=132THEN RETURN:REM*** BALL WEN
    T OVER PASS LINE ***           :rem 228
1790 IF J<2*YM THEN J=J+1:GOTO1760:rem 133
```

```
1800 GOSUB1830:REM*** MAKE THE BALL PLOP
     {SPACE}SOUND ***                    :rem 13
1810 GOTO1730:REM*** GET NEXT BALL ***
                                         :rem 34
1820 REM*** SOUND OF THE BALL PLOP ***
                                         :rem 0
1830 SYS 28672                           :rem 212
1840 POKESS,255:POKESS+1,93:POKESS+5,2
                                         :rem 58
1850 POKESS+22,104:POKESS+23,1:POKESS+24,
     79:POKESS+4,129                     :rem 97
1860 POKESS+24,0                         :rem 145
1870 RETURN                              :rem 176
1880 REM*** CHIME SOUND ***              :rem 160
1890 SYS 28672                           :rem 218
1900 POKE SS+1,255:POKE SS+5,9:POKESS+15,
     225:POKE SS+24,15                   :rem 46
1910 POKESS+4,21                         :rem 142
1920 FORTT=1TO300:NEXT:POKESS+4,20:rem 116
1930 RETURN                              :rem 173
1940 REM*** SOUR BONG SOUND ***          :rem 166
1950 SYS 28672                           :rem 215
1960 POKE SS+1,55:POKE SS+5,9:POKESS+15,2
     5:POKE SS+24,15                     :rem 208
1970 POKESS+4,21                         :rem 148
1980 FORTT=1TO300:NEXT:POKESS+4,20:POKE S
     S+24,0                              :rem 118
1990 RETURN                              :rem 179
2000 REM*** ROUTINE TO LOOK FOR A WINNER
     {SPACE}***                          :rem 155
2010 A1=3:A2=80:A3=0:A4=0                :rem 46
2020 WI=NC:GOSUB 2120:REM*** CHECK ROWS *
     **                                  :rem 116
2030 A1=80:A2=3:A3=0:A4=0                :rem 48
2040 WI=CR:GOSUB 2120:REM*** CHECK COLS *
     **                                  :rem 96
2050 IF NC<>CR THEN 2080:REM*** IS # ON M
     AJOR DIAGONAL? ***                  :rem 92
2060 A1=0:A2=3:A3=80:A4=0                :rem 51
2070 GOSUB 2120                          :rem 14
2080 IF NC<>(4-CR) THEN RETURN:REM*** IS
     {SPACE}# ON MINOR DIAGONAL? ***
                                         :rem 51
2090 A1=0:A2=3:A3=0:A4=80                :rem 54
2100 GOSUB 2120                          :rem 8
2110 RETURN                              :rem 164
2120 WJ=0                                :rem 211
2130 WM=S(CD)+WI*A1+WJ*A2+WJ*A3+(4-WJ)*A4
     +1                                  :rem 133
2140 WP=PEEK(WM)                         :rem 197
2150 IF WP<128THENRETURN                 :rem 228
2160 W(WJ)=WM + SS                       :rem 196
2170 WJ=WJ+1:IF WJ<=4THEN2130            :rem 177
2180 REM*** CHANGE WINNERS COLOR ***
                                         :rem 246
2190 FOR WJ=0TO4:FORQ=0TO1:POKEW(WJ)+Q,7:
     NEXT:NEXT:BO=1                      :rem 7
2200 REM*** PLAY THE BINGO SONG ***
                                         :rem 97
2210 POKE54296,15:POKE54277,10:POKE54278,
     10:REM SET VOL,ATT/DEC,SUS/REL
                                         :rem 211
2220 FORI=0TO21:POKE54272,FL(I):POKE54273
     ,FH(I):POKE54276,33                 :rem 243
2230 FORT=0TO DU(I)*4:NEXT:POKE54276,0:NE
     XT                                  :rem 98
2240 REM*** CHANGE WINNERS COLOR ***
                                         :rem 243
2250 FOR WJ=0TO4:FORQ=0TO1:POKEW(WJ)+Q,6:
     NEXT:NEXT:BO=1                      :rem 3
2260 RETURN                              :rem 170
2270 REM JOYSTICK TOKEN ROUTINE          :rem 198
2280 CM= F(CD)                           :rem 183
2290 OC=PEEK(CM):REM OC=OLD COLOR:rem 237
2300 POKE CM,5:POKE CM+1,5:REM COLOR IT G
     REEN                                :rem 70
2310 KB=PEEK(D0):REM READ THE KEYBOARD CO
     NTROL REG                           :rem 229
2320 POKE D0,255:PD=PEEK(D1)             :rem 40
2330 J0=-((PDAND8)=0)                    :rem 90
2340 J1=-((PDAND2)=0)                    :rem 86
2350 J2=-((PDAND4)=0)                    :rem 90
2360 J3=-((PDAND1)=0)                    :rem 89
2370 FB=-((PDAND16)=0)                   :rem 155
2380 POKE D0,KB:REM RESTORE KEYBOARD
                                         :rem 188
2390 IF(J0+J1+J2+J3+FB)=0 THEN 2560
                                         :rem 57
2400 IF FB=1THEN 2490                    :rem 73
2410 CC=CM+(J0-J2)*3+(J1-J3)*80:REM COMPU
     TE NEW POSITION                     :rem 227
2420 FR=INT((CC-S(CD)-SS)/40)            :rem 110
2430 X0=S(CD)+SS+FR*40:X1=X0+14:REM MIN,M
     AX H-POSITIONS FOR CARD             :rem 69
2440 IF CC>X1 OR CC<X0 OR FR>8{2 SPACES}O
     R FR<0 THEN 2560:REM TEST IF OUTSIDE
      BOX                                :rem 212
2450 REM VALID NEW POSITION-MOVE THE CURS
     OR                                  :rem 161
2460 POKE CM,OC:POKE CM+1,OC             :rem 92
2470 CM=CC:REM MOVE THE CURSOR           :rem 52
2480 GOTO2290                            :rem 212
2490 REM ACT ON FIREBUTTON-WE MUST CHECK
     {SPACE}IF THE CURSOR IS WITHIN A BOX
      AND IF                             :rem 227
2500 REM IT IS, IS THE NUMBER THE CORRECT
      ONE.                               :rem 89
2510 B0=PEEK(CM-SS)-48:B1=PEEK(CM-SS+1)-4
     8                                   :rem 161
2520 IF B0=N1 AND B1=N2 OR B0=N1+128 ANDB
     1=N1+128 THENGOTO1290               :rem 26
2530 REM FIRE BUTTON PRESSED WHEN NOT ON
     {SPACE}BOX                          :rem 111
2540 POKECM,OC:POKECM+1,OC:GOSUB 1950:REM
      SOUR GONG                          :rem 118
2550 NN=1:GOTO 1390:REM GET NEXT CARD
                                         :rem 109
2560 REM LOOP TILL JOYSTICK IS ACTIVE
                                         :rem 232
2570 FOR I=0TO20:NEXT                    :rem 233
2580 POKE CM,OC:POKE CM+1,OC             :rem 95
2590 FOR I=0TO20:NEXT                    :rem 235
2600 GOTO 2300                           :rem 198
2610 DATA 160,00,165,254,145,251,200,196,
     253,208,249,96,252,0,3,255          :rem 227
2620 DATA 0,3,3,128,7,57,128,7,35,128,7,5
     7,128,3,3,128,3,255,0,0,252,252,0
                                         :rem 37
2630 DATA3,255,0,3,3,128,7,207,128,7,207,
     128,7,207,128,3,3,128,3,255,0,0,252
                                         :rem 183
2640 DATA252,0,3,255,0,3,25,128,7,25,128,
     7,41,128,7,49,128,3,57,128,3,255,0
                                         :rem 147
2650 DATA0,252,252,0,1,131,0,3,49,128,6,1
     21,128,6,127,128,6,113,128,3,57
                                         :rem 239
2660 DATA128,3,131,0,0,252               :rem 32
2670 DATA252,0,1,131,0,3,57,128,6,124,128
     ,6,124,128,6,124,128,3,57,128,3,131
                                         :rem 184
2680 DATA 0,0,252                        :rem 59
2690 DATA 0,126,0,1,255,128,7,255,224,31,
     255,248,63,255,252,63,255,252,127,25
```

```
    5                                   :rem 11
2700 DATA 254,120,0,30,248,0,31,248,0,31,
     248,0,31,120,0,30,127,255,254,63,255
                                        :rem 166
2710 DATA 252,63,255,252,31,255,248,7,255
     ,224,1,255,128,0,126,0,0,0,0,0,0,0,0
                                        :rem 157
2720 DATA 38,43,39,38,43,39,183,45,39,183
     ,45,44,183,45,64,113,38,46,113,38,42
                                        :rem 238
2730 DATA 38,43,32,38,43,36,38,43,47,64,3
     4,50,64,34,54,113,38,37,113,38,39
                                        :rem 75
2740 DATA 113,38,51,64,34,57,83,32,53,168
     ,25,72,204,28,54,83,32,51,64,34,62
                                        :rem 121
2750 DATA 64,34,75                      :rem 125
```

Tank Mania

(Article on page 102.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Loader

```
4 PRINT"{CLR}":POKE56,28:POKE52,28:CB=716
  8:                                    :rem 116
5 FORI=7168TO7679:POKEI,PEEK(I+25600):NEX
  T:POKE36869,255                       :rem 119
6 READA:IFA=-1THEN9                     :rem 160
7 FORI=0TO7:READB:POKECB+A*8+I,B:NEXT
                                        :rem 93
8 GOTO6                                 :rem 167
9 POKE36878,15                          :rem 10
10 FORL=0TO21:POKE38400+L,C:POKE38905-L,C
   :POKE38400+L+1,4:POKE38905-L-1,0
                                        :rem 239
11 POKE7680+L,170:POKE7680+L+1,7:POKE8185
   -L,170:POKE8185-L-1,1                :rem 4
12 POKE36875,128+6*L:C=(C-(C<7))*-(C<7):I
   FC=1THENC=4                          :rem 122
13 NEXT:IFK=1THENRETURN                 :rem 52
14 PRINT"{6 DOWN}{6 SPACES}{RVS}{GRN}CCCC
   CCCCCCC":PRINT"{6 SPACES}{RVS}{GRN}TAN
   K MANIA!"                            :rem 29
15 PRINT"{6 SPACES}{RVS}{GRN}CCCCCCCCCCC"
                                        :rem 200
20 PRINT"{3 DOWN}{RVS}{BLU}{5 SPACES}PRES
   S ANY KEY"                           :rem 245
21 A$="":GETA$:IFA$=""THEN21            :rem 9
22 PRINT"{CLR}{DOWN}":PRINT"{RVS}{YEL}RIG
   HT JOYSTICK (RED)";"{OFF}{PUR} A"
                                        :rem 156
23 PRINT"{DOWN}{BLK}G";"{RVS}{YEL} LEFT J
   OYSTICK";"{RVS}(BLUE) {DOWN}{BLU}";"
   {OFF}7{RVS}{YEL} BLOCKADES":PRINT"
   {DOWN}.{RVS} MINES"                  :rem 122
24 PRINT"{2 DOWN}{RVS}{CYN}{4 SPACES}PRES
   S ANY KEY "                          :rem 104
25 A$="":GETA$:IFA$=""THEN25            :rem 17
26 PRINT"{CLR}"                         :rem 204
27 K=1:GOSUB9:POKE7702,32:POKE8163,32:POK
   E36869,240                           :rem 230
28 PRINT"{HOME}{2 DOWN}{2 SPACES}JUST A F
   EW MOMENTS"                          :rem 252
30 POKE198,5:POKE631,78:POKE632,69:POKE63
   3,87:POKE634,13:POKE635,131:END
                                        :rem 225
1000 DATA 0,72,236,126,55,239,124,56,24
                                        :rem 120
1001 DATA 1,63,63,30,118,118,30,63,63
                                        :rem 11
1002 DATA 2,24,56,124,239,55,126,236,72
                                        :rem 124
1003 DATA 3,24,24,90,126,102,126,126,66
                                        :rem 112
1005 DATA 5,66,126,126,102,126,90,24,24
                                        :rem 116
1006 DATA 6,18,55,126,236,247,62,28,24
                                        :rem 83
1007 DATA 7,252,252,120,110,110,120,252,2
     52                                 :rem 39
1008 DATA 8,24,28,62,247,236,126,55,18
                                        :rem 87
1009 DATA 9,0,0,12,28,56,48,0,0         :rem 225
1010 DATA 10,0,0,48,56,28,12,0,0        :rem 1
1011 DATA 11,0,24,24,24,24,24,0,0       :rem 45
1012 DATA 12,0,0,0,62,62,0,0,0          :rem 145
1016 DATA 16,0,112,126,102,32,48,48,0
                                        :rem 6
1017 DATA 17,228,18,37,68,36,18,33,198
                                        :rem 98
1018 DATA 18,0,48,48,32,102,126,112,0
                                        :rem 10
1019 DATA 19,68,170,145,0,34,85,137,129
                                        :rem 138
1020 DATA 20,153,90,60,255,255,60,90,153
                                        :rem 167
1021 DATA 21,129,137,85,34,0,145,170,68
                                        :rem 124
1022 DATA 22,0,14,126,102,4,12,12,0
                                        :rem 142
1023 DATA 23,198,33,18,36,68,37,18,228
                                        :rem 92
1024 DATA 24,0,12,12,4,102,126,14,0
                                        :rem 146
1046 DATA 46,0,0,66,36,24,36,66,0       :rem 79
1055 DATA 55,126,255,255,255,255,255,255,
     126,-1                             :rem 19
```

Program 2: Main Program

```
1 C=22:R=22:S=7680:A=30720:DD=37154:P1=37
  151:P2=37152:SL=5:DA=37136:REM SL=SKILL
   LEVEL                                :rem 200
2 POKE36879,29:T=3:CY=4:CE=6:CA=7:CS=7:CQ
  =4:CM=0:X=-1                          :rem 156
3 V=36878:S1=V-2:S2=V-1:DIMDC%(2,2),OC%(2
  ,2),U(1),O(1),Q(1),D(1),E(1)          :rem 127
4 FORI=0TO2:FORJ=0TO2:X=X+1:DC%(I,J)=X:OC
  %(I,J)=X+16:NEXTJ,I                   :rem 193
5 DEFFNA(Z)=S+X+C*Y:DEFFNB(Z)=PEEK(FNA(Z)
  ):DEFFNR(Z)=INT(RND(1)*Z)             :rem 66
6 POKEV-9,255:PRINT"{CLR}{BLK}":X=S+A:FOR
  I=XTOX+505:POKEI,T:NEXTI:GOSUB100
                                        :rem 163
7 POKE36879,29:FORI=1TO3+2*SL:X=FNR(C):Y=
  FNR(R)                                :rem 132
8 POKEFNA(0),46:POKEFNA(0)+A,CA:NEXT
                                        :rem 167
11 X=FNR(C):Y=FNR(R):IFFNB(0)<>32THEN11
                                        :rem 90
12 D(0)=X:E(0)=Y:Q(0)=FNA(0):U(0)=-1:O(0)
   =FNR(3)-1                            :rem 172
13 POKEFNA(0),DC%(U(0)+1,O(0)+1):POKEFNA(
   0)+A,CY                              :rem 143
14 X=FNR(C):Y=FNR(R):IFFNB(0)<>32THEN14
                                        :rem 96
```

```
15 D(1)=X:E(1)=Y:Q(1)=FNA(Ø):U(1)=1:O(1)=
   FNR(3)-1                          :rem 135
16 POKEFNA(Ø),DC%(U(1)+1,O(1)+1):POKEFNA(
   Ø)+A,CE:FORI=1TO5ØØ:NEXT           :rem 9
18 ONW+1GOSUB75,41:IFFBTHENX=D(W):Y=E(W):
   PX=U(W):PY=O(W):GOTO46             :rem 4
19 B=Ø:F=Ø:IFJ3THENB=1                :rem 43
2Ø IFJ2THENB=-1                       :rem 121
21 IFJ1THENF=1                        :rem 8Ø
22 IFJØTHENF=-1                       :rem 125
23 IFB=ØANDF=ØTHEN B=U(W):F=O(W)      :rem 136
27 U(W)=B:O(W)=F                      :rem 153
28 D(W)=D(W)+U(W):E(W)=E(W)+O(W)      :rem 26
3Ø X=D(W):Y=E(W):J=FNB(Ø):IFJ=32THEN35
                                      :rem 5
31 IFJ>54THENX=X-U(W):D(W)=D(W)-U(W):Y=Y-
   O(W):E(W)=E(W)-O(W):GOTO35         :rem 64
34 GOTO 6Ø                            :rem 6
35 POKEQ(W),32:POKEQ(W)+A,T:Q(W)=FNA(Ø):P
   OKEQ(W),DC%(U(W)+1,O(W)+1):POKEQ(W)+A,
   CY+2*W                             :rem 12
37 J=Ø:IFW=1THENW=Ø:GOTO18            :rem 126
38 W=1:GOTO18                         :rem 12
41 P=PEEK(DA):JØ=-((PAND4)=Ø):J1=-((PAND8
   )=Ø):J2=-((PAND16)=Ø):J3=-((PAND2)=Ø)
                                      :rem 56
42 FB=-((PAND32)=Ø):RETURN            :rem 9
46 Z=PX*PY:POKEV,8:IFZ=1THENJ=1Ø      :rem 71
47 IFZ=-1THENJ=9                      :rem 222
48 IFZ=ØANDPX=ØTHENJ=11               :rem 194
49 IFZ=ØANDPY=ØTHENJ=12               :rem 197
5Ø FORI=1TO1Ø:X=X+PX:Y=Y+PY:POKES2,23Ø-I
                                      :rem 35
51 IFI<>1THENPOKEZ,32:POKEZ+A,T       :rem 225
52 B=FNB(Ø):IFB=32THEN58              :rem 134
53 IFB<>55THEN57                      :rem 184
54 IFB=55THENI=1Ø:NEXTI:POKEV,Ø:GOTO19
                                      :rem 177
57 I=1Ø:NEXTI:GOTO6Ø                  :rem 238
58 Z=FNA(Ø):POKEZ,J:POKEZ+A,CM:NEXTI
                                      :rem 64
59 POKEZ,32:POKEZ+A,T:POKEV,Ø:GOTO19
                                      :rem 47
6Ø POKES2,23Ø:SC=X-1:IFSC<ØTHENSC=Ø
                                      :rem 155
61 FC=X+1:IFFC>CTHENFC=C              :rem 236
62 SR=Y-1:IFSR<ØTHENSR=Ø              :rem 28
63 FR=Y+1:IFFR>RTHENFR=R              :rem 58
64 FORX=SCTOFC:FORY=SRTOFR:J=OC%(X-SC,Y-S
   R)                                 :rem 122
65 POKEFNA(Ø),J:POKEFNA(Ø)+A,CQ:NEXTY,X
                                      :rem 167
66 POKES1,22Ø:FORJ=15TOØSTEP-1:POKEV,J:FO
   RJ1=1TO5Ø:NEXTJ1:NEXTJ             :rem 88
67 POKEV,Ø:FORX=SCTOFC:FORY=SRTOFR:POKEFN
   A(Ø),32:POKEFNA(Ø)+A,T:NEXTY,X:rem 174
68 IFPEEK(Q(1))=32ANDPEEK(Q(Ø))=32THENWC=
   WC+1:WH=WH+1:A$="YOU GOT EACH OTHER!":
   GOTO72                             :rem 73
69 IFPEEK(Q(Ø))=32THENA$="RED IS REARRANG
   ED!":WC=WC+1:GOTO72                :rem 83
7Ø IFPEEK(Q(1))=32THENA$="BLUE IS TANK DU
   ST!":WH=WH+1:GOTO72                :rem 54
71 GOTO18                             :rem 1Ø
72 POKEV-9,24Ø:PRINT"{CLR}{3 DOWN}";A$:PR
   INT"{2 DOWN}SCORE: BLUE";WC;" RED";WH
                                      :rem 155
73 PRINT"{3 DOWN}PRESS ANY KEY TO STOP":F
   ORI=1TO4ØØ:GETA$:IFA$<>""THENI=4ØØ:NEX
   TI:END                             :rem 75
74 NEXTI:GOTO6                        :rem 156
75 POKEDD,127:P=PEEK(P2)AND128:J3=-(P=Ø):
   POKEDD,255                         :rem 254
76 P=PEEK(P1):J1=-((PAND8)=Ø):J2=-((PAND1
   6)=Ø)                              :rem 51
77 JØ=-((PAND4)=Ø):FB=-((PAND32)=Ø):RETUR
   N                                  :rem 149
1ØØ FOR RA=ØTOSL*1Ø:POKES+INT(RND(1)*484)
    ,55:NEXT                          :rem 167
1Ø1 FOR L=Ø TO 21                     :rem 56
1Ø3 POKE S+L,55                       :rem 35
1Ø4 POKE S+(22*22)+L,55               :rem 146
1Ø5 NEXT L                            :rem 33
1Ø6 FOR U=Ø TO 484 STEP 22            :rem 35
1Ø7 POKE S+U,55                       :rem 48
1Ø8 POKE S+21+U,55                    :rem 191
1Ø9 NEXT U:RETURN                     :rem 72
```

Variable Storage

(Article on page 108.)

Program 1: Variable Utility

```
44440 REM{3 SPACES}DUMP...            :rem 164
44441 REM***START WITH GOTO 44444:rem 1Ø6
44443 END:REM PROTECT SUBROUTINE      :rem 41
44444 ZB=PEEK(47)+256*PEEK(48)-7:ZA=PEEK(
      45)+256*PEEK(46)                ;rem 185
44445Ø PRINT"STRINGS &{2 SPACES}VARIABLES:
      ":PRINT"**********************"
                                      :rem 114
44446Ø FOR ZZ=ZA TO ZB STEP 7         :rem 39
44465 IF PEEK(ZZ)>127 THEN GOSUB 44711Ø:GO
      TO44521Ø:REM INT VAR            :rem 171
44471Ø IF PEEK(ZZ+1)<128 THEN GOSUB 44543:
      GOTO 44521Ø:REM FP VAR          :rem 177
44475 REM*****STRING*************VARIABL
      E                               :rem 39
44481Ø GOSUB44485:GOTO44521Ø          :rem 255
44485 PRINTCHR$(144)CHR$(PEEK(ZZ))CHR$(PE
      EK(ZZ+1)-128)CHR$(36)CHR$(61);
                                      :rem 76
44491Ø ZY=PEEK(ZZ+3)+256*PEEK(ZZ+4):ZX=PEE
      K(ZZ+2):REM STRINGADDRESS AND LENGT
      H                               :rem 56
44495 IF ZY=Ø THEN 4451Ø              :rem 231Ø
445ØØ FOR ZØ=1TOZX:PRINTCHR$(PEEK(ZY));:Z
      Y=ZY+1:NEXTZØ                   :rem 234
4451Ø PRINT:RETURN                    :rem 165
4452Ø NEXTZZ                          :rem 242
44525 GOSUB 448Ø5:REM DO ARRAYS NOW:rem Ø
4453Ø PRINT:PRINTCHR$(144)"....ALL DONE":
      END                             :rem 75
44541Ø REM***FLOAT PT***********VARIABLE
                                      :rem 187
44543 IFPEEK(ZZ)=9Ø AND(PEEK(ZZ+1)=65 OR
      {SPACE}PEEK(ZZ+1)=66)THEN RETURN
                                      :rem 148
44545 PRINTCHR$(144)CHR$(PEEK(ZZ))CHR$(PE
      EK(ZZ+1))CHR$(61);              :rem 198
4455Ø Z1=2↑(PEEK(ZZ+2)-129)           :rem 251
4456Ø Z2=128:Z3=256:Z4=1              :rem 62
4457Ø Z5=PEEK(ZZ+3): IFZ5>=128 THEN Z5=Z5
      -128:Z4=-1                      :rem 123
4458Ø Z9=Z1+Z5*Z1/Z2+PEEK(ZZ+4)*Z1/Z2/Z3+
      PEEK(ZZ+5)*Z1/Z2/Z3↑2+PEEK(ZZ+6)*Z1
      /Z2/Z3↑3                        :rem 78
4459Ø PRINTZ9*Z4                      :rem 222
4460Ø RETURN                          :rem 222
44711Ø REM***INTEGER*************VARIABL
      E                               :rem 43
```

```
44710 PRINTCHR$(144)CHR$(PEEK(ZZ)-128)CHR
      $(PEEK(ZZ+1)-128)CHR$(37)CHR$(61);
                                    :rem 12
44720 Z4=1:Z7=PEEK(ZZ+2):Z8=PEEK(ZZ+3)
                                    :rem 29
44730 IF Z7 >127THENZ7=255-Z7:Z8=256-Z8:Z
      4= -1                         :rem 25
44740 Z9=Z7*256+Z8:REMNOTE REVERSE HIBYTE
      -LOBYTE SEQUENCE              :rem 114
44750 PRINTZ9*Z4                    :rem 220
44760 RETURN                        :rem 229
44800 REM*** ARRAY**************VARIABLE
      S                             :rem 240
44805 IFZQ=0THENZA=0:GOSUB44550:ZA%=0:GOS
      UB44720:ZR=2:ZQ=2:ZX=2:ZY=2:Z0=2
                                    :rem 84
44806 REM ABOVE DUMMIES NEEDED TO STABILI
      ZE{3 SPACES}POINTER TO ARRAYS
                                    :rem 240
44810 ZZ=PEEK(47)+256*PEEK(48):IFZZ=PEEK(
      49)+256*PEEK(50)THEN RETURN   :rem 32
44815 PRINT"SPACEBAR WHEN READY{3 SPACES}
      FOR ARRAYS":WAIT197,32        :rem 25
44820 IF PEEK(ZZ+4)<>1THENGOSUB45110:GOTO
      44820:REM MULTI-D ARRAY       :rem 125
44825 IF PEEK(ZZ)>127 THEN GOSUB 44900:GO
      TO44820:REM INT ARRAY         :rem 69
44828 IF PEEK(ZZ+1)>127 THEN GOSUB 45010:
      GOTO44820:REM STRING ARRAY    :rem 137
44829 REM*****FLOAT PT ************ARRAY
                                    :rem 82
44830 ZQ=ZZ:ZZ=ZZ+7                 :rem 224
44840 FOR ZR=0 TO PEEK(ZQ+6)+256*PEEK(ZQ+
      5)-1:REM**DIM                 :rem 70
44850 PRINTCHR$(144)CHR$(PEEK(ZQ))CHR$(PE
      EK(ZQ+1))CHR$(40)ZRCHR$(41)CHR$(61)
      ;                             :rem 204
44860 ZZ=ZZ-2:GOSUB44550:ZZ=ZZ+2    :rem 2
44870 ZZ=ZZ+5                       :rem 12
44880 NEXTZR:IFZZ=PEEK(49)+256*PEEK(50)TH
      EN RETURN                     :rem 108
44890 GOTO44820                     :rem 68
44900 REM****INTEGER************ARRAYS
                                    :rem 101
44910 ZQ=ZZ:ZZ=ZZ+7                 :rem 223
44920 FOR ZR=0 TO PEEK(ZQ+6)+256*PEEK(ZQ+
      5)-1:REM**DIM                 :rem 69
44930 PRINTCHR$(144)CHR$(PEEK(ZQ)-128)CHR
      $(PEEK(ZQ+1)-128)CHR$(37)CHR$(40);
                                    :rem 251
44940 PRINTZRCHR$(41)CHR$(61);      :rem 233
44950 ZZ=ZZ-2:GOSUB44720:ZZ=ZZ+2    :rem 1
44960 ZZ=ZZ+2                       :rem 9
44970 NEXTZR:IFZZ=PEEK(49)+256*PEEK(50)TH
      EN GOTO 44530                 :rem 197
44980 RETURN                        :rem 233
45000 REM****STRING************ARRAYS
                                    :rem 80
45010 ZQ=ZZ:ZZ=ZZ+7                 :rem 215
45020 FOR ZR=0 TO PEEK(ZQ+6)+256*PEEK(ZQ+
      5)-1:REM**DIM                 :rem 61
45030 PRINTCHR$(144)CHR$(PEEK(ZQ))CHR$(PE
      EK(ZQ+1)-128)CHR$(36)CHR$(40);
                                    :rem 42
45040 PRINTZRCHR$(41)CHR$(61);      :rem 225
45050 ZZ=ZZ-2:GOSUB44490:ZZ=ZZ+2    :rem 253
45060 ZZ=ZZ+3                       :rem 2
45070 NEXTZR:IFZZ=PEEK(49)+256*PEEK(50)TH
      EN GOTO 44530                 :rem 189
45080 RETURN                        :rem 225
45100 REM**MULTI-D**************ARRAYS
                                    :rem 160
45110 ZX=2:ZY=2:PRINTCHR$(43)PEEK(ZZ+4)"D
      IMENSIONALARRAY:":PRINTTAB(5);
                                    :rem 16
45120 IF PEEK(ZZ)<127THENPRINTCHR$(PEEK(Z
      Z));:GOTO45140                :rem 111
45130 PRINTCHR$(PEEK(ZZ)-128);:ZX=1
                                    :rem 99
45140 IFPEEK(ZZ+1)=0THEN45170       :rem 176
45145 IFPEEK(ZZ+1)=128THEN ZY=1:GOTO45170
                                    :rem 180
45150 IF PEEK(ZZ+1)<127THENPRINTCHR$(PEEK
      (ZZ+1));:GOTO45170            :rem 45
45160 PRINTCHR$(PEEK(ZZ+1)-128);:ZY=1
                                    :rem 195
45170 IF ZX=1 AND ZY=1THENPRINT"%";:GOTO4
      5190                          :rem 122
45180 IF ZY=1 THENPRINT"$";         :rem 17
45190 PRINTCHR$(40);                :rem 129
45200 Z9=PEEK(ZZ+4)                 :rem 84
45210 FORZ8=Z9TO1STEP-1:Z7=PEEK(ZZ+4+2*Z8
      )+(PEEK(ZZ+4+2*Z8-1))*256-1:rem 254
45220 PRINTZ7;                      :rem 86
45230 IFZ8=1THENPRINTCHR$(41):GOTO45250
                                    :rem 115
45240 PRINTCHR$(44);:NEXTZ8         :rem 140
45250 PRINT                         :rem 141
45260 ZZ=ZZ+PEEK(ZZ+2)+PEEK(ZZ+3)*256:IF
      {SPACE}ZZ=PEEK(49)+256*PEEK(50)THEN
      44530                         :rem 107
45270 RETURN                        :rem 226
```

Program 2:

Variable Utility, Condensed Version

```
44443 END:REM MINIDUMP FPVAR & $     :rem 36
44444 ZB=PEEK(47)+256*PEEK(48)-7:ZA=PEEK(
      45)+256*PEEK(46)              :rem 185
44460 FORZZ=ZATOZBSTEP7             :rem 39
44470 IFPEEK(ZZ+1)<128THENGOSUB44543:GOTO
      44520                         :rem 20
44480 GOSUB44485:GOTO44520          :rem 255
44485 PRINTCHR$(144)CHR$(PEEK(ZZ))CHR$(PE
      EK(ZZ+1)-128)CHR$(36)CHR$(61);
                                    :rem 76
44490 ZY=PEEK(ZZ+3)+256*PEEK(ZZ+4):ZX=PEE
      K(ZZ+2)                       :rem 168
44495 IFZY=0THEN44510               :rem 230
44500 FOR Z0=1TOZX:PRINTCHR$(PEEK(ZY));:Z
      Y=ZY+1:NEXTZ0                 :rem 234
44510 PRINT:RETURN                  :rem 165
44520 NEXTZZ                        :rem 242
44530 END                           :rem 215
44543 IFPEEK(ZZ)=90THENRETURN       :rem 114
44545 PRINTCHR$(144)CHR$(PEEK(ZZ))CHR$(PE
      EK(ZZ+1))CHR$(61);            :rem 198
44550 Z1=2↑(PEEK(ZZ+2)-129)         :rem 251
44560 Z2=128:Z3=256:Z4=1            :rem 62
44570 Z5=PEEK(ZZ+3):IFZ5>=128THENZ5=Z5-12
      8:Z4=-1                       :rem 123
44580 Z9=Z1+Z5*Z1/Z2+PEEK(ZZ+4)*Z1/Z2/Z3+
      PEEK(ZZ+5)*Z1/Z2/Z3↑2+PEEK(ZZ+6)*Z1
      /Z2/Z3↑3                      :rem 78
44590 PRINTZ9*Z4                    :rem 222
44600 RETURN                        :rem 222
```

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Checksums
For Early GAZETTE Programs

In the January issue, we asked for reader response concerning checksums for early (July-October) GAZETTE programs. Response was great, so we've chosen some of the longer and most difficult-to-type programs.

If you've already typed in a program, you can use "Automatic Proofreader" to check each line of the program. Disk drive users can LOAD and RUN Automatic Proofreader, then LOAD the program to be checked. If you own a cassette drive, see the special loading instructions below.

When the program to be checked has been LOADed, type SYS 886 to start Automatic Proofreader. LIST the program and stop when it fills the screen (remember that CTRL will slow the listing and RUN/STOP will stop it). Position the cursor on the first program line and hit RETURN. The checksum number will appear in the upper left-hand corner. Press RETURN again and you will see the next number. When you reach the bottom of the screen, LIST the next section of the program.

If you're typing in one of the programs below for the first time, LOAD and RUN Automatic Proofreader. Then type in the original listing while comparing the checksums.

Special Notations

There are a few symbols in the listings which should be noted. First, any letters appearing to the left of the line number represent the month (O for October, D for December, etc.) in which a necessary correction was made in "Bug-Swatter." We've not included minor modifications. The letter appears only if the contents of the line are different from the original listing. Refer to "Bug-Swatter" in the issue noted for the correction.

An asterisk (*) following a line number indicates that there were too many characters per logical line; therefore, the checksum is meaningless. Remember, the VIC accepts no more than 88 characters per line, and the 64 no more than 80. In cases where you see the asterisk, you can split the line by creating a new line number. For example, if line 350 is too long and the next line number is 360, simply create line 355 and type in a latter section of line 350. (After a colon is always a safe bet.) A better alternative is to type in the statement using keyword abbreviations (? for PRINT, P SHIFTed O for POKE, etc.).

For Tape Users

Because Automatic Proofreader is a machine language program that fits in the cassette buffer, it is erased when you load a program from tape. To get around this problem, follow these instructions:

1. LOAD and RUN Automatic Proofreader. This will put the machine language program into the cassette buffer.

2. Type the following lines in direct mode (without line numbers):

```
A$="PROOFREADER.T": B$="{10 SPACES}": FOR
   X = 1 TO 4: A$=A$+B$:NEXTX
FORX= 886 TO 1018: A$ = A$ + CHR$(PEEK(X)
  ):NEXTX
OPEN1,1,1,A$:CLOSE1
```

After you type the last line, you will be asked to press RECORD and PLAY. We recommend that you start at the beginning of a new tape.

You now have a new version of Automatic Proofreader. Turn your computer off and on, then LOAD the program you were working on. Put the cassette containing PROOFREADER.T into the tape drive and type:

```
OPEN1:CLOSE1
```

You can now get into Proofreader by typing SYS 886. To test this, PRINT PEEK (886) should return the number 173. If it does not, repeat the steps above, making sure that A$ (PROOFREADER.T) contains 13 characters and that B$ contains 10 spaces.

The new version of Automatic Proofreader will load itself into the cassette buffer whenever you type OPEN1: CLOSE1 and PROOFREADER.T is the next program on your tape. It will not disturb the contents of BASIC memory.

July

Snake Escape (VIC)

```
100 :212
110 :186
120 :247
130 :199
140 :247
150 :240
160 :017
170 :119
180 :119
190 :057
200 :190
210 :235
220 :110
230 :219
240 :102
250 :232
260 :245
270 :046
280 :189
300 :125
310 :014
4000 :234
4010 :120
4020 :018
4030 :031
4040 :112
4050 :091
4060 :151
4070 :170
4080 :188
4090 :189
4100 :165
5000 :217
5010 :124
5020 :127
5030 :130
5035 :137
5040 :169
5050 :073
5060 :007
5070 :087
5080 :136
5090 :225
5100 :201
5110 :242
5120 :189
6000 :048
6005 :238
6010 :194
6020 :049
6025 :198
6030 :123
6040 :080
6050 :215
6060 :122
6070 :214
6080 :247
7000 :187
7010 :250
7020 :006
7030 :194
7040 :236
7050 :083
7060 :099
7070 :174
8000 :085
8005 :113
8010 :180
8020 :178
8030 :176
8040 :051
8045 :120
8050 :225
8060 :009
8070 :122
8080 :132
8090 :128
8100 :124
8110 :208
9000 :111
9010 :210
9020 :201
9030 :144
9040 :227
9050 :042
9060 :175
9500 :120
9510 :051
9520 :046
9530 :251
9540 :183
9550 :189
9560 :174
9570 :072
9580 :224
9590 :023
9600 :201
9610 :123
9620 :157
10000 :242
28000 :143
29000 :140
29010 :097
30000 :200
30010 :072
30020 :104
30030 :173
30040 :106
30050 :049
30060 :103
30070 :243
30080 :041
30090 :174
30100 :228
30110 :041
30120 :214
```

Snake Escape (64)

```
5 :255
10 :057
15 :059
20 :136
30 :067
100 :239
110 :186
120 :247
130 :199
140 :247
150 :240
160 :017
170 :119
180 :119
190 :057
200 :195
210 :237
220 :113
230 :219
240 :102
250 :232
260 :245
270 :046
280 :189
300 :096
310 :126
4000 :234
4010 :009
4020 :163
4030 :065
4040 :112
4050 :091
4060 :151
4070 :057
4080 :166
4090 :189
4100 :165
5000 :093
5010 :124
5020 :127
5030 :130
5035 :137
5040 :169
5050 :158
5060 :007
5070 :138
5080 :059
5090 :044
5100 :158
5102 :102
5103 :017
5106 :131
5120 :221
6000 :045
6003 :098
6005 :214
6010 :155
6020 :167
6021 :146
6022 :136
6025 :139
6026 :173
6027 :151
6028 :142
6040 :027
6050 :215
6060 :122
6070 :214
6080 :228
7000 :063
7010 :253
7020 :040
7030 :227
7040 :154
7042 :102
7043 :176
7045 :197
7050 :083
7060 :099
7070 :174
8000 :185
8005 :113
8010 :194
8020 :179
8030 :177
8040 :052
8045 :137
8050 :225
8060 :009
8070 :122
8080 :132
8090 :128
8100 :124
8110 :208
9000 :200
9010 :195
9020 :171
9030 :120
9040 :225
9050 :030
9060 :175
9500 :173
9505 :108
9510 :141
9515 :179
9520 :153
9525 :147
9530 :176
9533 :156
9536 :149
9540 :183
9550 :054
9560 :174
9570 :033
9580 :090
9590 :033
9600 :216
9610 :123
9620 :157
10000 :242
28000 :141
29000 :135
29010 :097
30000 :076
30010 :077
30020 :109
30030 :178
30040 :111
30050 :054
30070 :092
30080 :041
30090 :174
30100 :228
30110 :041
30120 :214
```

Alfabug (VIC)

```
1 :060
5 :147
10 :223
20 :193
25 :237
30 :094
34 :172
36 :131
40 :242
50 :097
55 :039
57 :240
60 :031
70 :002
75 :083
76 :218
77 :090
78 :089
79 :003
80 :175
81 :114
85 :012
90 :087
100 :200
102 :094
105 :111
110 :020
115 :056
118 :155
120 :061
130 :123
140 :043
145 :004
150 :109
175 :037
200 :022
```

Alfabug (64)

```
0 :031
1 :065
5 :094
6 :227
10 :030
20 :193
25 :236
30 :136
34 :219
36 :131
40 :242
50 :059
55 :039
57 :235
60 :147
70 :002
74 :128
75 :124
76 :218
77 :090
78 :233
79 :003
80 :174
81 :134
85 :012
90 :214
100 :123
102 :094
105 :073
110 :020
115 :056
118 :091
120 :205
130 :123
140 :043
145 :003
150 :109
174 :124
175 :100
176 :042
177 :240
178 :128
200 :114
205 :094
210 :235
215 :233
220 :116
```

Word Hunt (VIC)

```
2 :019
3 :225
4 :216
5 :080
10 :123
11 :091
```

```
12 :215
13 :093
14 :235
20 :091
25 :161
70 :165
80 :116
90 :232
95 :137
100 :063
110 :213
120 :045
130 :235
140 :166
150 :108
170 :045
180 :193
190 :014
200 :226
210 :007
220 :131
230 :228
240 :122
250 :141
260 :136
270 :029
280 :217
290 :218
295 :170
300 :125
310 :037
320 :120
340 :090
360 :184
370 :201
380 :203
400 :116
410 :221
430 :086
440 :033
450 :081
460 :221
470 :246
490 :052
500 :175
510 :095
520 :080
530 :061
550 :130
560 :098
570 :114
580 :134
590 :134
600 :108
610 :093
620 :129
630 :111
640 :097
650 :097
670 :027
680 :035
690 :140
710 :186
720 :093
740 :162
760 :181
770 :242
775 :117
780 :126
790 :027
800 :166
810 :108
820 :228
860 :02
861 :175
870 :214
880 :179
890 :228
900 :159
910 :074
920 :204
921 :149
930 :164
940 :207
950 :160
951 :204
960 :226
970 :133
980 :048
1000 :245
1020 :252
1025 :243
1030 :038
1040 :204
1050 :210
1060 :122
1070 :156
1080 :156
1090 :215
1100 :120
1110 :170
1120 :158
1140 :154
1150 :183
1160 :126
1170 :012
1190 :108
1200 :163
1210 :112
1230 :110
1240 :049
1250 :175
1260 :203
1270 :213
1280 :024
1300 :065
1310 :040
1320 :017
1330 :151
1340 :070
1341 :214
1342 :012
1343 :061
1344 :063
1345 :036
1350 :201
1360 :167
1370 :213
1380 :194
1390 :157
1400 :066
1420 :000
1430 :160
1450 :173
1460 :045
1470 :032
1480 :094
1490 :083
1491 :168
1492 :006
1493 :008
1500 :002
1505 :150
1510 :062
1515 :050
1520 :056
1525 :040
1530 :061
1535 :138
1540 :121
1541 :079
1550 :113
1560 :025
1570 :048
1580 :023
1590 :052
1600 :018
1610 :045
1620 :020
1630 :049
1650 :206
1660 :134
1670 :253
1680 :119
1700 :137
```

Word Hunt (64)

```
4 :137
10 :224
11 :009
12 :133
13 :011
14 :080
90 :188
295 :047
300 :175
310 :072
320 :172
430 :086
775 :055
780 :254
790 :032
810 :039
1480 :094
1491 :046
1492 :241
1493 :001
1520 :238
1525 :086
1527 :010
1530 :181
1535 :237
1541 :169
```

VIC Timepiece

```
10 :188
15 :155
20 :059
30 :094
50 :022
60 :175
70 :171
80 :099
83 :152
85 :253
90 :170
100 :015
105 :136
110 :173
120 :100
130 :081
140 :251
150 :208
160 :220
170 :115
200 :172
210 :018
220 :010
300 :070
310 :072
320 :067
325 :090
330 :253
340 :038
350 :039
400 :116
410 :020
420 :175
430 :013
440 :207
450 :230
460 :202
500 :229
505 :011
510 :119
520 :111
525 :172
530 :011
600 :199
605 :009
610 :165
620 :115
630 :053
640 :236
650 :090
659 :199
660 :234
670 :101
680 :151
690 :243
695 :212
700 :019
710 :119
720 :142
730 :086
740 :021
750 :088
760 :148
900 :114
905 :206
910 :235
920 :240
930 :110
1000 :024
1010 :004
1020 :184
1030 :254
1040 :227
1045 :175
1050 :052
1055 :047
1060 :046
1070 :141
1080 :164
1090 :109
1100 :135
1110 :162
1120 :030
1130 :143
2000 :047
2005 :196
2010 :076
2015 :172
2020 :202
2030 :154
2035 :198
2040 :127
2060 :119
2080 :167
2085 :166
2090 :165
2100 :057
2110 :061
2120 :198
2180 :027
2190 :144
7999 :253
8000 :028
8010 :249
8020 :240
8025 :199
8030 :007
8040 :181
```

August

Wordspell (VIC)

```
0 :242
21 :159
22 :007
23 :254
24 :194
25 :237
26 :025
27 :205
28 :194
29 :132
30 :075
31 :072
32 :164
33 :007
34 :095
35 :238
36 :103
37 :194
38 :170
39 :076
40 :090
41 :093
42 :192
43 :126
44 :252
45 :070
46 :241
47 :197
48 :076
49 :091
50 :254
51 :181
52 :242
53 :128
54 :069
55 :113
56 :196
57 :159
58 :098
59 :069
60 :255
61 :*
62 :157
63 :102
64 :038
65 :087
66 :035
67 :031
68 :117
69 :021
70 :160
71 :057
72 :245
```

```
73 :169
74 :069
75 :154
76 :088
77 :162
78 :028
79 :164
80 :015
81 :039
82 :179
```

Wordspell (64)

```
 0 :202
21 :103
22 :007
24 :194
25 :237
26 :025
27 :205
28 :212
29 :132
30 :075
31 :072
32 :164
33 :007
34 :095
35 :238
36 :103
37 :194
38 :170
39 :076
40 :108
41 :093
42 :018
43 :126
44 :078
45 :070
46 :241
47 :255
48 :076
49 :091
50 :254
51 :181
52 :242
53 :130
54 :069
55 :113
56 :196
57 :202
58 :098
59 :069
60 :255
61 :110
62 :*
63 :*
64 :253
65 :136
66 :224
67 :000
68 :033
69 :118
70 :014
71 :005
72 :245
73 :169
74 :069
75 :154
76 :088
77 :162
78 :028
79 :164
80 :015
81 :104
83 :116
85 :009
87 :092
89 :083
90 :001
100 :150
110 :141
120 :128
130 :094
140 :117
```

VIC/64 Mailing List

```
8 :209
10 :185
11 :016
13 :063
16 :199
17 :222
18 :213
19 :014
20 :*
21 :*
22 :208
23 :237
24 :095
25 :072
26 :079
28 :012
29 :024
30 :153
31 :091
32 :115
33 :242
34 :152
35 :137
36 :127
37 :088
38 :250
39 :241
40 :149
41 :188
42 :199
43 :181
44 :243
45 :198
46 :014
47 :028
48 :012
49 :045
50 :158
51 :217
52 :119
53 :011
54 :021
55 :059
56 :066
60 :078
62 :034
64 :214
66 :040
68 :134
70 :124
72 :039
73 :179
74 :196
76 :142
78 :044
80 :011
82 :078
84 :247
86 :192
88 :227
90 :014
92 :205
93 :053
94 :245
95 :174
96 :151
98 :092
99 :253
100 :149
101 :064
102 :214
103 :042
104 :117
106 :155
107 :170
108 :*
110 :161
112 :102
114 :029
116 :180
118 :054
120 :096
500 :207
510 :001
511 :003
512 :146
513 :225
514 :110
515 :216
516 :063
517 :117
518 :061
520 :249
530 :251
540 :253
550 :255
560 :001
570 :003
580 :005
590 :007
600 :039
610 :204
```

The Viper (VIC)

```
10 :110
20 :195
30 :136
40 :172
50 :060
60 :128
70 :135
80 :042
90 :040
100 :122
110 :068
120 :133
130 :162
140 :077
150 :145
160 :174
170 :057
180 :211
190 :233
200 :183
210 :247
220 :113
230 :054
240 :059
250 :106
260 :204
270 :058
280 :237
290 :128
300 :079
310 :138
320 :017
330 :134
340 :056
350 :120
360 :007
370 :220
380 :042
390 :113
400 :131
410 :105
420 :194
430 :147
440 :244
450 :173
460 :087
470 :202
480 :208
490 :221
500 :197
510 :052
520 :056
530 :039
540 :156
550 :089
560 :012
N570:*
580 :094
590 :249
600 :226
610 :034
620 :167
630 :166
640 :141
650 :022
660 :175
670 :001
680 :038
690 :059
700 :101
710 :000
720 :121
730 :249
740 :245
750 :131
760 :007
770 :059
780 :045
```

The Viper (64)

```
100 :007
110 :022
120 :156
130 :102
140 :018
150 :222
160 :124
170 :143
180 :026
190 :204
200 :237
210 :168
220 :075
230 :080
240 :134
250 :111
260 :143
270 :040
280 :120
290 :155
300 :038
310 :218
320 :167
330 :034
340 :173
350 :126
360 :177
370 :201
380 :106
390 :039
400 :098
410 :217
420 :180
430 :216
440 :245
450 :039
460 :103
470 :028
480 :053
490 :079
500 :207
510 :004
520 :211
530 :096
540 :028
550 :060
560 :219
0570:184
580 :104
590 :202
600 :000
0610:161
620 :235
630 :039
640 :127
650 :195
660 :108
670 :029
680 :254
0690:254
700 :016
710 :199
720 :153
730 :013
740 :125
750 :017
760 :205
770 :114
780 :184
790 :175
800 :165
810 :237
820 :021
830 :174
840 :159
850 :059
860 :252
870 :109
880 :185
890 :161
900 :121
910 :243
920 :029
930 :255
940 :004
950 :168
960 :018
970 :233
```

```
980 :010    1220 :025
990 :244    1230 :172
1000 :024   1240 :235
1010 :229   1250 :175
1020 :047   1260 :221
1030 :*     1270 :244
1040 :058   1280 :180
1050 :188   1290 :236
1060 :068   1300 :103
1070 :*     1310 :019
1080 :008   1320 :072
1090 :199   1330 :213
1100 :084   1340 :094
1110 :083   1350 :115
1120 :000   1360 :078
1130 :070   1370 :109
1140 :247   1380 :177
1150 :224   1390 :219
1160 :104   1400 :083
1170 :017   1410 :019
1180 :054   01420:124
1190 :053   1430 :186
1200 :163   1440 :055
1210 :023   1450 :069
```

Cylon Zap: Setup (VIC)

```
10 :039     20 :000
```

Cylon Zap: Instructions (VIC)

```
10 :219     165 :182
30 :232     170 :227
35 :130     175 :138
40 :120     180 :114
45 :074     185 :160
50 :015     190 :146
55 :202     195 :164
60 :153     200 :118
65 :032     205 :241
70 :067     210 :042
75 :243     215 :235
80 :033     220 :202
85 :191     225 :207
90 :098     230 :032
95 :121     235 :114
100 :222    240 :015
105 :092    245 :251
110 :244    250 :176
115 :220    255 :092
120 :106    260 :035
125 :198    265 :141
130 :051    270 :200
135 :121    275 :134
140 :220    280 :238
145 :155    285 :229
150 :151    290 :056
155 :151    295 :113
160 :238    300 :105
305 :182    504 :232
310 :069    505 :*
400 :044    506 :227
420 :246    507 :172
430 :119    508 :194
440 :215    509 :*
450 :121    510 :*
500 :*      511 :141
501 :*      512 :192
502 :251    513 :149
503 :023
```

Cylon Zap (VIC)

```
35 :093     330 :242
40 :102     335 :247
45 :186     340 :128
50 :005     345 :154
55 :068     350 :222
60 :108     355 :253
65 :199     360 :063
70 :051     365 :135
75 :041     370 :152
80 :126     375 :232
90 :156     380 :206
95 :024     385 :226
100 :131    390 :134
105 :211    395 :159
110 :008    400 :067
115 :045    405 :201
120 :099    410 :220
125 :104    415 :130
130 :105    420 :056
135 :109    425 :007
140 :110    430 :223
145 :161    435 :252
150 :156    440 :056
155 :163    445 :160
160 :161    450 :249
165 :168    455 :191
170 :123    460 :110
175 :132    465 :127
180 :132    470 :147
185 :141    475 :168
190 :121    480 :224
195 :211    485 :024
200 :127    490 :224
205 :206    495 :204
210 :118    500 :035
215 :155    505 :095
220 :128    510 :022
225 :159    515 :017
230 :172    520 :111
233 :088    525 :124
235 :060    530 :045
240 :135    535 :214
295 :227    540 :172
300 :042    545 :075
310 :116    550 :151
315 :121    555 :222
320 :147    560 :072
325 :015    565 :158
570 :219    750 :027
575 :095    755 :042
580 :157    760 :248
585 :008    765 :001
590 :090    770 :248
595 :245    775 :255
600 :082    780 :143
605 :215    785 :250
610 :059    790 :042
615 :124    795 :071
620 :061    800 :060
625 :178    805 :119
630 :044    810 :047
635 :040    815 :118
640 :252    820 :192
645 :204    825 :099
650 :152    830 :024
655 :163    835 :161
660 :070    840 :160
665 :101    845 :164
670 :246    850 :125
675 :030    855 :153
680 :209    860 :154
685 :124    865 :149
690 :025    870 :000
695 :118    875 :206
700 :217    880 :213
705 :238    885 :222
710 :190    890 :225
715 :163    895 :085
720 :156    900 :096
725 :028    905 :107
730 :090    910 :105
735 :073    915 :112
740 :141    920 :110
745 :221    925 :117
```

Cylon Zap (64)

```
100 :070    330 :*
125 :054    340 :249
130 :252    350 :221
140 :078    360 :*
145 :200    370 :*
150 :007    380 :058
160 :181    390 :124
170 :172    400 :219
180 :011    410 :005
190 :087    420 :151
200 :155    430 :147
210 :243    440 :239
220 :199    450 :174
230 :028    460 :206
240 :200    470 :136
250 :141    480 :112
260 :069    490 :222
270 :040    500 :141
280 :*      510 :155
290 :012    520 :123
300 :141    530 :242
310 :*      540 :048
320 :*      550 :237
```

```
560 :217
570 :218
580 :040
590 :110
600 :007
610 :239
611 :001
620 :186
630 :098
640 :046
650 :148
660 :212
670 :142
680 :242
700 :104
710 :044
711 :160
712 :099
720 :225
721 :140
730 :227
735 :131
750 :178
760 :253
770 :126
780 :222
790 :128
800 :051
810 :218
820 :110
825 :071
830 :012
835 :176
840 :113
845 :057
850 :162
855 :009
860 :116
865 :065
870 :008
875 :160
880 :055
885 :158
890 :017
895 :120
900 :052
905 :137
910 :030
915 :146
920 :174
925 :113
930 :126
935 :004
940 :153
1000 :000
1060 :184
1070 :231
1080 :165
1090 :239
1100 :098
1110 :194
1120 :202
1130 :115
1140 :146
1150 :017
1160 :247
1170 :020
1180 :181
1190 :097
1200 :147
1210 :049
1220 :057
1230 :057
1240 :068
1250 :106
1260 :207
1270 :210
1280 :213
1290 :216
1300 :222
1310 :227
1320 :232
1330 :237
1340 :167
1350 :034
1360 :183
1370 :039
1380 :175
1390 :245
1400 :177
1410 :241
1420 :012
1430 :136
1440 :202
1450 :130
1460 :246
1470 :103
1480 :173
1490 :222
1500 :166
1510 :247
1520 :199
1530 :054
1540 :032
1550 :083
1560 :100
1570 :253
1580 :205
1590 :023
1600 :033
1610 :163
1620 :097
1630 :250
1640 :202
1650 :023
1660 :250
1670 :061
1680 :113
1690 :000
1700 :199
1710 :112
1720 :244
1730 :053
1740 :108
1745 :121
1750 :175
1770 :183
1780 :130
1790 :123
1800 :169
1810 :194
1820 :211
1830 :226
1840 :190
1850 :017
1860 :128
1870 :220
1880 :150
1890 :082
1900 :064
1910 :216
1920 :172
1930 :157
1940 :250
1950 :223
1960 :125
1970 :197
1980 :017
1990 :128
2000 :190
2010 :002
2020 :179
2030 :239
2040 :094
2050 :*
2060 :165
2070 :000
2080 :028
2090 :183
2100 :231
2110 :156
2120 :165
2130 :042
2140 :220
2150 :137
D2155:*
2160 :090
2170 :043
2180 :248
2190 :224
2200 :092
2210 :134
2220 :071
2230 :161
2240 :251
2250 :206
2260 :165
2270 :234
2280 :158
2290 :015
2300 :023
2310 :236
2320 :205
2330 :177
2340 :169
2350 :072
2360 :134
2370 :023
2380 :067
2390 :158
2400 :148
2410 :033
2420 :036
2430 :185
2440 :032
2450 :080
2460 :003
2470 :006
2480 :061
2490 :096
2500 :204
2510 :087
2520 :*
2530 :127
2540 :203
2550 :205
2560 :078
2570 :209
2580 :175
2590 :226
2600 :196
2610 :076
2620 :184
2630 :045
2640 :057
2650 :063
2660 :061
2670 :068
2680 :104
2690 :171
2700 :129
2710 :134
2720 :175
2730 :215
2740 :218
2750 :221
2760 :224
2770 :227
```

The Beginner's Corner: Keyboard

```
2 :219
3 :067
4 :077
5 :086
6 :203
7 :068
8 :251
9 :073
10 :032
11 :117
12 :046
13 :122
14 :174
15 :169
16 :180
20 :027
21 :125
22 :029
23 :127
50 :075
51 :071
52 :141
54 :199
55 :012
56 :028
58 :172
60 :132
62 :063
64 :141
66 :199
68 :255
70 :213
72 :166
80 :242
90 :017
92 :081
93 :006
94 :001
104 :189
106 :002
108 :082
109 :087
110 :085
111 :048
150 :058
152 :032
154 :*
156 :244
158 :186
160 :117
164 :*
166 :144
168 :046
170 :111
```

September

Demon Star: Main Program (VIC)

```
1 :010
2 :187
3 :068
4 :074
5 :012
6 :057
7 :108
8 :179
9 :162
10 :068
11 :226
12 :068
13 :002
14 :209
15 :073
16 :130
17 :147
18 :249
20 :204
21 :088
22 :142
23 :099
24 :147
25 :013
26 :099
27 :124
28 :140
29 :139
30 :189
31 :234
32 :005
33 :007
34 :094
35 :055
36 :229
37 :228
38 :216
39 :215
40 :202
41 :146
42 :235
43 :083
44 :009
45 :027
46 :186
47 :108
48 :151
49 :082
50 :195
51 :224
52 :087
53 :184
54 :250
55 :036
56 :096
57 :167
58 :065
59 :069
60 :193
61 :033
62 :208
63 :252
64 :026
65 :241
66 :229
67 :018
```

```
68 :113      72 :109
69 :224      73 :088
70 :162      74 :243
71 :023      75 :197
```

Demon Star: Data File (VIC)

```
10 :120      160 :226
20 :247      170 :219
30 :200      180 :235
40 :255      190 :177
50 :012      200 :248
60 :074      210 :115
100 :009     220 :127
110 :183     230 :242
120 :018     240 :043
130 :128     250 :021
140 :066     260 :231
150 :128     999 :130
```

Demon Star (64)

```
90 :230      480 :033
100 :181     490 :032
110 :086     500 :002
120 :080     510 :001
130 :181     520 :048
140 :071     530 :248
150 :221     540 :030
160 :134     550 :083
170 :066     560 :103
180 :164     570 :129
190 :180     580 :073
200 :062     590 :159
210 :123     600 :193
220 :119     610 :175
230 :007     620 :040
240 :250     630 :004
250 :182     640 :137
260 :102     650 :030
270 :161     660 :096
280 :130     670 :130
290 :021     680 :142
300 :003     690 :229
310 :020     700 :239
320 :101     710 :111
330 :139     720 :246
340 :193     730 :111
350 :150     740 :252
360 :198     750 :075
370 :064     760 :219
380 :150     770 :233
390 :175     780 :067
400 :191     790 :107
410 :190     800 :155
420 :035     810 :100
430 :029     820 :008
440 :056     830 :074
450 :101     840 :184
460 :107     850 :190
470 :106     860 :081
```

```
870 :127     1010 :030
880 :028     1020 :088
890 :203     1030 :068
900 :021     2000 :013
910 :132     2010 :142
920 :071     2020 :138
930 :134     2030 :199
940 :233     2040 :143
950 :218     2050 :127
960 :235     2060 :144
970 :187     2065 :098
980 :012     2070 :169
990 :136     3000 :018
1000 :170
```

Potholes: Initialization (VIC)

```
10 :183      130 :004
20 :219      140 :062
30 :023      150 :000
40 :089      160 :063
50 :054      170 :252
60 :035      180 :253
70 :092      190 :254
80 :025      200 :064
90 :005      210 :003
100 :015     220 :098
110 :124     230 :247
120 :204     250 :101
```

Potholes: Main Program (VIC)

```
100 :152     570 :168
110 :057     580 :234
300 :176     600 :047
310 :014     610 :128
320 :019     620 :162
330 :019     630 :198
340 :022     1000 :192
350 :120     1010 :051
360 :170     1020 :130
370 :202     1040 :094
400 :207     1050 :086
402 :051     1060 :195
403 :104     1100 :229
405 :201     1110 :037
410 :185     1120 :164
420 :186     1200 :207
430 :178     1210 :129
440 :170     1220 :041
450 :120     1230 :166
460 :174     1500 :014
500 :045     1510 :156
510 :123     1520 :132
520 :027     1530 :201
530 :214     1700 :010
540 :082     1710 :007
550 :199     1720 :015
560 :003     1730 :103
```

```
1740 :199    6030 :248
3000 :187    6040 :201
3010 :241    6100 :250
3020 :108    6110 :195
3030 :019    10000 :135
3100 :189    10010 :080
3110 :238    10020 :104
3120 :102    10030 :218
3130 :020    10040 :235
3200 :091    10050 :101
3210 :208    10060 :221
3220 :240    10065 :188
3230 :108    10070 :122
3240 :090    10080 :141
3250 :176    10090 :167
4000 :008    10100 :010
4001 :186    10110 :051
4010 :169    10120 :233
4020 :045    10130 :085
4030 :239    10140 :196
4031 :160    10150 :202
4040 :220    10200 :056
4050 :196    10210 :037
4060 :106    20000 :216
4070 :210    20010 :159
4071 :115    20020 :204
6000 :181    20030 :104
6010 :142    20040 :194
6020 :253    20050 :215
```

Potholes (64)

```
70 :190      510 :123
80 :123      520 :027
90 :079      530 :214
91 :179      540 :082
92 :009      550 :199
93 :186      560 :085
94 :074      570 :168
95 :241      580 :125
96 :072      600 :047
99 :058      610 :128
110 :057     620 :162
300 :176     630 :198
310 :011     1000 :192
320 :019     1010 :051
330 :023     1020 :130
340 :024     1040 :094
350 :120     1050 :086
360 :170     1060 :195
370 :202     1100 :229
400 :207     1110 :037
402 :051     1120 :164
403 :104     1200 :254
405 :201     1210 :129
410 :185     1220 :041
420 :186     1230 :166
430 :178     1500 :014
440 :170     1510 :156
450 :120     1520 :132
460 :174     1530 :201
500 :045     1700 :010
```

```
1710 :007
1720 :015
1730 :103
1740 :199
3000 :187
3010 :028
3020 :148
3030 :166
3100 :189
3110 :026
3120 :148
3130 :167
3200 :091
3220 :190
3230 :053
3250 :170
4000 :008
4001 :186
4010 :169
4020 :045
4030 :239
4031 :160
4040 :220
4050 :196
4060 :106
4070 :210
4071 :115
6000 :181
6010 :142
6020 :194
6030 :248
6040 :201
6100 :250
6110 :195
10000 :135
10010 :080
10020 :104
10030 :218
10040 :235
10050 :101
10060 :221
10065 :188
10070 :122
10080 :141
10090 :167
10100 :010
10110 :051
10120 :233
10130 :085
10140 :196
10150 :249
10200 :056
10210 :037
20000 :216
20010 :110
20020 :204
20030 :104
20040 :194
20050 :215
30000 :087
30010 :088
30020 :089
30030 :164
30040 :103
30050 :198
30060 :091
30070 :145
```

Checkbook Reporter

```
20 :066
23 :043
26 :204
29 :084
30 :240
32 :143
35 :187
36 :246
37 :247
38 :173
40 :241
41 :160
42 :243
44 :181
47 :207
50 :028
53 :216
54 :095
55 :061
56 :063
57 :101
58 :103
71 :138
74 :022
77 :146
80 :201
83 :035
86 :056
89 :150
90 :147
91 :209
92 :027
96 :252
97 :240
98 :063
101 :188
104 :255
107 :182
110 :026
113 :162
116 :046
119 :040
122 :194
125 :109
128 :114
131 :*
134 :219
137 :099
140 :092
143 :191
146 :025
149 :010
152 :042
153 :138
155 :102
158 :070
161 :029
164 :034
167 :075
170 :018
173 :123
176 :064
179 :221
182 :058
185 :234
186 :100
188 :085
191 :077
194 :084
197 :085
200 :144
203 :102
206 :085
209 :108
212 :181
215 :119
218 :017
221 :214
224 :205
227 :160
```

States & Capitals Tutor: Main Program

```
5 :149
10 :033
15 :019
20 :212
25 :082
30 :236
35 :240
40 :011
45 :097
48 :231
50 :168
55 :218
60 :105
65 :150
70 :241
100 :209
105 :122
110 :013
115 :255
120 :218
125 :102
130 :024
140 :216
145 :121
150 :069
155 :107
170 :199
175 :184
180 :010
185 :015
190 :215
195 :130
200 :026
205 :198
210 :095
220 :145
225 :008
230 :039
235 :102
250 :204
255 :141
260 :241
300 :117
305 :010
310 :085
315 :108
320 :059
325 :089
330 :193
335 :089
340 :097
400 :001
405 :054
408 :056
410 :077
415 :060
430 :063
435 :018
440 :251
445 :093
450 :059
```

October

Aardvark Attack

```
10 :121
12 :138
14 :006
15 :251
16 :173
18 :134
19 :004
20 :097
22 :133
23 :073
24 :245
25 :189
30 :003
32 :183
40 :006
45 :220
48 :186
50 :077
53 :220
J55:
58 :246
60 :214
63 :241
70 :063
72 :233
74 :249
80 :024
82 :139
84 :057
86 :185
90 :167
98 :229
99 :026
100 :074
105 :131
110 :119
120 :186
130 :082
140 :122
150 :210
160 :254
170 :086
180 :011
190 :075
200 :041
210 :176
220 :110
221 :189
222 :034
223 :134
230 :099
240 :126
250 :201
260 :234
280 :225
299 :027
300 :097
319 :088
320 :117
321 :095
322 :115
323 :135
324 :133
326 :026
328 :063
800 :182
801 :130
805 :203
810 :025
815 :088
820 :136
825 :127
898 :128
899 :031
900 :160
910 :193
920 :029
925 :193
930 :114
940 :119
950 :024
955 :009
960 :248
961 :066
970 :128
994 :070
995 :123
999 :139
1000 :090
1001 :066
1002 :075
1003 :026
1004 :042
1200 :218
1210 :202
1220 :146
1230 :125
1240 :026
1250 :050
1260 :025
1270 :195
1280 :171
```

Word Match (VIC)

```
1 :190
2 :243
3 :163
4 :139
10 :104
12 :192
13 :111
20 :028
30 :074
32 :207
33 :152
35 :024
36 :191
37 :144
38 :021
39 :232
40 :067
41 :123
42 :227
43 :084
44 :087
45 :168
47 :124
50 :223
51 :217
52 :236
53 :201
54 :124
```

```
 55 :077      153 :112
 56 :013      154 :026
 60 :084      155 :098
 62 :199      156 :103
 64 :214      160 :231
 66 :191      162 :100
 70 :149      200 :214
 71 :176      205 :135
 74 :238      210 :056
 80 :072      211 :185
 81 :102      212 :189
100 :143      215 :003
105 :092      220 :178
110 :226      225 :018
115 :218      230 :072
117 :022      231 :015
120 :087      232 :078
121 :080      235 :086
122 :189      237 :242
123 :055      238 :212
124 :238      240 :097
125 :060      300 :216
126 :097      305 :175
127 :199      306 :004
128 :065      307 :159
129 :247      308 :161
130 :186      309 :165
131 :239      310 :052
132 :015      311 :037
135 :130      312 :233
136 :037      314 :102
137 :020      400 :112
138 :015     1000 :016
139 :220     1005 :155
140 :069     1040 :100
150 :083     1050 :200
151 :165     1060 :068
152 :249     1065 :069
```

Word Match (64)

```
100 :009      250 :118
110 :254      260 :174
120 :073      270 :022
130 :155      280 :186
140 :212      290 :138
145 :252      300 :210
150 :161      310 :165
160 :039      320 :015
161 :048      330 :009
162 :160      340 :028
163 :103      350 :249
164 :063      360 :172
165 :243      370 :125
170 :127      380 :061
180 :*        390 :138
190 :204      400 :253
200 :066      410 :001
210 :019      420 :011
220 :186      430 :197
230 :*        440 :224
240 :018      450 :028
460 :122      831 :052
470 :*        832 :162
480 :154      833 :155
490 :099      834 :245
500 :229      835 :108
510 :217      836 :247
520 :163      837 :107
530 :092      838 :002
540 :146      840 :193
550 :199      850 :197
560 :065      860 :009
570 :253      870 :189
580 :065      880 :025
590 :154      890 :181
600 :200      900 :018
610 :066      910 :178
620 :253      920 :087
630 :196      930 :254
640 :247      940 :212
650 :020      950 :108
660 :133      960 :228
670 :186      970 :183
680 :023      980 :012
690 :018      990 :167
700 :214     1000 :199
710 :079     1010 :203
720 :131     1020 :099
730 :136     1030 :084
731 :051     1040 :075
732 :165     1050 :195
733 :099     1060 :172
734 :106     1061 :096
735 :253     1062 :211
740 :252     1063 :146
750 :115     1064 :060
760 :029     1065 :172
770 :101     1070 :015
780 :106     1080 :166
790 :243     1090 :110
800 :102     1100 :201
810 :221     1110 :200
820 :138     1120 :064
830 :046
```

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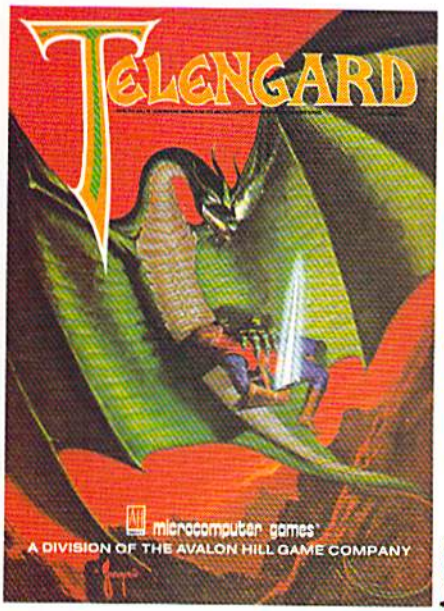

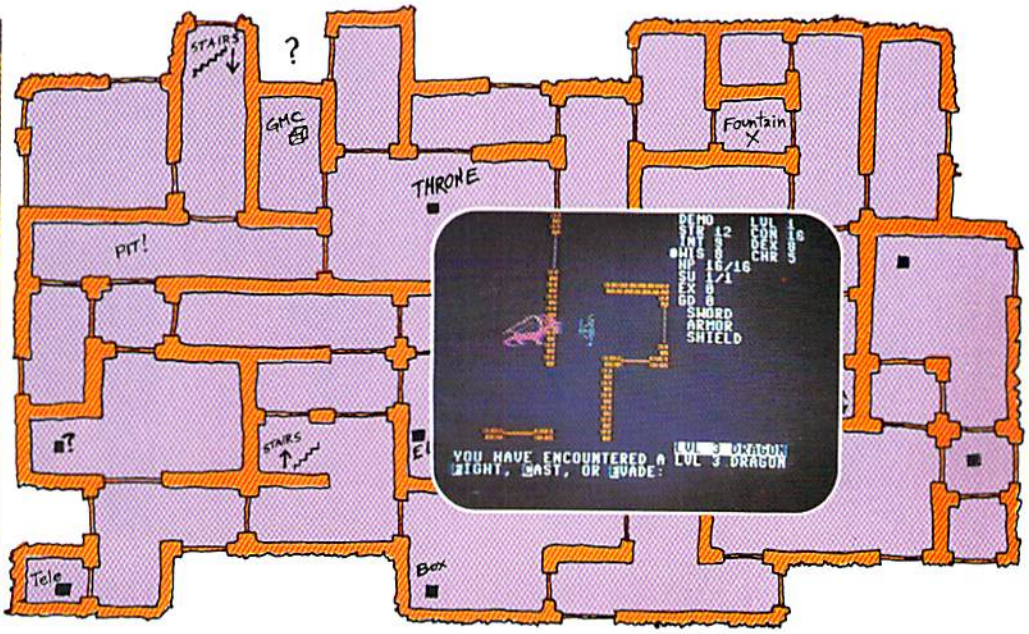

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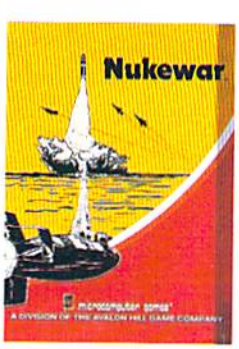

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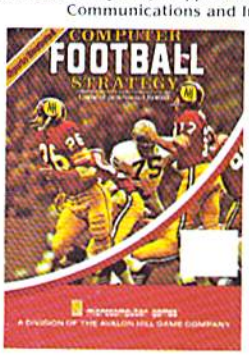

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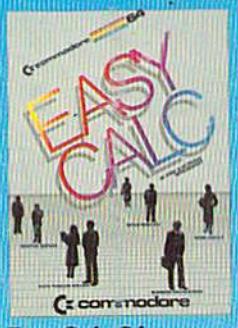

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