The Commodore 64 & VIC-20 Magazine

Program of the Month—
Print Your Screen

RUN

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A CWC/I Publication
December 1984

TRIVIA
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—How Much Do You Know?
—It's Puzzling

Shopping for Software
—Over 200 Companies Listed
—Which Program(s) To Select
—How to Buy More For Less

Spotlight on Productivity—Plus/4 Word Processing

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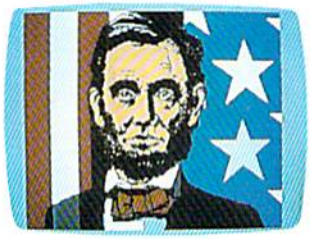
"Doodle! is a good value with a wide range of features. It'll show you a lot about the graphics capabilities of your Commodore 64."—RUN



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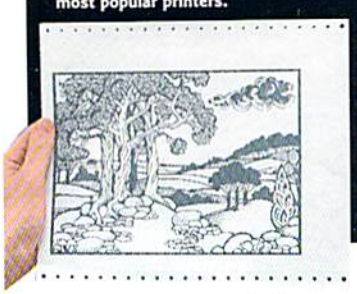

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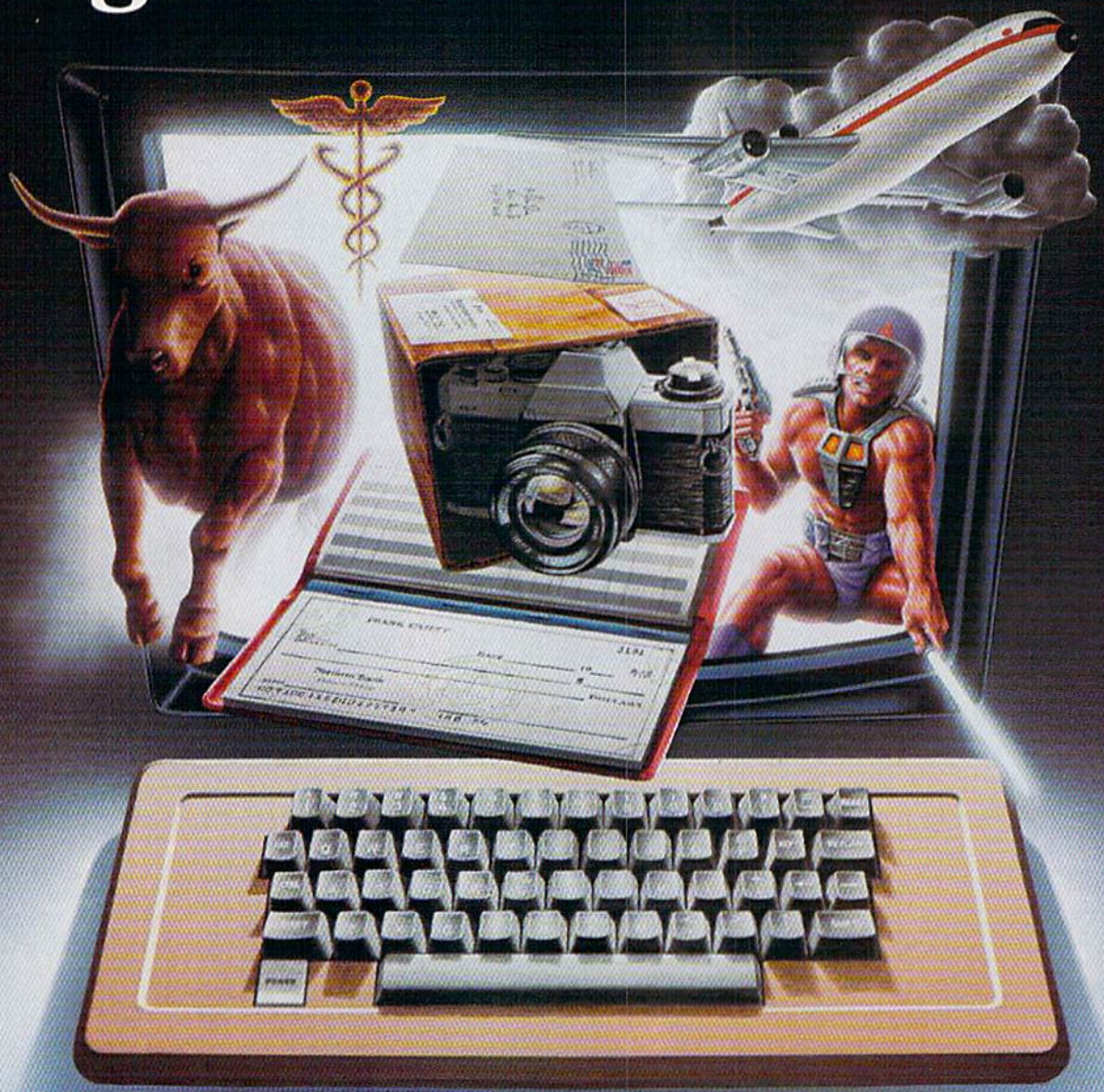

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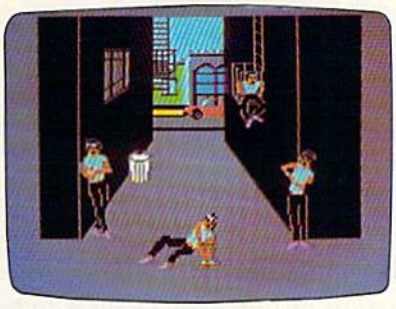

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December 1984
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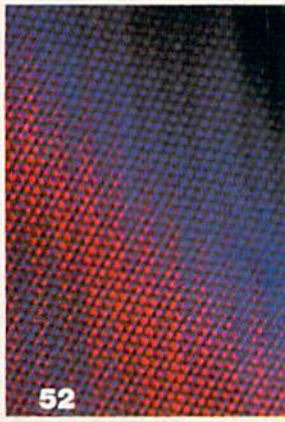

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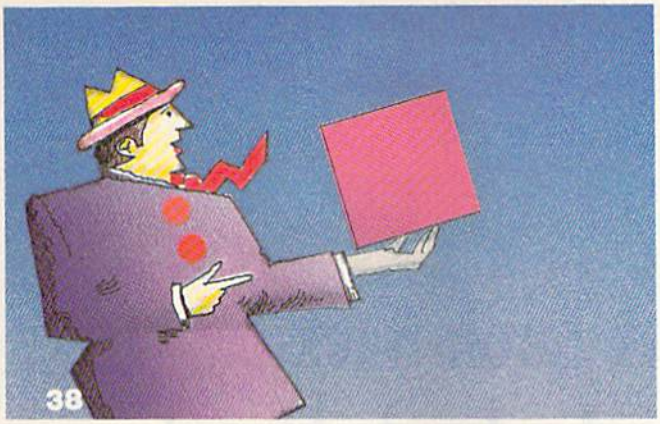

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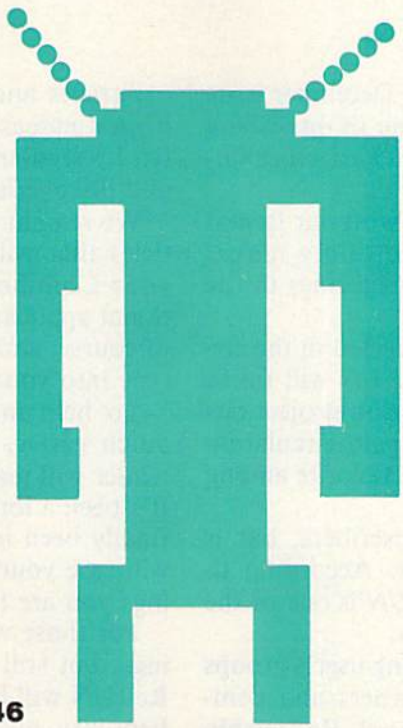

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A Look Back... And a Look Ahead

It's the end of the year, and this December issue marks the completion of the first year of publishing *RUN*. It's been a hectic year, but an altogether satisfying one.

We're capping off this first year with our largest issue to date—224 pages. This certainly makes *RUN* one of the fastest-growing magazines in the marketplace.

Its spectacular success is also reflected in the circulation growth of the magazine. *RUN* will finish the year well in excess of its circulation projections for 1984, as we close in on a net paid circulation figure of 200,000. *RUN* is a proven favorite among Commodore owners.

RUN has done well among subscribers, but is also a big hit on the newsstands. According to *RUN*'s newsstands' distributor, *RUN* is one of the hottest-selling computer magazines.

RUN is enjoying popularity among user's groups and clubs, first-time computer owners and computerists in both the home and school. Readership surveys indicate that the typical *RUN* reader is actively involved in computing, and makes use of *RUN* magazine each month for new ways to use his/her Commodore computer.

During this first year, we have received many comments from our readers, and have had an opportunity to meet many of them—in person, over the phone lines and through correspondence. We are grateful for your interest and thank you for your support.

In the coming months of 1985, you can look forward to more of the features you have come to expect and enjoy during this first year. The popular Magic and Commodore Clinic columns will return, along with new columns that will explore the sound/music and graphics capabilities of your Commodore.

We will continue to keep you informed about the latest products being developed for the Commodore with reviews and buyer's guides that take a look at new software and hardware that manufacturers are introducing.

Articles and programs will feature some of the biggest names in the industry, as well as those written by regular readers who share their tribulations and discoveries in the pages of *RUN*.

We remain committed to bringing you useful articles that will help you get full enjoyment from your Commodore—tutorials, home and educational applications, programming techniques, and, of course, games and application programs you can type into your computer and use.

To help make typing in program listings that much easier, the long-awaited checksum/proofreader will make its debut with the February issue. It's been a long time coming, but all the bugs have finally been ironed out, and this checksum reader will ease your mind about the accuracy of the listings you are typing.

For those who would rather not type in the listings, but still want to make use of the programs, ReRUN will be beefed up in 1985. Beginning with February, and continuing on a bimonthly basis, we will be offering your favorite published programs on cassette and disk.

In addition, with this December issue, you will notice that there are some design changes taking place in the magazine. Through the next few months, we will be incorporating some type and layout changes to give the magazine a cleaner look and make it easier to read and use.

We have also included a new logo and, beginning with the January issue, a new subtitle ("The User's Guide to Commodore Home Computing"), which, we think, succinctly captures *RUN*'s niche in the marketplace.

In 1985, we will continue to rely on our readers' input to make *RUN* an even better magazine. By keeping the lines of communication open, we will have a better feel for what our readers want in a Commodore home computing magazine. We look forward to serving you throughout the coming year.

Happy holidays and happy computing.

db

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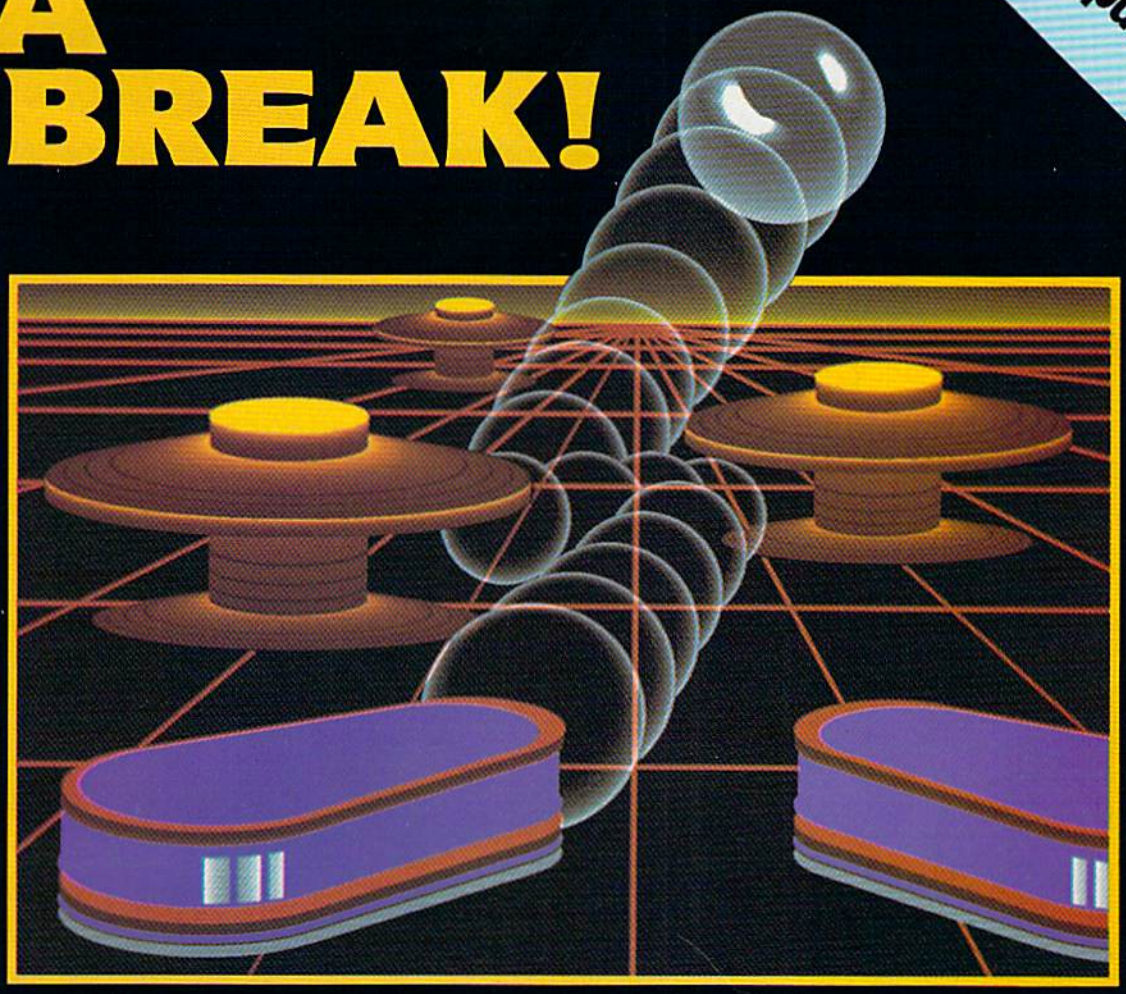

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Magic

Compiled by Louis F. Sander

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

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

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

Send your own tricks to:

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This month's bag holds a dozen printer tricks, plus baker's dozens more on Basic statements and commands. Given our powers of prescience, we *know* you'll like them.

Our staff of Magical Beings is working double overtime, materializing copy for next month's special *RUN*. It's Issue 13, a number with special significance in our realm. And it's really a work of magic, featuring every one of 1984's tricks, plus hundreds of new ones, all indexed for easy reference—a useful collector's item if ever you've seen one.

On a more timely note, Trondheim, our Typesetting Troll, visited her cousin at the North Pole last week, and you wouldn't *believe* what she saw. Santa, long a Commodore and *RUN* fanatic, has *tremendous* things in store for our readers. He knows every name on *RUN*'s mailing list, and come Christmas Eve, he's vowed to bless his kindred spirits. We've promised not to tell who's getting what, but the size-60 stockings won't hold the hardware that some of you are about to receive. And software! Two major disk houses have been sending all their production Santawards since July! Santa's copy shop, in Singapore (the North Pole's a *lousy* magnetic environment), is cranking out unprotected software at a rate you wouldn't believe. All in all, Christmas morning should be the biggest computer event since Babbage was in baby clothes.

But enough of the news from the Northland; it's time to start computing. Before you try the tricks, take time for our holiday wish: Peace on Earth, good will to men. And from all the folks at Magic, to our readers around the world—Merry CHR$(ISTMAS) and Happy New Gear!

$13D Printer switches—When you set up a non-Commodore printer to work with your Commodore system, two things are important. First, your interface must allow full emulation of all the Commodore printer commands; most of the available interfaces do this with no problem. Second, the little DIP switches on the interface *and* on the printer must be properly set.

The interface switches are often properly set at the factory and are usually well covered in the documentation. The printer switches, however, often are *not* set properly for your Commodore, since most printers are made to function with a more industry-standard type of interface. The printer manual usually tells all about the DIP switches and their function, but the information may be hard to dig out. Just persevere, and everything will work out in the end.

Tom Rohrer
Dimondale, MI

$13E What *are* DIP switches?—Most printers and interfaces, as well as many other computer peripherals, have a group of DIP switches to configure them for different types of operation. These are tiny switches, often seen in groups of eight or so, that must be set with a penpoint, paperclip or other small instrument. Usually their settings determine the behavior of the device when power is applied—in the case of a printer, one of the DIP switches may determine the number of characters per inch, and another may determine whether or not the printer requires a separate linefeed character to advance the paper.

The various switch settings are always covered in the manual, but the brief descriptions can be cryptic to the newcomer. Often, the parameters that the DIP switches control can be changed later under software control, say by sending a special control character to the printer.

People often wonder why they're called DIP switches. It's because they are made with the same pin size and spacing as IC chips—they'll fit perfectly into standard IC sockets. The standard IC pin scheme, a dual line of precisely spaced connections, has a name. It's called the Dual In-line Package, or DIP. Since the switches are made to the same measurements, they've taken on the name.

Matthew A. Henson
Maryland

$13F Printer paper holder—You can have a very attractive and efficient paper feeder for your printer by buying a plastic in/out basket from an office supply store. Simply put its opening towards the back of your desk and set your printer on top of the basket. Put your fanfold paper in the basket and feed it up to the printer. The paper will unfold itself, page by page, as the printer needs it. I bought my basket in a smoke color, which matches my printer's dust cover.

Ron Reynolds
Sylvania, OH

$140 Paper jam hint—When your printer paper jams, spray some silicone or teflon lubricant in the paper-feed pathway, then slide some paper through to clean off the excess. It will help your paper feed smoothly without binding.

Tom Hoppe
Spokane, WA

$141 Tearing printer paper—When I try to tear the paper off my printer, sometimes I get a sloppy edge, or even half a sheet of paper, crudely ripped down the middle. To solve the problem, I took the metal cutter off a box of aluminum foil, leaving some of the cardboard attached, and glued it to the back cover of my printer. It gives me a neatly torn edge every time.

Signature illegible
ZIP code 14864

$142 Extending ribbon life—Printers like the Commodore 1525 use a ribbon cartridge that inks itself as it goes. If you print a lot of graphics or reverse field characters, the inking process can fall behind, leaving you with very light print. The following program runs your ribbon continuously without printing anything; after five minutes or so of this activity, your ribbon should be thoroughly inked. If you do this from time to time, the ink may last as long as the ribbon.

```
1 OPEN 4,4
2 PRINT#4,CHR$(15)"[38 spaces]";
3 PRINT#4,CHR$(15)"[38 spaces]"CHR$(8) : GOTO 2
```

Donald H. Butler
Waterford, PA

$143 Ribbon reinking—Some of you have recommended reinking printer ribbons as a money-saving measure,but it could ruin your printhead. Many stamp pad inks contain microscopic abrasive particles that can cause more damage than I like to think about. You should use ink

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that is made *only* for a dot-matrix head; this type has a lubricant in it to reduce wear.

Joseph H. Walters
Bellflower, MO

$144 Easy printer listings—I use this routine at the end of any long program I'm working on. It lets me do a hardcopy listing just by typing RUN10000. When the listing is finished, I just press the return key to disable the printer.

```
10000 PRINT "[SHFT CLR][CRSR DN]PRINT#4:CLOSE4[CRSR UP]"
10010 OPEN4,4:CMD4:LIST
```

Charles Christensen
Aurora, IL

**$145 Printer listing hint**—If you're having problems getting your non-Commodore printer to produce the reverse field heart symbol and other cursor control graphics, there is an alternative. Instead of using those graphics in your program, use their CHR$ codes instead. The code for Clear Screen is CHR$(147), and no printer will have difficulty duplicating it in a listing.

Paul West
Portland, OR

$146 RS-232 printer tips—Most printers that use Commodore's built-in RS-232 interface work fine for program listings, but using them in a program is a different story—they don't work well unless you follow a few guidelines.

First, if CLR is used in the program, it should be used before the printer channel is open; unfortunately, CLR closes the printer channel, and trying to access the printer will give a Device Not Present error.

Second, the first line of your program (or after the CLR) should open the RS-232 port to include the baud rate. This information should be found in your printer manual.

Third, don't close the printer channel until you want to end the program.

Chris Poole
Niceville, FL

$147 Working with CHR$ codes—Any CHR$ code, or any combination of codes, can be assigned to an ordinary string variable. Doing this often makes it much easier to use the codes in programs. For example:

```
100 CS$=CHR$(147) : REM CLEAR SCREEN
200 PRINT CS$ "HELLO"
```

The string-based codes can also be sent to any peripheral device, for example:

```
400 SO$=CHR$(14) : SI$=CHR$(15) : CR$=CHR$(13)
410 OPEN 4,4
420 PRINT#4,SO$"DOUBLE WIDTH PRINTING"
430 PRINT#4,SI$"NORMAL PRINTING"
440 PRINT#4,CR$
```

They can also be used together:

```
500 ES$=CHR$(27) : A$=CHR$(0) : B$=CHR$(1)
510 PRINT#4,ES$"W"B$"DOUBLE WIDTH"
520 PRINT#4,ES$"W"A$"NORMAL WIDTH"
```

And they can be concatenated:

```
600 DW$=ES$+"W"+B$ : NO$=ES$+"W"+A$
610 PRINT#4,DW$"DOUBLE WIDTH"
620 PRINT#,NO$"NORMAL PRINTING"
```

These CHR$ codes and combinations are given as examples, and might not work on your printer. The technique, however, will work with all combinations and peripheral devices, as well as on the computer alone.

Allen Ross Brier
Houston, TX

$148 For...Next hint—When breaking out of a For...Next loop before it is completed, you should terminate the loop by setting the index variable to its highest value, then branching to a Next statement. Failure to do this can cause problems such as unexpected Out of Memory errors. Here's a short program demonstrating the technique:

```
100 DIM A(100) : A(50)=2
110 FOR X=1 TO 100
120 IF A(X)>0 THEN PRINT X,A(X) : X=100
130 NEXT
140 PRINT "FINISHED"
```

John Belmonte
Chicago, IL

$149 VIC and the 1526 printer—The 1526 often hangs up in mysterious ways when used with the VIC. To cure the problem, enter SYS 64490, which changes the timing on the serial port to match that of the C-64. Without the SYS call, the VIC sometimes fails to recognize the presence of the printer, hence the Device Not Present message.

Howard M. Mesick
Hartley, DE

$14A Dynamic keyboard explained—It's easy to make a program simulate keypresses, with truly magical effect. The technique has been around since at least 1978, and it's commonly called *dynamic keyboard*. The basic idea is to have your program Poke the CHR$ values of one or more characters into the keyboard buffer area of memory. When the program is finished, the computer will print the Ready prompt, then respond as though you've *typed* the Poked characters.

The keyboard buffer occupies the ten memory locations from 631–640 decimal. It works in conjunction with location 198, which must always hold a count of the characters Poked into the buffer. Run the following little program to see the principle in action.

```
10 FOR I=1 TO 10 : POKE 630+I,65 : NEXT : POKE 198,10
```

You should get the Ready prompt, followed by a series of ten A's (CHR$(65) is A). Change the 65 to 64+I, and you'll get the first ten characters of the alphabet. Change the 10s to smaller numbers, and you'll get fewer letters.

Dynamic keyboard's *real* magic comes when your program prints an executable statement on the screen, then makes the Ready prompt appear on the line above it, so the cursor ends up on the executable line. If the buffer holds a 13, it's just like putting the cursor on that statement and hitting the return key; your computer will do whatever the statement tells it to do.

Continued on p. 188

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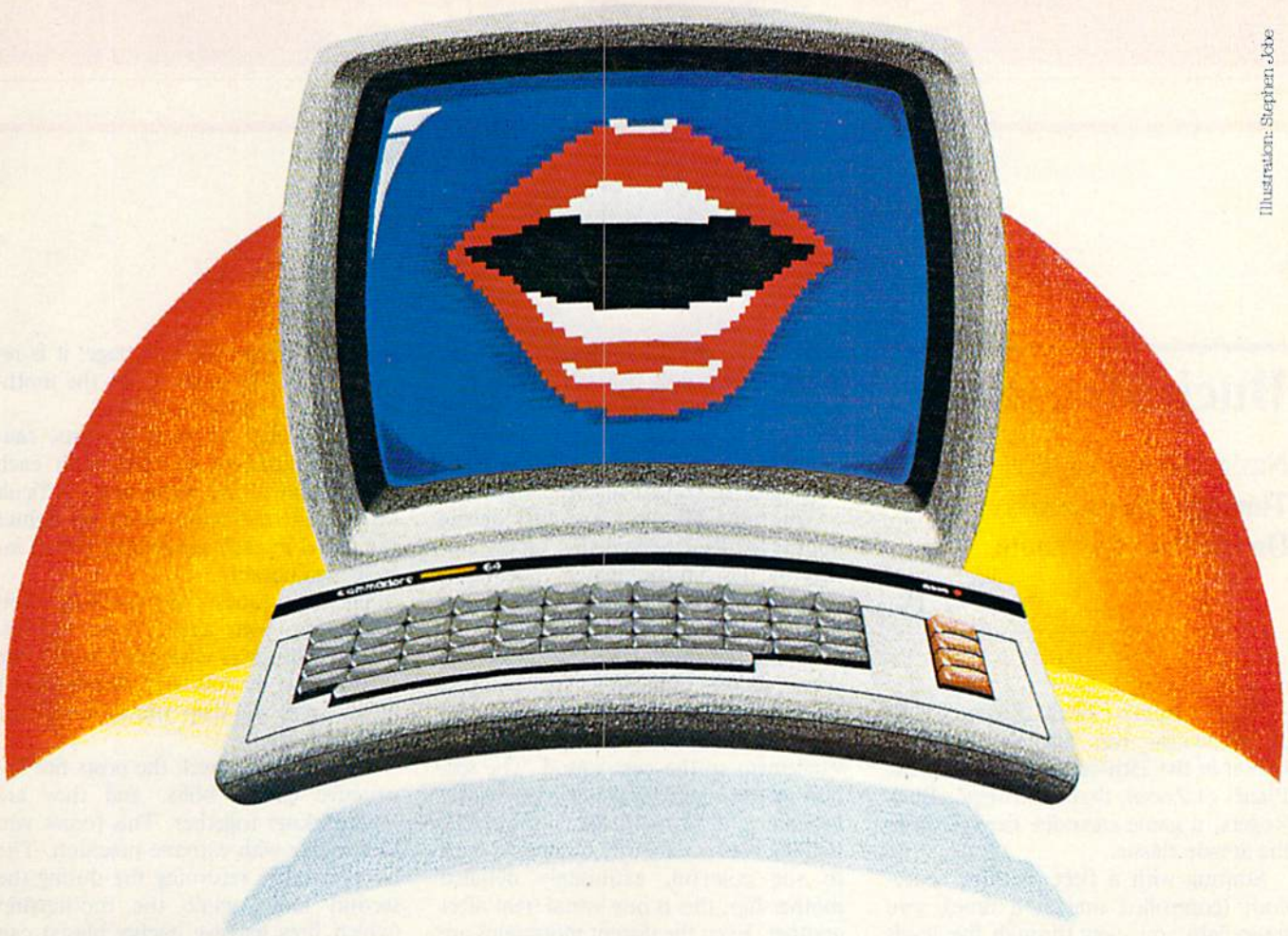

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Compiled by Shawn Laflamme

Buck Rogers

Navigate Your Fighter Through Alien Hordes On the Planet of Zoom

B

As Captain Buck Rogers, C-64 owners can navigate an agile fighter in the 25th-century battle for the Planet of Zoom, thanks to Sega's Buck Rogers, a game cartridge derived from the arcade classic.

Starting with a fleet of three spacecraft (controlled one at a time), you must fight your way through five levels of action while trying to destroy (or sometimes avoid) fatal combinations of electron posts, flying saucers and space hoppers before attempting to defeat the powerful mothership. Each difficulty level contains four rounds.

You can choose either joystick or keyboard control as you enter the interstellar fray. The fire button or spacebar activates your only offensive weapon—a forward-firing cannon of incredible power, but limited range. Without a doubt, the joystick is far superior to the keyboard for controlling your ship.

You must complete your task before depletion of the limited fuel supply carried by the nimble fighter. The faster you move your ship, the less fuel you will use. What an incentive!

The upper portion of the screen displays score, remaining fuel supply, number of reserve craft and enemies that must be vanquished before advancement to the next round. The section of the screen displaying the battleground is a hi-res delight. From the flaming rocket exhausts of Buck's craft to the colorful, exquisitely detailed mothership, this is one visual treat after another. Even the distant mountains are outlined and highlighted in painstaking detail.

The screen scrolls forward as you travel. This effect is accomplished with horizontal bands, which rotate toward the foreground. No matter how fast or how far you travel, the mountains never appear any closer. A short musical score announces the title page; it is repeated for your victory over the mothership at the end of each level.

The number of electron posts, saucers and hoppers increases with each round. Play is also made more difficult because the minimum speed the fighter can travel in each succeeding round increases noticeably.

The alien saucers are deadliest when overtaking your craft from behind. Proper altitude is vital here. Watch the shadow cast by your ship on the planet below—this will help you to determine your altitude.

After the first level, the posts fire destructive energy bolts, and they are spaced closer together. This forces you to navigate with extreme precision. The hoppers begin returning fire during the second level, while the mothership (which fires massive energy blasts) can only be destroyed by a dead-center cannon blast. Destroying the mothership is the culmination of a level, giving you a 20,000-point bonus, another reserve ship and a full load of precious rocket fuel.

Report Card

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

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

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

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

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

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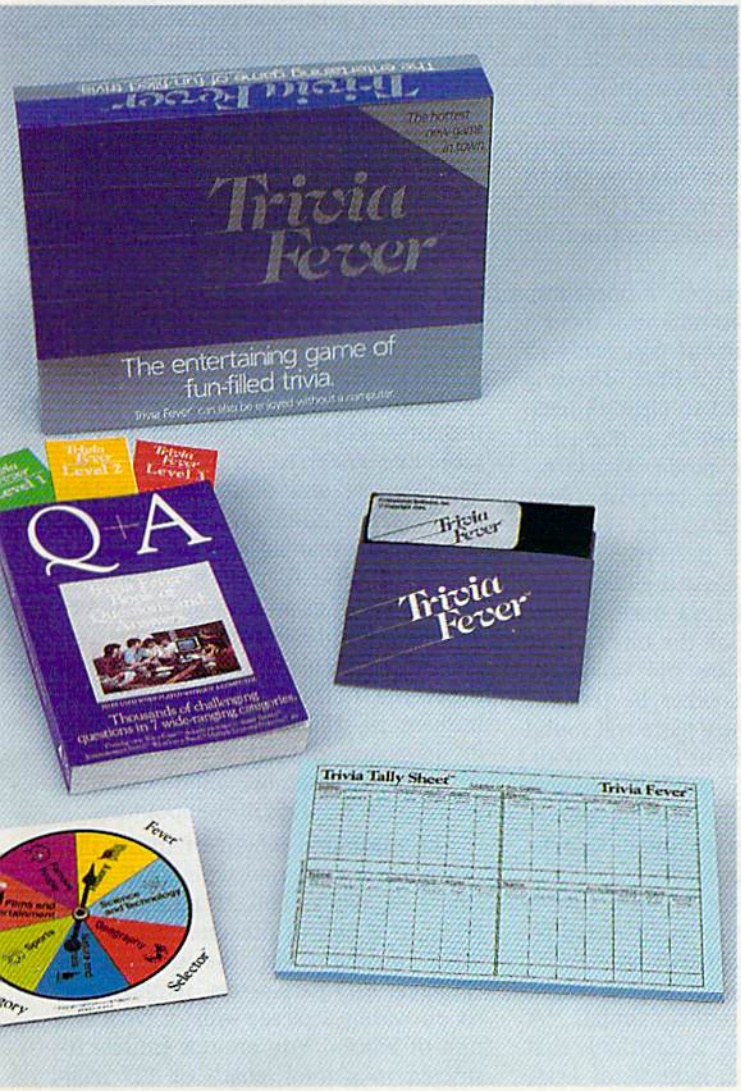

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While the graphics are eye-popping, the gameplay is a bit off the mark. There's plenty of action, but disaster strikes too suddenly. At times, it can be difficult to distinguish depth on the simulated 3-D battlefield. Though the action is somewhat disjointed, Buck Rogers offers tremendous challenge and enjoyment. *(Sega Consumer Products, 360 N. Sepulveda Blvd., Suite 3000, El Segundo, CA 90245.)*

Ted Salamone
Bridgeport, CT

Master Composer

This Music Utility Lets You Unlock the Power Of Your C-64's SID Chip

Master Composer, from Access Software, is a disk-based, copy-protected program that allows you to create musical compositions on your Commodore 64. These pieces can be played while a score appears on screen, or by a SYS command to a memory location while other activity (such as Basic programming) is taking place.

The program assumes that you are cognizant of the fundamentals of musical notation and theory—this is not a musical tutor. It also assumes familiarity with various aspects of the C-64's SID chip, such as waveforms, ADSR, synchronization, ring modulation and filters. An appendix to the program's manual gives rudimentary information about the principles of sound waves.

With the C-64's three voices, Master Composer does its job well, but I get the impression that this is a program for a person who likes to sleep in only one position. In other words, the program has limitations that can cause difficulty for someone who wants to use it for applications that are just a bit out of the ordinary.

The program is divided into two modes—Input mode, where music is created and edited on a score-like chart, and Programming mode, where various decisions are made about SID chip-related parameters relating to the Input mode work-in-progress.

After overcoming a few preliminary obstacles, creating music is relatively easy.

The Programming mode is also where completed pieces can be viewed on four staves representing not only treble and bass clefs, but also two clefs for the notes above and below these. One feature I don't like about the music's performance here is that the screen is not erased when something new begins at the left margin—instead, the new notes write over any old ones from the previous screen.

When Master Composer is booted up (which takes over two minutes), there is a piece of music present and ready to play—Beethoven's Fur Elise. Pressing the C key is supposed to clear all measures at this point—which it does, but only from the Input mode. The information about voices, tempos, filters and so on is still present in the Programming mode for the Beethoven piece. This also has to be cleared away, again by pressing C, which now means "close block." Even when all the blocks have been closed, there are still values remaining. These can either be retained (in which case, the new piece will sound like the beginning of Fur Elise) or modified. Also, one of several pre-programmed "voices," such as piano, French horn, banjo or oboe, can be called up and used instead.

This seems like a lot of hassle just to get started. It is further complicated by inputting the time signature after the C key clears all measures in the Input mode. According to the manual, "A legal Time Signature is anything that works out to an even multiple of 1/16, up to 16/16. For example, 3/8, 4/4, 5/16 and 2/2 are legal Time Signatures, while 3/7, 5/4 and 6/16 are not." Apparently, the programmers aren't aware that 5/4 *is* a legal time signature (e.g., Tchaikovsky's 6th Symphony, 2nd movement), as are tempos such as 9/8, 12/8 and 11/4. The manual says nothing about how to create such an unusual tempo.

Once a time signature is established, it isn't possible to change it without going through equally complicated maneuvering. This eliminates a lot of 20th-century music from Master Composer's repertoire—some of Bartok's and Stravinsky's music changes time practically every bar!

Another problem which must be overcome before any music can be created with Master Composer is the key signature. This is preselected by pressing the K key, which brings up another menu where you can choose either C major (no sharps or flats) or keys that have up to five sharps or six flats. Obviously, someone forgot about C flat major (seven flats), F sharp major (six sharps) and C sharp major (seven sharps). These keys may be very rarely encountered, but what if someone wants to use them? A piece in C sharp major would have to be transposed into D flat major (which is the same thing)—a truly brain-bending task.

After overcoming these preliminary obstacles, I found creating music (using the cursor keys to put notes on the four score-like grids) to be relatively easy. The smallest unit of tempo is a 16th note, which could prove restricting, though the manual explains how to overcome this. A passage with 32nd notes (again, not an unusual occurrence in music) can be created by using two bars with 16th notes and then doubling the tempo for those two bars alone. The business of triplets (three notes played in the space of two) is only cursorily covered in the manual, and no examples are referred to. This is disappointing.

The maximum length of music that can be created at one time is 127 measures, 64 blocks, or 23 pages. Block refers to a unit of measures (or even a single measure) for the purpose of changing SID parameters, tempos, and so on within a piece, while a page is a unit of blocks. You are not entirely restricted to a total length of 127 measures, since longer works can be created in several parts and then loaded into

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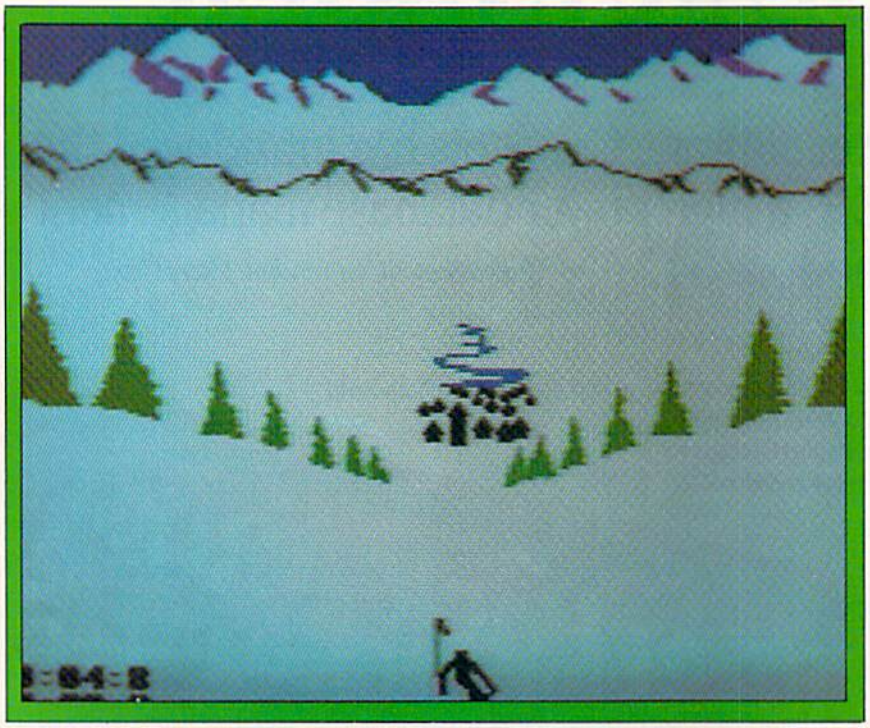

specific memory areas, to be played sequentially.

This last feature allows you to load a piece to a memory area of the computer without even using Master Composer. Type a SYS command (usually SYS 30120), and the music will play while you go about other activities (though running a program or loading from disk causes the music to pause). You could also use this procedure to create pieces of music for use in other programs, which could then be accessed by the SYS command.

Although the manual suggests it is possible to duplicate blocks that have already been created and move them from one place to another, there is no append feature in the Input mode. Loading one piece into memory wipes out what was already there.

Included with Master Composer are other pieces in addition to Fur Elise: *Bill Bailey*, *Maple Leaf Rag*, *The Entertainer*, Donna Summer's *She Works Hard for the Money* and a movement from one of Bach's Brandenburg Concertos.

One interesting feature of Master Composer is the ability to dump screens from both the Programming and Input modes to a printer, which works very well. It should be noted that the "score" in this case does not look like normal music, but it is quite easy to follow once you are familiar with the program's system of notation.

A backup disk is available by sending in the warranty, and damaged disks can be replaced, both for an additional charge. *(Access Software, 925 East 900 South, Salt Lake City, UT 84105. $39.95.)*

Michael Quigley
Vancouver, BC, Canada

Slalom!

World-Class or Novice, You Won't Break a Leg On These Slopes!

C

Skiing is big business in the U.S.A., so it makes sense that virtually every home computer system has, or will eventually have, a program that lets you wax your skis and hit the slopes without leaving the comfort of the ski lodge.

Slalom! for the Commodore 64 was designed with the assistance of some serious, world-class skiers. Their input is evident in some aspects of this game.

In this race against time, skiers must suit up to run the course as quickly as possible. There are no cozy lodges with warm fireplaces, though there is a rather attractive, silhouetted village in an alpine valley, serving as a depth-producing backdrop.

Viewing the on-screen skier (in a manner reminiscent of the race car driver's perspective in Pole Position), you must maneuver him around the slalom poles while avoiding the patches of ice and the occasional rocks strewn about the course. This slope is certainly not of Olympic quality.

You can jump over the obstacles (by pressing the fire button) or just go around them. More time is lost through avoidance, so timing and agility are important for success.

Crashing into anything, including a gate, adds penalty seconds to your score. If you pass two poles on the same side, your skier must complete the run, even though he has been disqualified with a run time of 9:99:9.

Tilting the joystick right or left moves the skier accordingly. Ninety-degree turns stop him in his tracks. Pushing the stick forward gives him speed; pulling it back slows him down.

There are five courses in all, though they don't appear very different from each other. The same village, pine trees and distant mountains are all viewed in exactly the same perspective. The increase in challenge comes from the slightly more numerous hazards, as well as the wider placement of the gates. Acceleration is also faster on the more difficult courses, though this can be eased through extensive use of the joystick braking feature.

Perspective is the key factor in making this game as good as it is. The on-screen figure shifts his body weight and falls like a real skier. The effect of speed is achieved with a line of bright green conifers running along both sides of every course. They flash by in a fluid blur, similar to the appearance of the roadside from the window of a car traveling 80 mph.

As you guide your skier horizontally, the line of trees shifts in one direction, and the exquisite mountain background shifts in the other. In the dead center of the screen lies the village. This skewing

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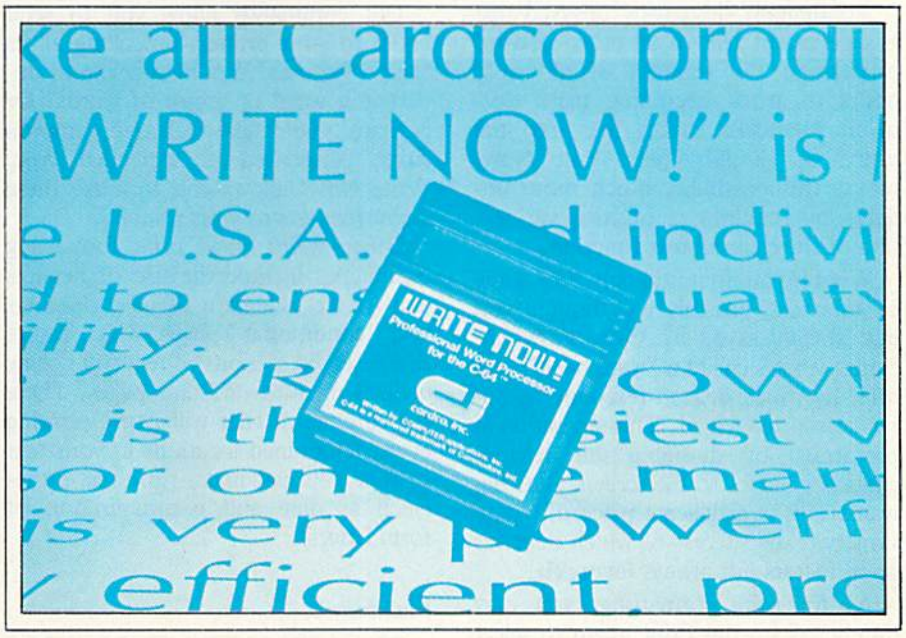
provides a great simulation of extensive lateral movement. The combined effect of forward progress and lateral movement creates a realistic feeling.

In spite of the exciting features, there is still something lacking in Slalom! There isn't enough variation between the slopes, for one thing. As a matter of fact, the supposedly difficult slopes have fewer gates, so my best scores were achieved on these runs. Secondly, the lack of a counter depicting the number of gates past or remaining always leaves you wondering just how close you are to the finish line.

A catchy song, or even a second screen, would have helped. Despite the exceptional visual effects, Slalom! is not an exceptional game. *(Tronix, 8295 South LaCienega Blvd., Inglewood, CA 90301.)*

Ted Salamone
Bridgeport, CT



Write Now! and Mail Now!

For Business or Personal Use, These Cartridge-Based Programs Aren't Short on Features

B

Write Now!, by Cardco, is a powerful, yet inexpensive, word processor for the Commodore 64. A plug-in cartridge, it loads instantly, and it's easy to use. The program has a collection of features usually reserved for programs priced two to four times higher. It can also be interfaced with Mail Now!, Cardco's mailing list processor.

Write Now!

Any word processing software is only as good as its supporting documentation. Write Now!'s instruction manual is easy to read and well organized, with a table of contents and an almost exhaustive index, providing you with every imaginable cross-reference to topics.

Although I highly recommend that you read the manual thoroughly, Write Now! also includes five help screens, available to you for quick reference at any time. You may reach these screens with a single keystroke, refresh your memory of a particular function, and then return to find your text untouched.

The support material also includes two cut-out keyboard overlays that are handy reminders of all the important keystrokes—this is much easier than constantly returning to the manual or help screens until you've memorized the most frequently used commands.

Write Now! uses a 40-column display with both upper- and lowercase characters available. An especially nice touch is four different text/background color combinations available to please your eyes and your moods.

Text is always entered at the twelfth line from the top of the screen, allowing you to view text both before and after the current cursor line. As text is entered, the screen scrolls up and darkens while the cursor line remains highlighted.

At the bottom of the screen is the status line, which provides three important pieces of information: the present character position with respect to the first character in your text, a reminder of whether you are in Write Now!'s Insert mode (discussed below) and a running balance of free space remaining for entering text.

As you enter text, Write Now! accepts each keystroke with a reassuring tick. Certain illegal entries are accompanied by a nasty beep to alert you to the problem.

Write Now! allows you to do all editing as you write *without changing screens!* This is far easier to use than a word processor that forces you to constantly switch between Write and Edit modes.

You can edit text by simply overwriting your mistake or by deleting the old text and inserting the new (using the C-64's insert/delete key). When you enter Write Now!'s special Insert mode, you can type in strings of text while all existing text slides over to make room, and all subsequent paragraphs remain intact.

You can also work with what's called a "block" of text of any size (a sentence, a paragraph or an entire chapter) and delete it, move it, copy it to other locations or save it to tape or disk for future use—all with single keystrokes.

A global search-and-replace function will search for a word, or group of words, throughout your text and replace it with other text of your choice.

Write Now! offers several methods of cursor control. For short hops, you can change the current cursor position by using the C-64's own cursor control keys (or you can use a joystick). There are also single keystrokes that will move the cursor to the top or bottom of text, flip through text one page at a time or move to one of nine preset markers.

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Accidentally destroying unsaved text is a persistent fear of all users of word processors; the thought of all those hours of work becoming mere electronic memories strikes fear into the hearts of us all! Well, Write Now! makes this possibility much more unlikely by requiring a positive verification of the clear-all-text function.

What if you do mistakenly clear some of your text; possibly you thought you had already saved it? Write Now! includes what's called a "yankback" feature, by which deleted text may be miraculously recovered. This operation is performed by dumping the deleted-character buffer to the screen. But, beware! This is a delicate piece of "data surgery," the success of which depends upon factors not always favorable.

As for print formatting, you may simply call up the Print menu to select the standard print parameters, such as margins (top, bottom, left and right), page numbering, number of lines per page and number of copies you'd like printed. The Print menu also offers you the option of accepting preset default values for any or all of these.

Careful reading of the manual also uncovers the existence of some important options not visible on the Print menu. The most helpful of these is one that allows you to preview your text in full 80-column mode prior to printing, a handy way to check readability and general layout.

Two other options are specifically aimed at achieving a successful interface between your C-64, printer and parallel interface device. The first assures that a non-Commodore printer will receive a straight ASCII version of Commodore's non-standard character set. The second provides a means to control the automatic line feed function of your printer from the keyboard for proper interfacing.

With Write Now!, you can choose to set most of the above print parameters, as well as many more, by utilizing "dot" commands. Inserted at key positions in your text, dot commands are an extremely powerful means of determining exactly how your printed text will appear. You may set line spacing, page length, page numbering (on/off, starting value, Roman or Arabic numerals). You can center all text on a page or select left- or fill-justification.

Dot commands allow you to send codes to your printer, unlocking all its special features. Would you like to underline a word or group of words? Or perhaps you'd like italicized, emphasized, condensed or expanded type. Write Now! allows you to make these direct requests to your printer.

Other Write Now! print formatting capabilities include the use of headers and footers, location of page numbers and "conditional" pages, which assure that reserved sections of text will not be broken up into different pages. There are commands that will pause printing at predetermined locations in your text so that you can make run-time entries (such as date and personalization of form letters).

Mail Now!

Also available from Cardco is Mail Now!, a mailing list processing program that can be used independently or in conjunction with Write Now!

Used by itself, this disk-based program allows you to create a disk file of names and addresses (up to 600 entries per disk) and then use the file to generate mailing labels. Used with Write Now!, it offers mail merge capabilities.

Mail Now!'s Main menu options include: Make Entry, Search, Modify, Delete, Format Print, Printer, Backup, Write Now or Leave Program.

In the Make Entry mode, you do just that: you create the name and address records that will be stored on each disk file. Each entry also allows a notation for Category and a larger Remark field (for a telephone number or other pertinent information).

Returning to Mail Now!'s Main menu is always possible with a single keystroke. Regardless of the particular mode you're in, there is always a menu visible to cue the options available.

The Search option allows you to call from disk any address (or group of addresses) you wish. You may select according to last name, state, zip code or "category" code—or any combination of these. You could, for example, search through your entries for all Texans with the last name Jones. Perhaps you'd like to create a mailing to all your business clients in a certain zip code. Mail Now! will search for and load all requested information for subsequent use.

Once loaded, address information may be modified, deleted or printed. Before printing, however, Mail Now! allows you to select the exact format in which you'd like your labels to appear by using the Format Prt option.

The most powerful use of Mail Now! might be in its Write Now option. Here you may choose to write selected name and address information to disk as a special mail merge data file. Then, later, your Write Now! word processor will access any designated file and incorporate all or part of an address record into its text processing, enabling you to create personalized letters or other documents.

Final Comments

Write Now! is a winner! When I started to inspect this program, I expected to find all the many compromises which (I thought) had to be made in order to market a word processing program for $49.95. But as I scanned the table of contents, I began to wonder...most of the features I'd ever heard of (and more) were listed there!

A skeptic by nature, I started into the guts of the manual, sure that I'd find all those touted features encrypted within some incomprehensible dialect of 21st-century computerese. What I discovered instead was an enjoyable tutorial on the Write Now! program. It was a pleasant surprise to find a piece of software documentation so readable, thorough and educationally sound!

Mail Now! is a user-friendly mailing list processing tool with most of the standard features you'd expect. However, the review copy I received included a preliminary version of the user's manual, which, I hope, will be revised in the future. Its many typos and rough layout were in sharp contrast to the Write Now! manual, making a relatively simple and well-written program unnecessarily difficult to unravel.

I should add that Cardco makes good on its claim to provide complete product support. I contacted them via their customer service number regarding some interfacing difficulties I was experiencing, and they offered suggestions that solved my problem.

For business, education or personal use, Write Now! and Mail Now! are highly recommended! *(Cardco, Inc., 300 S. Topeka, Wichita, KS 67202.)*

Ken Silverstein
Salem, NH

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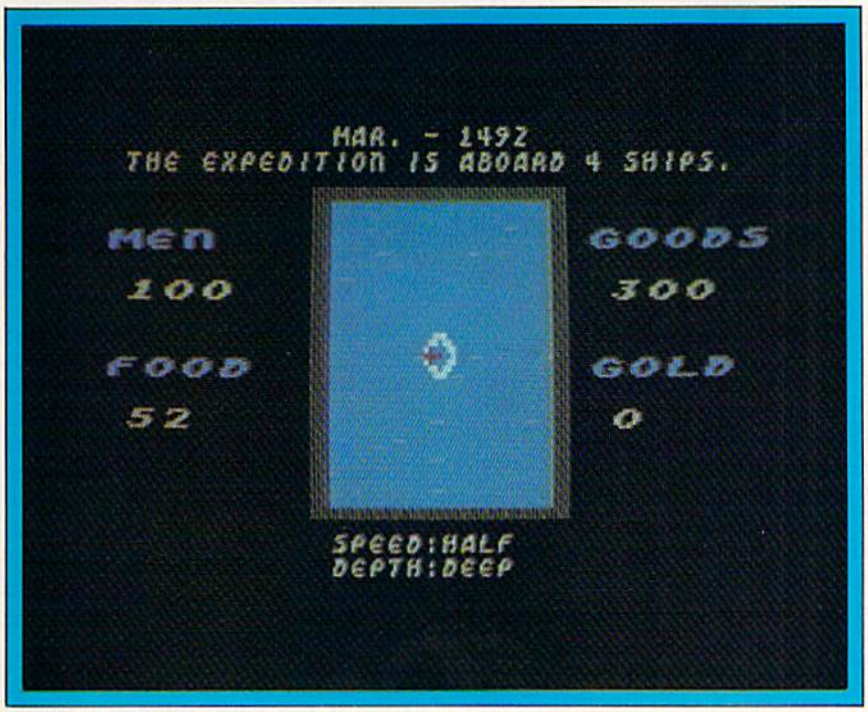

Seven Cities Of Gold

As a Conquistador, You'll Explore New Worlds and Secure Gold for the Crown

Have you ever wondered what it was like to be alive in the days of Columbus, Balboa and Pizarro, setting sail for parts unknown? If you have, then you're going to love Seven Cities of Gold!

This is an adventure game, but it's quite a bit different from others of this genre. For starters, play-action is controlled entirely through the joystick. But even before you begin to play, you'll have to create a map disk. This map disk is created through a utility included on the program disk. Your new world, ready for your exploration, is replete with mountains, rivers, natives, villages, mines and so on. The computer creates this new world by utilizing various geographic, demographic and historic facts. The result is a unique, new land.

There's also a provision to duplicate the map disk once created, allowing you to compete with a friend using the same world as the background for your adventures. Creation of the map disk takes approximately 20 minutes, but this is something you'll only have to do once (unless you grow tired of your new world and want to create another one).

As with most other Electronic Arts programs, the game's packaging is a masterful piece of art in itself. Enclosed in the record-album style package, you'll find the game disk, the player's manual and a handy quick-reference card. The humorous notes inside the package set the mood for the game even before you boot up the disk.

The well-written player's manual gives you a clear-cut idea of the game's objectives, and it contains many fascinating facts about the exploits and experiences of the historic explorers of that period. Valuable playing tips are also provided. Owing to the quick-reference card, it's not necessary to read the manual, but if you don't, you'll only be cheating yourself of added enjoy-

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ment. This manual is definitely top-notch!

After creating your map disk of the new world, you'll start the game as a novice captain. The Crown has decided to fund your expedition, and you are given ships, men, food, goods and other necessary provisions for your exploratory voyage. On your way to the pier, you may stop in to the outfitter's shop and either acquire additional supplies and provisions or trade off some of what you have—it's your option. However, the Crown generally does a good job portioning everything you'll need, so don't bother to adjust these quantities until you become a more seasoned mariner.

You'll board your ship, and together with your stalwart crew, you're off on an expedition across the uncharted ocean in search of new lands, riches and adventures. Spain, your home country, is located at 30 degrees north latitude, and you should remember this if you ever expect to get home again!

An inset "window" at the center of the screen shows your fleet of explorer ships as you travel across the sea. You're likely to encounter storms along the way, and there is a map-viewing feature that will show you your relative position in these uncharted waters and give you your latitude reading.

Directional navigation is easy: at all times north is toward the top of the screen, west is to the left, east is to the right and south is at the bottom. Going south, for example, will take you down to 0-degrees latitude (the equator), and there you'll find some agricultural civilizations and/or tribes of hunters. Going to the extreme north or south will deliver you to polar regions, and you'll find out that your crewmen refuse to leave the ship!

When you reach land (no matter which direction it's in), you may decide to take a landing party with you to explore the terrain of this new world. Before you leave the ship, you'll have to decide how many men to bring, how much food you'll need for the overland journey, how many goods you'll need for trade and other necessary preparations. Virtually everything available can be selected with the joystick from the menu screens provided.

Once you've disembarked, you're ready to start exploring. Go cautiously, though, lest you fall victim to a native ambush. It's a very good idea to carry lots of goods along with you to use as gifts should you find yourself in a situation like this: in most instances, your generosity will overcome the natives' hostility. In the native villages, you'll need the goods to trade for gold and food, since your on-board supply will eventually start running low.

Of course, you can play the role of baddie if you wish, entering a village, annihilating the natives and pillaging their gold and food supplies. This is the historically realistic way of doing things, but I should warn you that the Crown takes a dim view of such actions, and you'll receive a reprimand for your behavior when you return home to Spain! Another factor to consider is that civilized behavior is rewarded with promotions to elevated titles (such as Governor and Viceroy) by the Queen. Essentially, this is the name of the game—moving up the ladder of success.

At the end of your expedition, you'll have several options awaiting you when you return home. By stopping into the pub, you'll be given the option of saving your adventures to disk (to be resumed at a later time), or going to the Palace to receive either a commendation (perhaps a promotion) or a reprimand for your behavior. You then have the option to go home and examine what you've discovered and accomplished on your last voyage, or to go to the outfitter's shop to prepare for your next expedition.

This game was created by Ozark Softscape (the Bunten Brothers and friends), who brought us M.U.L.E. (also from Electronic Arts). I found Seven Cities of Gold to be both fun and fascinating. *(Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403. $40.)*

Tom Benford
Bricktown, NJ

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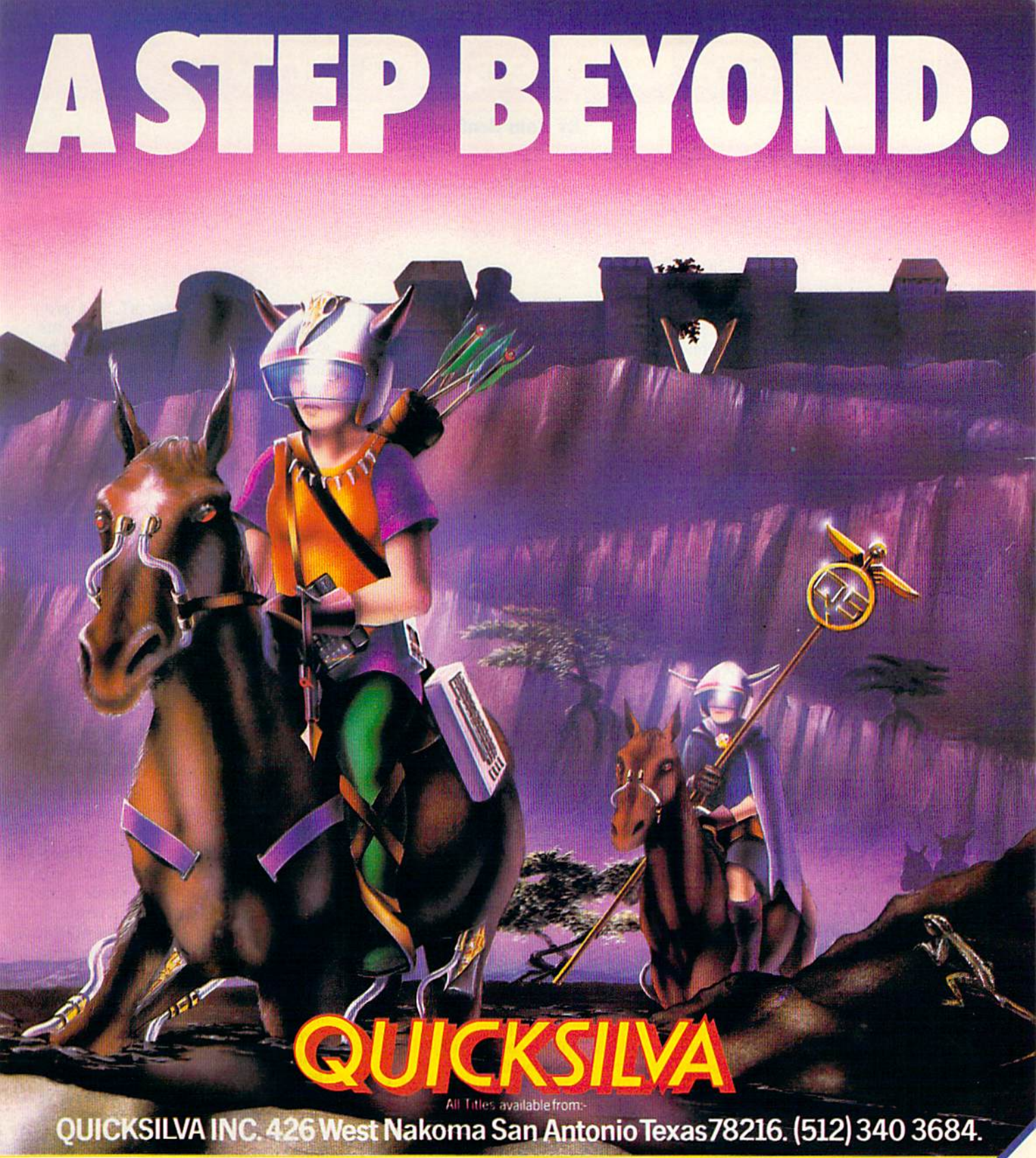

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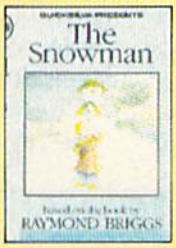

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For Gamesters Only

By Tom Benford

Hi, gamesters! Though Christmas is still a little ways off, I'm going to give you your presents early, and you'll find them all right here in this column.

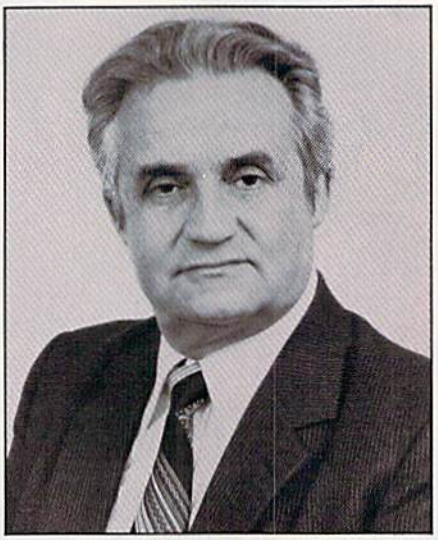
There are several treats in store for you—exciting news about a new adventure game series; a knock-your-socks-off translation of the arcade favorite, Satan's Hollow; some interviews with the programming gurus at Commodore; and, for the first time anywhere, a review of Jack Attack for the C-64, C-16 and Plus/4 computers!

Questprobe Series

Adventure International, Commodore Business Machines and Marvel Comics have all joined forces to bring us a new series of adventure games—the Questprobe Series. These games will be available for the C-64, Plus/4 and a few non-Commodore computers as well! Commodore has decided to take a bold step and release this series for Apple, IBM and possibly other systems. I spoke to Sig Hartmann, President of the Software Division at Commodore, about this radical (for Commodore) approach to software marketing:

RUN: Sig, do you feel that the new Questprobe Adventure Series will be well-received?

SH: Before signing the contracts, we looked at who was involved. Scott Adams (Adventure International) has always done a bang-up job with his excellent games—they're all heavy-hitters...he has the background, the experience. The Marvel series is very well-known—you see the comic-book heroes on TV shows and magazine racks. I think it's going to be an excellent game series that will sell very well. Kids, even adults, read the comic books, and they're familiar with the heroes. So when they see that they can get this on their computer, there's no question in my mind that they'll buy it. I believe that the Marvel series will be another



Commodore's Sig Hartmann.

type of hit software. We think we're going to sell a helluva lot of them.

RUN: Let me ask you about the decision to release non-Commodore versions of the series. This certainly seems to be a bold step for Commodore. Is this any indication of how well-received you think the series will be?

SH: We believe that these are unique games. The name Marvel itself has tremendous attraction, and we believe that they will sell on *every* machine. If we were to sell it for only one system, we'd be missing the boat. That's why we're pushing to get maximum exposure in the marketplace.

RUN: Will you release the series in an Atari version as well?

SH: At this point in time, the Atari version depends upon what happens with Atari, but I believe the IBM PC and Apple versions are going to be very well-accepted.

* * *

The initial release of the series will be The Hulk Adventure. There will be an accompanying comic book to preface the game, so the game will pick up where the comic leaves off. The projected retail price will be $29.95 for the Commodore versions, and it should be hitting the dealers' shelves by the time you read this.

Satan's Hollow

(C-64 disk from Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380. $34.95.)

From there I moved on to Dave Berezowski, one of Commodore's game programmers (he's also Software Product Manager for the C-16 computer), who just completed the nearly impossible task of converting Satan's Hollow, a Bally/Midway arcade classic, into a C-64 version.

Why was it so difficult? Well, for starters, the arcade machine has 128 sprites, and the C-64 has eight. But that was only one of the many problems Dave had to solve. Even the designers at Bally/Midway consider Satan's Hollow to be the most technologically advanced arcade game ever converted to a home computer.

John Mathias, Commodore's Director of Recreational Software, said, "It's the best translation of an arcade game for any home system." Sig Hartmann expects it to be the most successful of the Bally/Midway Series. So how good is it? It's that good, and better!

If you remember, a few months ago in my "Behind the Scenes at Commodore" feature (*RUN*, May 1984), I mentioned that I had seen the game in the early stages of development. This has been a rare opportunity for me. I've followed this game through its stages of development, and it's been an education in many ways.

The game is played via joystick, with options for either one or two players. There's also the option to use the fire button either to fire missiles or activate shields. An easy level is also included.

The color, graphics, animation, sound

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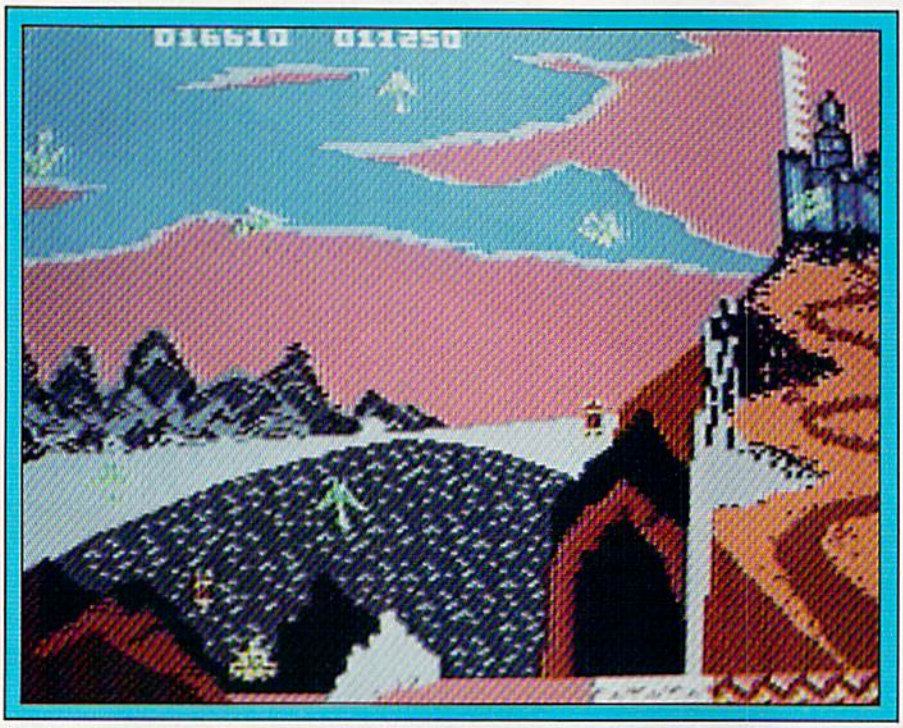

The arcade classic Satan's Hollow is now for the C-64.

effects and play-action are absolutely the best I've seen yet on any home system. Without a doubt, this is the most incredible translation of a coin-op game I've ever seen on any system! Even the music, Wagner's *Ride of the Valkyrie*, is superb!

The scenario is this: You must build a bridge over a fiery river to cross over into a bonus round, where you will do battle with Satan himself. You are given an initial armada of three ships, which come into play one at a time. You will be awarded one (and this is the only one) bonus ship at 10,000 points. Overhead, there are pterodactyls circling and dive-bombing your ship.

You fire laser missiles from your ship's cannon, and for each pterodactyl that you kill with either your laser missiles or your deflection shields, a section of bridge appears at the lower left side of the screen. You must then transport it from the left side to the right side, still under seige from the pterodactyls and their bombs.

When you've cleared the screen of pterodactyls, a bonus flag (worth 1,000 points) is placed atop the castle in Satan's Hollow before the next wave of attackers descends upon you. When all sections of the bridge are in place, you cross over it in your ship and do battle with an extremely angry Satan, who hurls lethal bolts at you.

If you're successful in defeating the devil, your bonus score is metered out according to how many flags you have on the castle. Then it's back to the other side of the bridge for a fresh round of either pterodactyls or another type of demon, who randomly spews forth fire in an attempt to incinerate you. The only protection you have from this is your shield (which is activated by pushing or pulling the joystick) or evasive action (moving rapidly to the left or right). The shield is most effective, but its protective power is depleted in a matter of seconds. It takes slightly longer than that to recharge it. You are vulnerable to virtually everything on the screen: pterodactyls, devils, bombs, fire, meteors and more.

The challenge just does not quit in this game, and there's a provision for recording your high scores to disk. This is an absolute "must have" in your C-64 game collection—it will soon become the standard against which all other arcade translations—or C-64 games in general, for that matter—will be measured.

Matt Blais, the programming assistant responsible for sound effects and some of the graphics, holds the worlds' highest scoring record for Satan's Hollow with an incredible 2,600,000 points!

I asked Dave Berezowski to share some of his experiences during the game's translation to the C-64:

RUN: How long did the translation from the coin-op game take, Dave?

DB: About eight months.

RUN: How did the hardware of the arcade machine stack up next to the C-64?

DB: That machine has 128 sprites, and they're all overlayed, which was quite a problem. It also has a six-voice music board that can update the sound every 180th of a second—three times faster than the C-64. The third problem is that the arcade machine has massive amounts of memory—about 128K.

RUN: So how did you tackle the project?

DB: When I started it, my main problem was trying to figure out how to get all the background on the screen and all those objects moving. To do this, I had to write what I call a "multi-sprite processor." This is a program that will allow an end number of sprites to be displayed anywhere on the screen, within the limitations of the hardware. This processor took about two months in itself to develop.

RUN: Apparently, the actual game program was going to be extremely large. How much code does it actually use now in its completed version?

DB: The program is 50K, which I've managed to compress into 32K. I had to compress it into 32K because it was originally intended to go into a cartridge. From Day One of the project, I knew I had twice as much code as I had room for. Economy of code was the only solution—utilizing tables to conserve memory.

* * *

This version is on disk, but a cartridge version will probably be available in the near future.

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Jack Attack

(Cartridge for C-64, C-16 and Plus/4 from Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380.)

Jack Attack began as a submission to Commodore from Kevin Kieller and John Traynor, two young Canadians, for the VIC-20. John Mathias, Recreational Software Director, recalls that it was "rough, but it had potential. The biggest thing was that it required strategy, not just good eye-hand coordination. Speed alone meant nothing without strategy."

The game had only a few levels of play when Kieller and Traynor submitted it to Commodore for consideration. The finished product for the C-64 has 64 levels. Unfortunately, the VIC-20 version of the game has been put on hold.

Jack Attack comes on cartridge for the C-64, C-16 and Plus/4. The cartridge for the C-16 and Plus/4 works in either machine, although the C-64 cartridge can't be used with any other machine.

Jack Attack is one of the most challenging and entertaining games I've ever played.

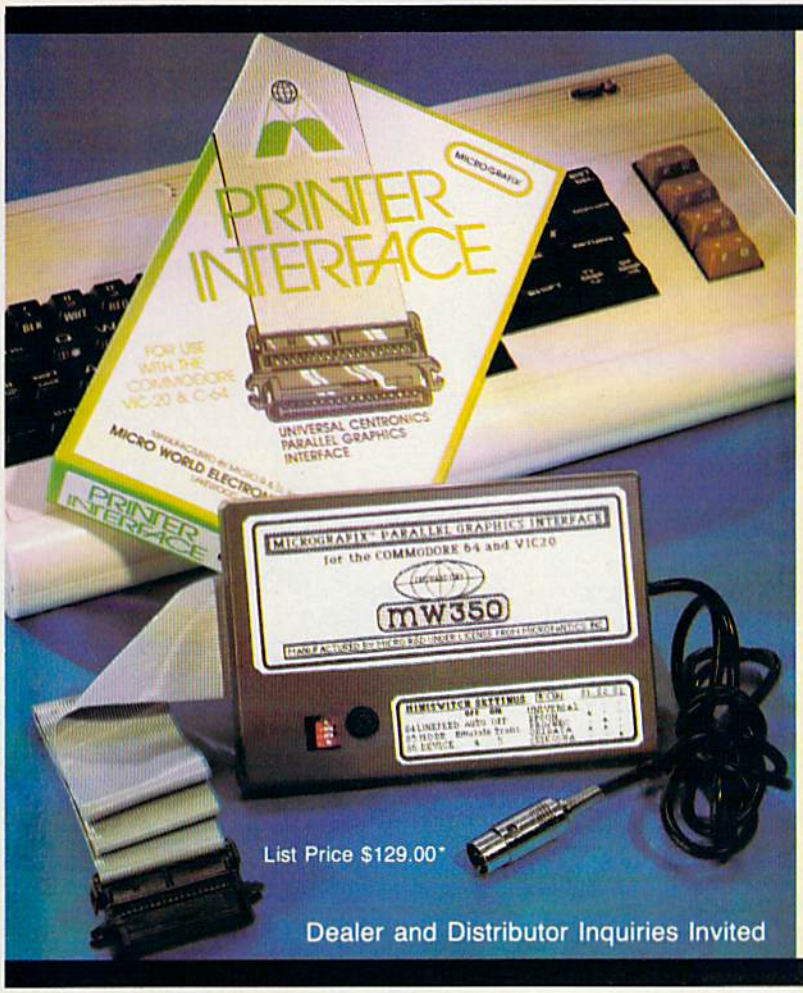
The game is controlled via the joystick and fire button, and it will accommodate either one or two players. You're given three little Jacks, which are played one at a time. At the top of the screen are balloon monsters who will drop from the sky and bounce about the play field. Little Jack has to do his best to avoid contact with them, which is lethal.

There are blocks arranged in various stacks on each level—Jack can jump on the blocks, or he can push or pull them to squash the monsters. But should a monster or block fall on Jack, he's a goner. On some levels you'll also have to contend with water—you are cautioned that monsters float, but Jack doesn't.

On other levels there are platforms that you can try to touch for bonus points, but touching these platforms is a hairy matter indeed with all those monsters bounding around!

Jack Attack is one of the most challenging and entertaining games I've ever played. The color, animation, sound effects and play-action are superb in all versions. My compliments to the gamesters at Commodore, and my advice to you gamesters is to go out and get it—you'll love it! R

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



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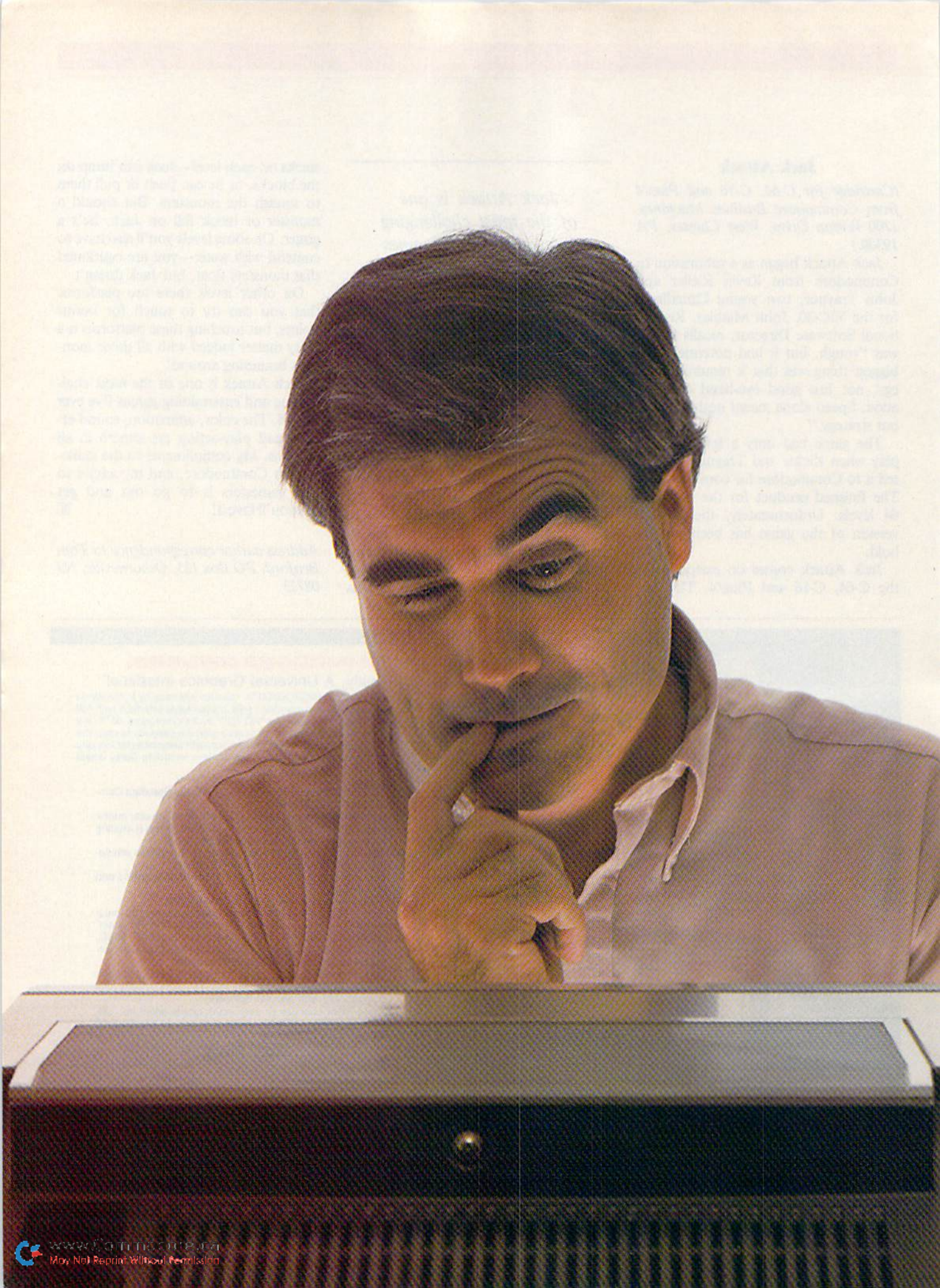

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TRIVIA CRAZE

By JOHN JERMAINE and RUN *STAFF*

At the Consumer Electronics Show held in Chicago last June, one of the best-attended booths was that belonging to Professional Software, Inc. What was the attraction?

PSI was announcing a new trivia game and, as part of its promotion, was hosting trivia contests, in which CES attendees were encouraged to participate. It didn't take much encouragement, however. There were many willing participants.

Most people love to be tested. They enjoy the opportunity to show off their knowledge about little-known facts. For some, it's their only chance to put to use the "information" garnered from many hours of TV-watching. For others bursting with sports information, it's their only release. And for movie buffs, it's their big moment to shine.

Trivia is fast becoming a national pastime. A sure indication that trivia is catching on is the number of software manufacturers who have released trivia games for the Commodore within the past several months. No less than ten manufacturers are stocking the shelves with trivia games this Christmas in an attempt to capitalize on the trivia craze.

Most of the packaging for these new games depicts a home setting with several couples gathered around the computer, obviously enjoying a brisk game of trivia. Computerized trivia is meant to be played in a group, and encourages play among individuals of varying competitive levels through a handicapping system. Indeed, one of the quickest ways to draw a crowd is to boot up a game of trivia on the Commodore.

Trivia, through the success of the popular board game Trivial Pursuit, is enjoying a revival. It appeals to today's computer generation, which is very information-conscious—but no more so than the generations that made such TV quiz shows as "The $64,000 Question," "Concentration," "Jeopardy" and "Who, What and Where" so successful.

The trivia craze has come to the computer world. This article explores the trivia phenomenon and takes a look at some of the new trivia games available for your Commodore.

Computerized trivia features questions that are about trivia, although the questions themselves are not necessarily trivial. Marketing manager Ken Paradiso notes that, with its product, PSI is "riding the fence between the educational and entertainment fields." Indeed, trivia is a great way to pick up information and learn little-known facts, as well as to impart your knowledge.

But most of all, trivia is popular because it's fun, challenging, competitive and entertaining.

If you're up for a challenge and are interested in finding out how much you do or don't know, then pick up a computerized trivia game. But before you do, read the following reviews to help you decide which one to buy.

Trivia Fever

Since its introduction at the Consumer Electronics Show, Professional Software's Trivia Fever has enjoyed tremendous success in the marketplace. With a fresh, innovative concept, a wide variety of features and a low price tag, Trivia Fever deserves its billing as "the hottest new game in town."

Trivia Fever is the embodiment of a unique concept—it's the first home computer game that can be played with or without a computer, placing it in competition with non-computer games such as Trivial Pursuit. (A $5 rebate is offered to non-computer users who return the program disk.)

The Computer Version

In Trivia Fever, up to eight players must correctly answer questions in each of five categories. Each player, in turn, is asked a question, to which only he is allowed to respond. When a player accumulates the necessary number of points for a particular category (determined at the start of the game), a Category Completion Question is given. When a player successfully completes all of his categories, the program generates a Game Winning Question. The first player or team to correctly answer a Game Winning Question wins the game.

Before you begin, you'll have to select one of the players to serve as the Master of the game. The Master controls the game through the computer keyboard. Occasionally, the Master will have to disqualify a question. For ex-

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ample, if a player knows an answer because of a previous game, or if a question recurs in the same game, then the question must be disqualified. The Master controls the game and acts as a judge when questions arise. In spite of this authoritative role, the person serving as Master can also be a player.

Handicapping

Since the world of trivia includes both trivia addicts and dabblers, the game allows you to handicap the polymaths among you. There are three possible ways to handicap a player, any combination of which may be used. One method of handicapping is to give individual players different time limits for answering questions. A novice may be given a 20-second limit, whereas an expert may be given only 10 seconds.

Another method is to give experienced players a higher point requirement for each category. A third method is to have the computer select categories at random for the experienced player, while novices are allowed to choose their own categories. This handicapping system is useful, especially in a family setting, since it allows younger, less experienced players to get into the game on a competitive level. I suspect that many of the rarely played games in America's closets are those that one particular player *always* wins.

Categories and Difficulty Levels

Trivia Fever generates questions from seven different categories: Science & Technology, Geography, History, Sports, Films & Entertainment, Famous People and Nature & Animals. Each player must answer questions from five of these seven categories. Categories can be chosen by the players (allowing you to avoid your weakest subjects) or randomly by the computer (which makes for a much more challenging game).

There are three levels of difficulty, but most of us would do well to stay on Level 1. What hormone regulates the metabolism of carbohydrates? What state has used almost twice the normal amount of fertilizer per acre of cropland, for many years? Who was the famous Sultan of Egypt and Syria in the 12th century? If you find these questions a bit daunting, then you should avoid Level 3. A correct answer earns the player one, two or three points, depending upon the difficulty level of the question.

Beating the Clock

As soon as a question is displayed, the clock starts counting down. The player must answer verbally; the Master then presses the space bar, which stops the clock. If time runs out before an answer is given, no points are awarded. The Master is then given three options: display the correct answer, disqualify the question or restart the clock. If the player's answer is correct, the points are then added to his score.

This is not a multiple-choice affair. The screen displays the name of the player, the subject category chosen, the difficulty level, time remaining, the question itself and the Master's three options (mentioned above). No possible answers are given to jog your memory—you're on your own! This diminishes your chances of guessing, thus adding to the challenge of Trivia Fever.

1. What is the third planet from the sun?

2. Name the first European explorer to visit China.

Category-Completion and Game-Winning Questions

When you have reached the required point total for a particular category, you must answer a category-completion question. These are always Level 2 questions, and you must answer a category-completion question correctly before you can move on to another category. If you answer incorrectly, a new category-completion question will be generated for you on your next turn.

When a player correctly answers his last category-completion question, a game-winning question is then generated. If you answer incorrectly, you must wait until your next turn for a new question. Many of the game-winning questions are challenging enough to frustrate even the most knowledgeable trivia buff. You might answer several of these questions incorrectly before you finally get one right. This gives players who have been lagging behind a chance to catch up, increasing the possibility of a close, nail-biting contest.

The Score Screen

For stats fanatics, there's a very complete score screen. You can call up this screen at the end of the game, or at any time during the game, except when a question is on the screen. Each player's name is displayed, along with his ranking and the percentage of questions answered correctly. The current score for each player is also broken up into categories, showing the number of points remaining to complete each category. The score screen gives you a clear report on how you're doing in relation to the competition.

Playing Without a Computer

For non-computerized play, a book of questions and answers is provided. This is a sturdy paperback, containing the same questions and categories that are provided on the program disk. The pages are color-coded according to difficulty level, allowing you to find each level at a glance. The right-hand pages contain questions; the answers to the questions can be found on the following left-hand pages.

As in the computerized game, you'll have to appoint a Master of the game. A timekeeper and a scorekeeper must also be designated; however, the Master can serve all three functions. For keeping score, a pad of trivia tally sheets is provided.

Handicapping and choosing categories and difficulty levels is the same as in the computerized game. For random selection of categories, a Trivia Fever category selector is provided. This is a small cardboard disk, divided into the seven available categories, with a metal spinner.

The Master is responsible for asking questions. If the Master is also a player, another player must be appointed to choose questions for the Master. Category-completion and game-winning questions must also be answered in this version of the game.

Playability and Flexibility

The two separate versions of Trivia Fever make it a unique software package. Trivia Fever was designed to be playable in a party atmosphere: in the computerized version, only the Master is required to sit at the keyboard; in the

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non-computer version, players do not have to hover around a game board.

Each version can be tailored to suit your needs—the length of each game and the depth of the challenge can easily be predetermined. In the non-computer version, the manual encourages you to modify the rules of the game (if desired) to increase your own enjoyment.

If your interests are more directed to one particular area, you will soon be able to purchase special-category disks such as Super Sports, Entertainment Extra and Word Trivia—all selling for $39.95 each.

A Good Value

Trivia Fever retails for $39.95, which is a very reasonable price, considering all that you get. The game is packaged in a sturdy, attractive box, similar to the packaging of high-quality board games.

Ken Paradiso enthusiastically predicts that Trivia Fever "will soon become the best-selling consumer software package of all time." Considering the game's fresh concept and its quality, timeliness and early success, he may very well be right. *(Professional Software, Inc., 51 Fremont St., Needham, MA 02194. C-64 disk, $39.95.)*

Fax

Realizing the enormous popularity of trivia, Epyx has created a dual-sided disk version of the Fax arcade game for the Commodore 64.

Before you begin answering any questions, Fax gives you two options. There are three difficulty levels from which to choose (novice, expert and genius), and you can also choose to have cartoons after answering each question. If you decide that you want cartoons, you will approach a podium after each question, to receive a dunce cap for an incorrect answer, or a mortarboard for a correct response. The absence of cartoons speeds up the game considerably, though.

Once you've loaded in the Fax program, it's time to select the category of the questions you wish to answer. There are over 3900 questions in four categories on the Fax disk. The categories are Entertainment, Grab Bag, History and Sports. If you want a real challenge, select the Grab Bag category. It offers questions on any subject, and it is totally unpredictable.

Fax is set up to be a one- or two-player game, in which the contestant answers multiple-choice questions. You must examine four possible answers to each question, decide which answer is correct, and press the number on the keyboard that appears next to that answer. The solitaire version of the game uses the keyboard numbers 1–4 to answer questions, while in the two-player mode of the program, the second player uses the numbers 6–9.

While you are deciding which answer to select, the score clock at the bottom of the screen rapidly loses points, from the moment the question appears. To show you how fast the points can slip through your fingers, each question begins with 1400 points. Five and a half seconds later, the point value of the question has reduced to zero. If you answer a question correctly, you will receive the number of points displayed at that moment on the score clock.

3. What were the German armored units of WWII called?

4. Who was the last baseball player to hit over .400 in a season?

Should you answer a question incorrectly, the score clock stops, and no points are awarded.

In a two-player game, the first person to select the correct answer to a question earns the immediate point value on the score clock. When one player answers a question incorrectly, the other player still has the opportunity to answer the question and possibly earn points.

The game clock, located in the upper portion of the screen, is a constantly shrinking bar graph, which displays the amount of time remaining in the game. You should also note that the subject of your questions, as well as the difficulty level of the game, are shown above the clock. Each level of difficulty requires the player to earn a set amount of points to qualify for bonus game time. At the genius level, you'll have to earn more than 16,800 points to qualify for bonus time.

The graphics and sounds of Fax are kept relatively simple, but I don't feel that they hurt the program. Practically everything in the C-64 version of Fax is patterned after the Fax arcade game. If you plan to buy Fax on the assumption that it resembles the original game, you'll not be disappointed.

Fax is a very interesting program because it's easy to load, simple to understand, and it offers a challenge to anyone who plays it. I would like to pass along some suggestions that will streamline your method of play, and allow you to get the most out of the game.

Place the four fingers of your writing hand lightly over the numbers you're using to answer questions on the keyboard. Practice pressing these numbers at random, until you feel comfortable using them. By answering questions in this manner, you will save precious seconds that are lost by reaching over and pressing a desired number.

You should also be prepared to encounter trick questions that are designed to confuse you and slow your pace. If you find that you've been had by a trick question, don't get excited—proceed to the next question with a cool head.

Also, when you find that you have to think about the answer to a question, quickly consider what you know about the question's subject. If you know very little about the subject of the question, guess the answer, or you will lose quite a bit of your precious time.

I have spent several evenings playing the game, and I haven't grown tired of it, because every game is different. If you enjoy a good test of intelligence and general knowledge, Fax is a game for you. *(Epyx, Inc., 1043 Kiel Court, Sunnyvale, CA 94089. C-64 disk.)*

Trivia Arcade

The Trivia Arcade, from Screenplay, is a fresh approach to Trivia. First of all, you have as much time as you need to read a question and answer it. The second unusual feature of the program is that points aren't used in the game at all.

The Arcade Chamber

Trivia Arcade is composed of three elements: the arcade chamber, the question screen and the gameboard section. When you begin playing Trivia Arcade, you encounter a large, enclosed cham-

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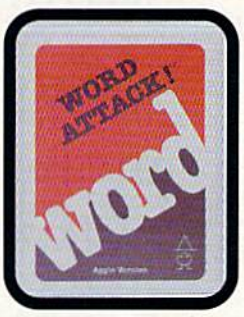

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ber containing symbols that represent the following categories: sports, music, television, science and general knowledge. This is the arcade portion of the program, and you must guide your crosshairs, controlled by your joystick, over a symbol and blast it before you run out of energy.

If you're curious about how much energy you possess at any given moment of play, look at the bar graph beneath the chamber. I wouldn't pay much attention to it, though, because you have only about five seconds to select a category. This amount of time will vary, since firing at a target consumes more energy than cruising around the chamber. A smart contestant will quickly fire twice at the desired subject symbol, and then try to shoot any symbol after that point in time.

5. Who was the leader of the group called "The Miracles"?

6. What famous 18th-century composer published his first work at age six?

The Question Screen

Once a category is determined, it's time to get down to business and answer a trivia question. The question screen of the Trivia Arcade game simply displays a question, offering four possible solutions. A purple arrow, which can be moved with the joystick, is used to indicate your answer. Pressing the fire

Other Trivia Titles for Your Commodore

PQ—The Party Quiz Game *(Suncom, 260 Holbrook Drive, Wheeling, IL 60090. C-64 disk, $69.95.)*

PQ uses hand-held quick response controllers to free players from the keyboard. Up to four players have direct access to the computer via the controllers, which are connected to the C-64 by cables. Players use the keyboard only to suspend a game in play (by pressing the space bar). All other functions, including answering questions and selecting options, are performed with the controllers.

The computer asks a question and provides four multiple-choice answers. Players must press the corresponding button on their controllers. The program has over 2500 questions covering a wide range of topics. Questions are randomly selected by the computer—players cannot choose the category.

PQ offers a number of options, allowing you to tailor the game to suit your preferences. You can determine the length of the game (from five to 20 rounds of questions), the number of players (from one to four) and the amount of time allowed for answering questions (from three to ten seconds). Skilled players can be given a handicap, allowing family members of different ages or experience levels to compete against each other.

PQ has two modes of play—competitive or social. In the competitive mode, all players compete to answer questions correctly before their opponents. Only the first correct answer wins points. In the social mode, all players have time to attempt an answer, even after a correct response has been entered. Points are awarded for all correct answers.

Teammates can use separate controllers to work together as one team, with one score. Two teams with two players each are allowed in this mode.

The game also offers lightning bonus rounds. With this feature, extra rounds of questions are given—at faster-than-normal speeds—throughout the game, giving players a chance to earn bonus points.

Between selected rounds, a report card gives updates on player/team rankings, with humorous grading comments. The top ten scorers of all time can enter their initials into the PQU Dean's List of high scorers.

PQ's questions cover a wide variety of categories, including history, politics, entertainment, sports and science. Future PQ supplement packages will be designed for classroom educational purposes.

The game package includes all required cables, a controller interface, four quick response controllers and the General Edition I disk. Additional disks are also available: General Edition II covers history, sports, entertainment, art and literature; General Edition III covers world records, science, geography, sports and music; Sports Edition I contains questions on sports only, and Education Edition I covers history, geography, grammar, science and literature.

Triviality *(AC3L Software, PO Box 7, New Derry, PA 15671. C-64 disk, $24.95.)*

Triviality challenges one to six players in a race against the clock. The game allows for individual or team play.

Players have 20 seconds to answer questions. There are 500 questions included in the program, and you can add up to ten of your own favorite questions. When you've mastered the existing questions, you can change any or all of the questions to design your own trivia game.

Triviality features color, sound and three resettable, random game se-

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quences. The game package includes the Volume One disk (with questions covering general topics) and documentation.

CompuTrivia *(Extek, PO Box 305, Oakville, Ontario, Canada. C-64 disk.)*

CompuTrivia allows six players or teams to play in a relaxed setting. The game limits keyboard input to let you play without too much crowding around the computer.

Questions are given from eight different categories. The program contains over 1300 non-repeating questions about people, places and events.

CompuTrivia keeps track of your name and your score, and it provides humor as you play. Hints are provided when you need them, and bonus situations are also available.

The Trivia Game *(Four-Score, 13452-A N.E. 175th, Suite 196, Woodinville, WA 98072. C-64/VIC-20 (8K expansion) disk, $21.95; cassette, $14.95.)*

The Trivia Game offers over 500 questions in the categories of movies, television, sports and radio.

Also included with the package is TQ, a program that allows you to create and save your own trivia or educational questions for use with The Trivia Game. The game also features color graphics and music.

Trivia Plus *(Academy Software, Inc., PO Box 6277, San Rafael, CA 94903. C-64 disk, $24.95.)*

Trivia Plus is designed for one to six players or teams. The program has over 3500 questions in the categories of general knowledge, humanities, movies, science, history and politics, geography, television and sports and games. There are also over 100 musical selections for you to identify.

There is also a Challenge option, which allows a player and a challenger to participate with each question. No typing is required, and no true/false or multiple-choice questions are used. Questions repeat only after all questions in that category have been asked. You can control the game through either the keyboard or a joystick.

Uptown Trivia *(Uptown Software, 310 Franklin St., Suite 339, Boston, MA 02110. C-64 disk.)*

Uptown Trivia allows an unlimited number of individuals or teams to participate, and it features 3600 questions in six categories. Each team must correctly answer three questions in each of the six categories. Question categories are selected at random from a spinning roulette wheel.

A team's turn begins with a spin of the category wheel. A question is shown, along with one of four possible answers. The team must respond with a "yes" or a "no" to the answer shown. If they pass up a correct answer, they cannot continue. A correct answer continues play, while an error transfers control to the next team. The team that answers three questions in each of the six categories with the fewest errors wins the game.

Keyboard input is limited to pressing a key to slow the category wheel and pressing "y" or "n" in response to a displayed answer. The game keeps a running tally of points scored per category and per team.

Trivia Mania *(Dynacomp, Inc., 1427 Monroe Ave., Rochester, NY 14618. C-64 disk or board game, $39.95.)*

Trivia Mania has six test categories, each containing 1000 questions. The game tests strategic skill as well as knowledge.

You can choose from four levels of timed plays. Up to six players or teams can participate. Players' scores are kept in dollar amounts.

Trivia Mania is also available as a non-computer board game.

button locks in your answer, and the wisdom of your response is revealed.

If you answer the question correctly, you progress to the gameboard section of the program. Should your answer be incorrect, your turn is over. Since Trivia Arcade does not set a time limit for answering questions, read each question carefully, and use logic and sound judgment in choosing your answers.

The Gameboard

The gameboard part of the program is a geometric chamber of question-marked pieces, with a mysterious arena in the center. Every time you answer a question correctly, you are entitled to lift an adjacent question mark, exposing a letter beneath it. Each question mark hides one of the letters used to spell the word "Trivia."

> 7. What is the longest of all snakes?
>
> 8. What is the name of Thomas Jefferson's home?

When you have exposed the letters necessary to spell "Trivia," it's time to enter the arena. This is accomplished by answering questions correctly and continuing to move over the gameboard until you reach one of the four outer chambers of the arena.

The arena is the final phase of the Trivia Arcade game, in which the arcade element is no longer necessary. You must answer one question correctly from each category in order to win the game and be declared a Trivia Whiz Kid. This final challenge is critical, because it will require a minimum of six turns to complete, and you can't predict what will happen to your opponent during this period of time.

To prove my point, I recently reached the arena and had to answer six questions from the sports category before I

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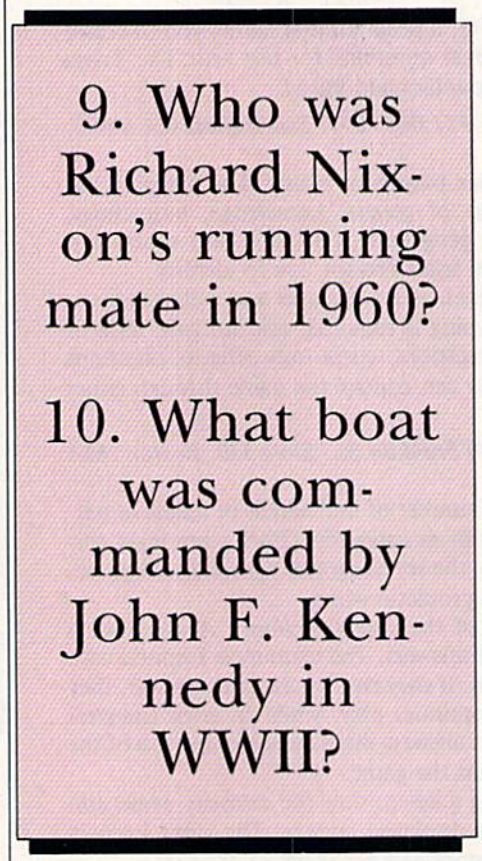
finally answered one correctly. In the meantime, my opponent had entered the arena, and he won the game while I stagnated on music questions.

Graphics and Sound

For a trivia game, Trivia Arcade has very interesting graphics. In the arcade phase of the program, a test tube represents questions dealing with science. The test tube isn't just a flat image—it has a simulated 3-D appearance. The tube is also animated, with suds foaming out at the top. All of the other symbols in the chamber are equally well developed, and pleasing to the eye.

The graphics in the gameboard section of the program are fairly simple, but they look good and serve their purpose. The use of motion in the program is also better than average. It's easy to move your crosshairs around the arcade chamber, and manipulating the purple arrow on the question screen is done with ease.



The sounds in Trivia Arcade also serve to keep the game interesting. Music is played constantly throughout the program, ranging from ragtime selections to *The Flight of the Bumble Bee.*

Options

The program has an abundance of options. Up to four players can play Trivia Arcade at one time. The game can also be played in a solitaire mode. You can choose to play the arcade section of the program, or the computer will select both questions and categories at random. If you wish to play the game quickly, bypass the arcade section.

You can answer questions in a multiple-choice format, or you can input entire answers by using the keyboard. The game allows for keyboard or joystick control. The speed of the arcade section of the program may be altered by pressing "s" for slow, "m" for medium or "f" for fast. Another option gives you the opportunity to view the correct answers to questions you have already answered.

Strategy

The strategy of Trivia Arcade is quite simple. In the arcade portion of the program, lock onto a symbol as quickly as possible. As you answer questions, you will definitely encounter some that you have to guess at. To give you an advantage with these questions, determine which answers are definitely false, and select your response from the remaining choices.

Trivia Arcade is a fascinating program—it merges some of the features of arcade games with the thinking required to answer trivia questions. I was also impressed with the large, thick, easy-to-read lettering in the program. (Half the battle when playing trivia games is being able to read the questions correctly!) The program also randomizes the questions very well. I recommend Trivia Arcade to anyone who enjoys the challenge of trivia. *(Screenplay, 500 Eastowne Drive, Suite 212, Chapel Hill, NC27514. C-64 disk, $34.05.)* R

ANSWERS

1. Earth
2. Marco Polo
3. Panzers
4. Ted Williams
5. Smokey Robinson
6. Mozart
7. Python
8. Monticello
9. Henry Cabot Lodge
10. PT 109

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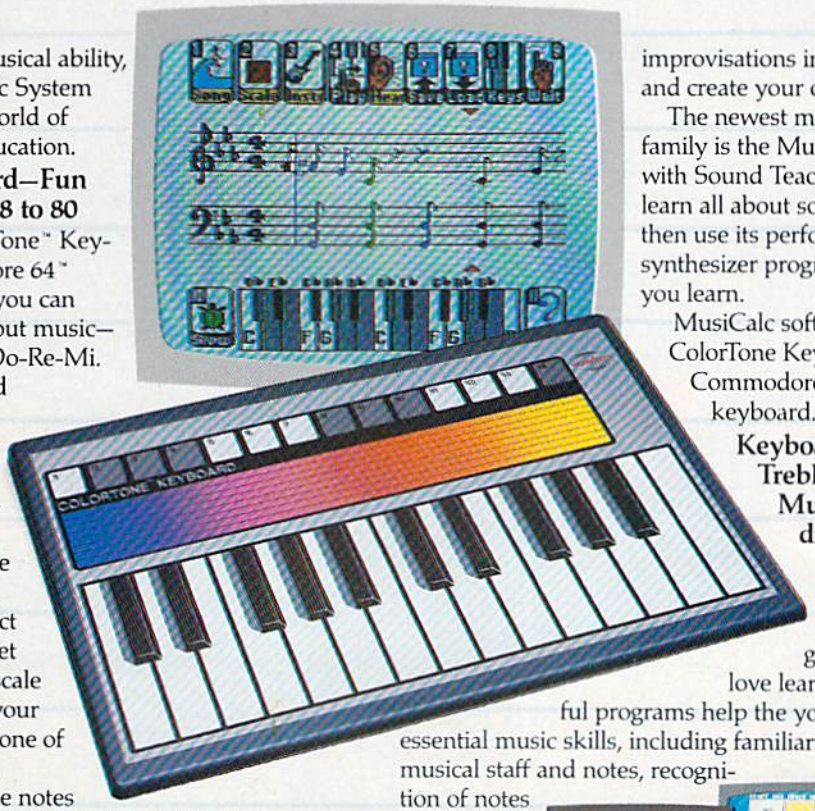

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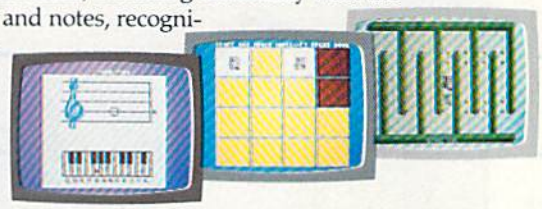

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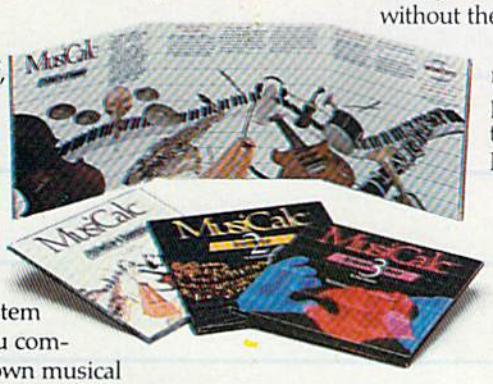

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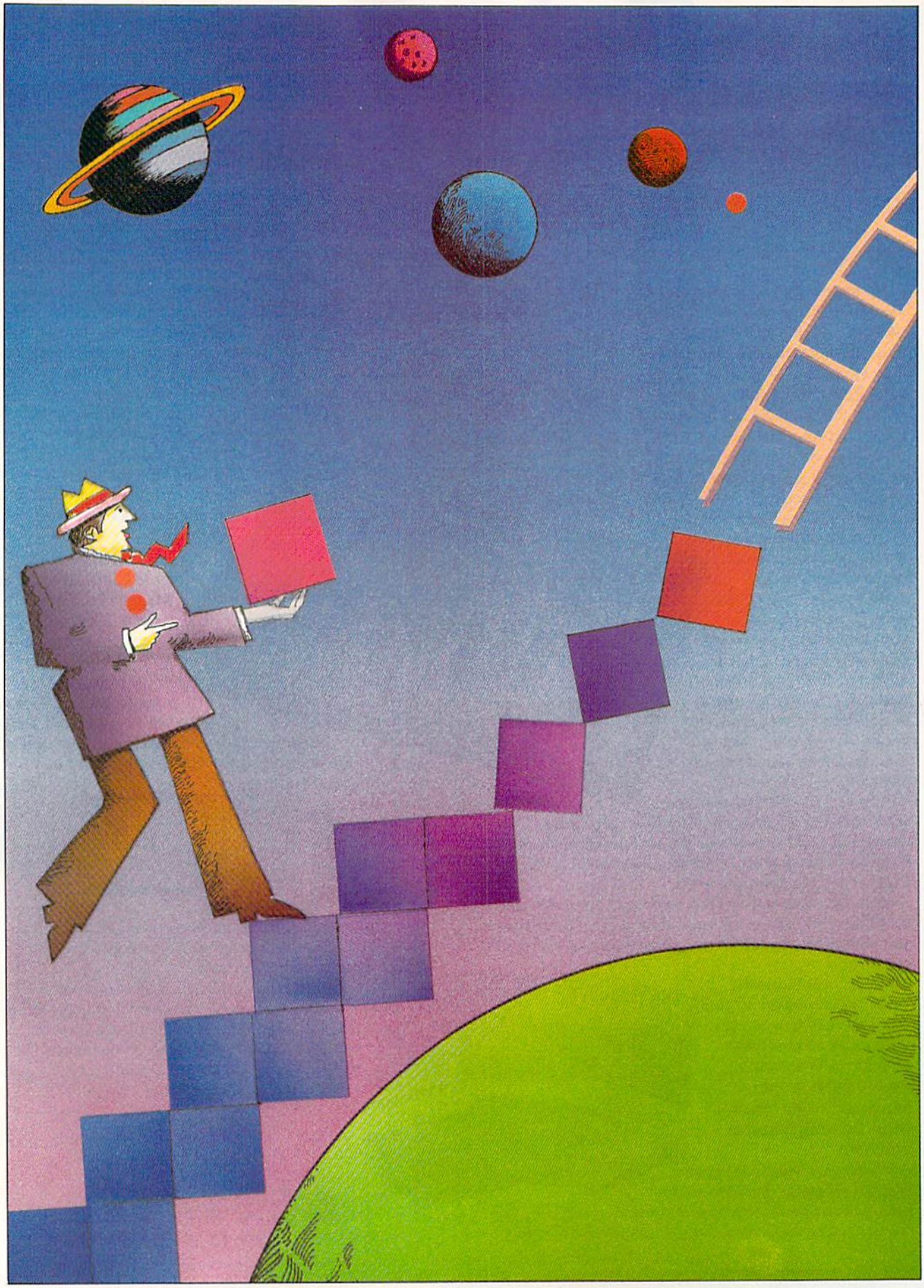

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Is Forth Headed For First?

BY JOHN MOORE AND ROBERT MOORE

What do you know about Forth, and is it for you? We challenge you to take the following quiz.

Which of the following is true of Forth?

a) It is a strange new computer programming language.
b) It is a fascinating high-tech cult phenomenon complete with T-shirts, bumper stickers, conventions and hot debates.
c) It is a threaded interpretive language.
d) It is a grass-roots innovation headed for commercial success.
e) It is the brainchild of a single man.
f) It started off controlling telescopes and now runs everything from video games to hand calculators to database management systems.
g) It is "Fourth," intentionally misspelled.
h) It is so unusual that it makes all the most popular programming languages look alike.
i) It is all of the above.

The correct choice is "i," and there is more besides. If you already find Basic confining or cumbersome, Forth is worth a try. If you want to write game programs, Forth is a better bet than Basic. If Basic already exposes you to more computer science than you want, stick with it. If you want to branch out and expand your knowledge, Forth is for you.

The History of Forth

Forth was developed in the late 1960s and early 1970s almost single-handedly by Charles Moore, working on an IBM 1130 computer system at the National Radio Astronomy Observatory in Charlottesville, Virginia. Moore was just creating a set of programming tools for his own professional benefit—trying to make his programming more efficient. Because the 1130's operating system permitted only five-character identifiers, he was forced to abbreviate the word "Fourth" (for the fourth version of some experimental stage of the new language) as "Forth," and somehow the name stuck.

Forth is gaining acceptance and being used more and more on small machines. (Forth is admirably suited for today's small computers, like the Commodore 64, because it was developed in the confines of the IBM 1130, which had a very small memory by today's standards.)

The rise of Forth has been a modern cult phenomenon, with all the trimmings: T-shirts, bumper stickers, exaggerated claims and rebuttals, fan and user groups, publications, hot debates and conventions. The circus atmosphere surrounding Forth, however,

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detracts from a fascinating programming system that is a language, an operating system, a program librarian, a virtual memory system and a set of utility programs, all rolled into one and sort of turned inside out.

How Forth Works

The two basic mechanisms of the Forth language are the stack and the dictionary.

The Stack

Forth features a 16-bit-wide stack on which all functions operate. The Forth stack is a place to put a pile of numbers, so to speak. A frequent analogy is the springy push-down contraption used in cafeterias to stack food trays. Only the top tray is immediately accessible. The last tray to be pushed onto the stack is always the first one to be popped off. By the way, "push" and "pop" are the real computerese terms for these operations on stacks.

If you've ever programmed a Hewlett-Packard hand calculator, or used the Unix utility "dc," or written any programming language using a last-in-first-out (LIFO) stack, you understand the strange, reversed logic required to manipulate a stack. If you have not done any of those things, the discussion below will give you a hint of what it is like.

The syntax of Forth is in a class known as reverse Polish, or postfix, notation. The terms reverse Polish and postfix are applied to any notation wherein an operator acts on the value of the entire expression to its left. Basic uses the more traditional infix notation of normal algebra. In infix languages, binary operators (operators like +, which require two operands) appear between their operands.

Basic (infix): 2 + 3
Forth (postfix): 2 3 +

In Forth, if I enter the number 2, I leave (or push) a single entry, containing a binary representation of the number 2, on top of the stack. Entering the number 3 pushes a 3 onto the stack. The 2 is still there, but it is "under" the 3.

Now comes the exciting part: If I enter the symbol +, the top two numbers are added together. The 2 and the 3 are popped from the stack, and their sum, 5, is pushed onto the stack. In Forth notation, this whole discussion could be symbolized:

2 3 + (add 2 and 3)

If you enter that line, including the parenthetical remark, the net result is a 5 on the stack. The remarks in parentheses are comments, like REM statements in Basic. They are ignored by the interpreter and serve only to document the logic of a program. If they are omitted, everything still works the same.

Note that where Basic always begins and ends with the Ready prompt, Forth always says OK.

The exchange would look like this on the screen (with the computer's output underscored):

OK
2 3 + OK

The working part is 2 3 +. First a 2 is pushed, then a 3. Then + pops the two numbers and pushes their sum.

When you enter 2 3 + to push a 5 onto the stack, the only visible effect will be OK, which is a pretty hollow victory. So far, you have only my word for what happened to the stack. Output is needed, and in Forth, the Dot command (.) performs output. It pops the top number on the stack and prints its value.

If I start with an empty stack and enter the line

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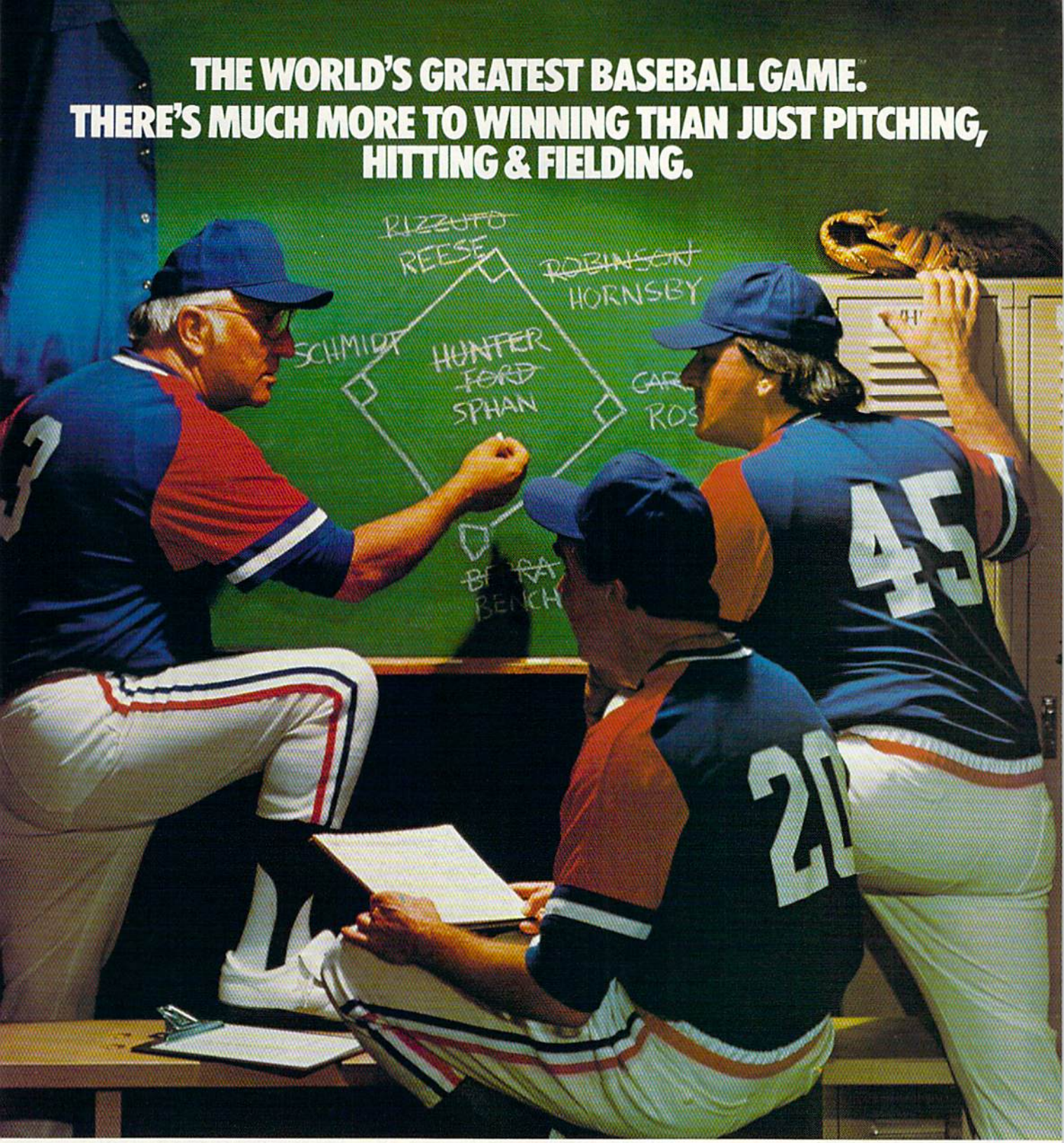

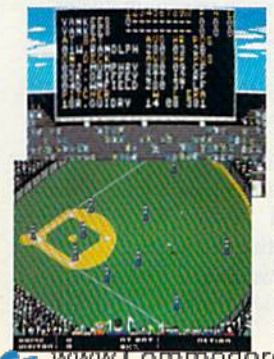

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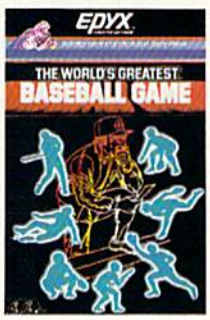

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```
2 3 + . ( PRINT "5". )
```

a 5 is printed, and the stack is again empty. The exchange would look like this on the screen:

```
OK
2 3 + . 5OK
```

A 2 is pushed, then a 3; they are replaced by their sum; the sum is popped and printed.

The basic syntactic difference between Forth and other languages takes some getting used to. However, combined with Forth's modern control structures (Begin/Until, Begin/While/Repeat, and an assortment of Do loop structures), the logic of reverse Polish usually forces the programmer to discover simpler solutions to problems. This results in briefer code that is easier to debug and modify.

The Dictionary

In Forth, almost everything is a word: every built-in program, every user program, even every variable. Each word is stored as an entry in the "dictionary." To write a Forth program, you use words already in the dictionary to define new words, which then become new entries in the dictionary. Thus, every time a new word is defined, the language is extended by one word. The newly defined word is in the same dictionary, and is referred to the same way, as all the built-in functions.

To execute a word, you enter its name. If the interpreter finds your word in the dictionary, it executes the word. If the word is not in the dictionary, Forth tries to interpret what you entered as a number. If what you entered is neither a word nor a number, Forth gives you an error message. Remember, words are executed, but numbers are pushed onto the stack.

In a very real sense, Forth *is* the dictionary: every function Forth provides is performed by executing dictionary entries (words). This scheme, with the simplicity of adding new words to the dictionary, leads to the much-touted extensibility of Forth.

Making New Definitions

Here is the definition of a simple Forth word. When it is executed, it prints the sum of the top two numbers on the stack. The word is PRINTSUM, a name I created, which doesn't duplicate any existing dictionary entry. The exchange defining PRINTSUM would look like this on the screen (comments optional):

```
OK
:   PRINTSUM  ( PRINT SUM OF TOP TWO )
    +         ( ADD THEM )
    .         ( PRINT THE SUM )

;
OK
```

Everything from ":" to ";" is the definition of PRINTSUM. If I enter those four lines, the result is a new dictionary entry, or word. Now that PRINTSUM is in the dictionary, I can execute it by simply entering its name, and it will add the top two numbers on the stack and print their sum. The exchange would look like this on the screen:

```
OK
2 3   PRINTSUM5OK
```

PRINTSUM has the same effect as "+ .":

```
2 3 + . 5OK
2 3 PRINTSUM 5OK
```

I can also use PRINTSUM in the definitions of future words (programs).

A similar definition is analyzed in more detail below, in the comparison between Basic and Forth.

The Uses of Forth

Forth has been used for everything from video arcade games to the inner workings of hand calculators. Its strengths and weaknesses are a nice compromise among speed, flexibility, lack of programming restrictions, compactness and ease of use.

Forth is even starting to find application in areas like interfaces between back-end database machines and their host computer systems, and new word processing systems.

In such large applications, Forth is often used as a high-level design language. When everything works, any performance problems are relatively easy to solve, because the assembler is so closely integrated with the rest of the system. Fast machine language subroutines are unusually easy in Forth.

Forth uniquely facilitates customizing and extending the language for everything from special applications to the programmer's personal programming style. This feature will especially attract serious programmers, including students of language design.

Some of the more enthusiastic fans of Forth suggest its use as an instructional language. Forth, at its simplest, is as simple as Basic and more exotic. It enforces the use of structured programming techniques.

Forth Compared to Basic

Here are Basic and Forth versions of the same simple algorithm, for comparison. First, a Basic program that prints the numbers 1–10:

```
100 FOR I=1 TO 10
200 PRINT I;
300 NEXT I
400 END
```

The output of this Basic program (what happens when you type RUN) looks like this:

```
RUN
 1  2  3  4  5  6  7  8  9  10
READY.
```

Line by line, here is the meaning of the Basic code:

100—Repeats all the lines from here to the line containing NEXT I (line 300 in this example); the first time through, sets I equal to 1; for each subsequent repetition, adds 1 to I, and keeps at it until the lines have been executed with I equal to 10; then drops through the NEXT I statement and continues.

200—Prints the current value of the variable I.

300—Goes back to the For statement that mentions I (line 100), after setting I to its next value.

400—Stops the program.

Now here is the same program, written in Forth:

```
: TEST
  CR
  10 0 DO
      I 1+ .
  LOOP
;
```

The output of this Forth program (what happens when you type TEST) looks like this:

```
TEST
 1  2  3  4  5  6  7  8  9  10 OK
```

Line by line, here is the meaning of the Forth code:

: TEST—The colon (:) signifies the beginning of the definition of a new word in the dictionary. The character string following ":" is taken to be the name of the new word. The name of the new word defined here is "TEST."

CR—Print a carriage-return character.

10 0 DO—Execute all the words between "DO" and the next "LOOP" with a DO index set at values 0, 1, 2, . . ., 8 and 9, in that order.

I 1+ .—"I" gets the current value of the DO index from a magic place where it is hidden, and pushes it onto the stack. "1+" is the same as "1 +" (with a space between the two characters), and adds one to the top number

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on the stack. The Dot command (.) pops the top number off the stack and prints its value.

LOOP—Adds 1 to the value of the DO index and returns to the most recent DO.

;—The semicolon (;) signifies the end of a "colon definition." When this semicolon is processed, a new word, "TEST," has been defined in the dictionary.

Pros and Cons of Forth

There is a hodgepodge of things to like and dislike about Forth. The ones that are important to you, if any, depend on your interests. If you are a professional software developer, your concerns are different than those of a hobbyist or a student. The type of application you write also makes a big difference.

Forth is much faster than Basic, but it is much slower than good machine language.

Forth generates more compact code than Basic. It even generates smaller code than most assembly language programmers have the time and skill for.

Forth programming is more easily portable to other machines than assembly language. This means that Forth code developed on, say, a Commodore 64, will run with relatively few changes on any machine that supports Forth. This is only a comparison, though, and a mysterious software law says that you will always be surprised by the amount of work required to transfer any program to a new machine.

In contrast, Forth is less portable than Basic. The Commodore 64's Basic is the small-machine standard MicroSoft implementation. Thus, your C-64 Basic programs should be relatively easy to carry to some other machine supporting a MicroSoft Basic.

Forth implementations typically lack floating-point arithmetic. They do all kinds of tricks with integers, even 32-bit integers, but don't understand fractions in any form. This makes accounting and scientific computations very tricky to write. This deficiency is not inherent in the design of the language and is being corrected in some implementations.

Forth is generally more modern and advanced than Basic, but not consistently so. Some of Forth's deficiencies seem archaic, but merely show its youth and specialized origin. The lack of floating-point arithmetic is an example. On the other hand, the ease of defining user-specified data types is a very modern convenience, and one of great power.

Forth is less common and therefore less widely understood than Basic, but it is better documented.

Well-written Forth is easier to read and understand than well-written Basic. Therefore, such Forth programs are easier to modify and debug.

Forth removes all restrictions from the programmer's access to the hardware, but this has the disadvantage that your system can then crash more readily than when your program is in Basic.

The inner workings of the whole Forth system are easily accessible. Standard implementations are documented in several good publications (see the recommended reading list at the end of this article). Forth was designed to be easily modified and extended. The functions of many basic system words (like ".") are easily changed. On the other hand, the programmer is thus tempted to try tricky stuff. He crashes his system. He reboots. He must learn more of the internals. It is fun and educational, but it goes on forever.

Forth enforces structured programming by not having any form of GOTO and by having a nonstandard source-code format. Each definition on the disk must fit in a block, or screen, 64 columns wide by 16 rows high. If a new definition is too large to fit into that size screen, part of the word must first be defined, and the rest called from a second definition. This restriction has both advantages and disadvantages, but it is less of a restriction than you might think, and it fosters good programming habits.

So, is Forth for you? It is if you prefer a changing language destined to progress and adapt to the world over the next few years.

Recommended Reading

Starting Forth, by Leo Brodie, 1981, Prentice-Hall, Inc., Englewood Cliffs, NJ 07632.

Forth Dimensions, published periodically by: Forth Interest Group, PO Box 1105, San Carlos, CA 94070.

Forth Encyclopedia, by Mitch Derick and Linda Baker, 1982, Mountain View Press, Inc., PO Box 4656, Mountain View, CA 94040.

All About Forth, by Glen Haydon, 1982, Mountain View Press, Inc., PO Box 4656, Mountain View, CA 94040. R

Address all author correspondence to John Moore and Robert Moore, M&M Software Co., 3790 El Camino Real, Suite 2003, Palo Alto, CA 94306.

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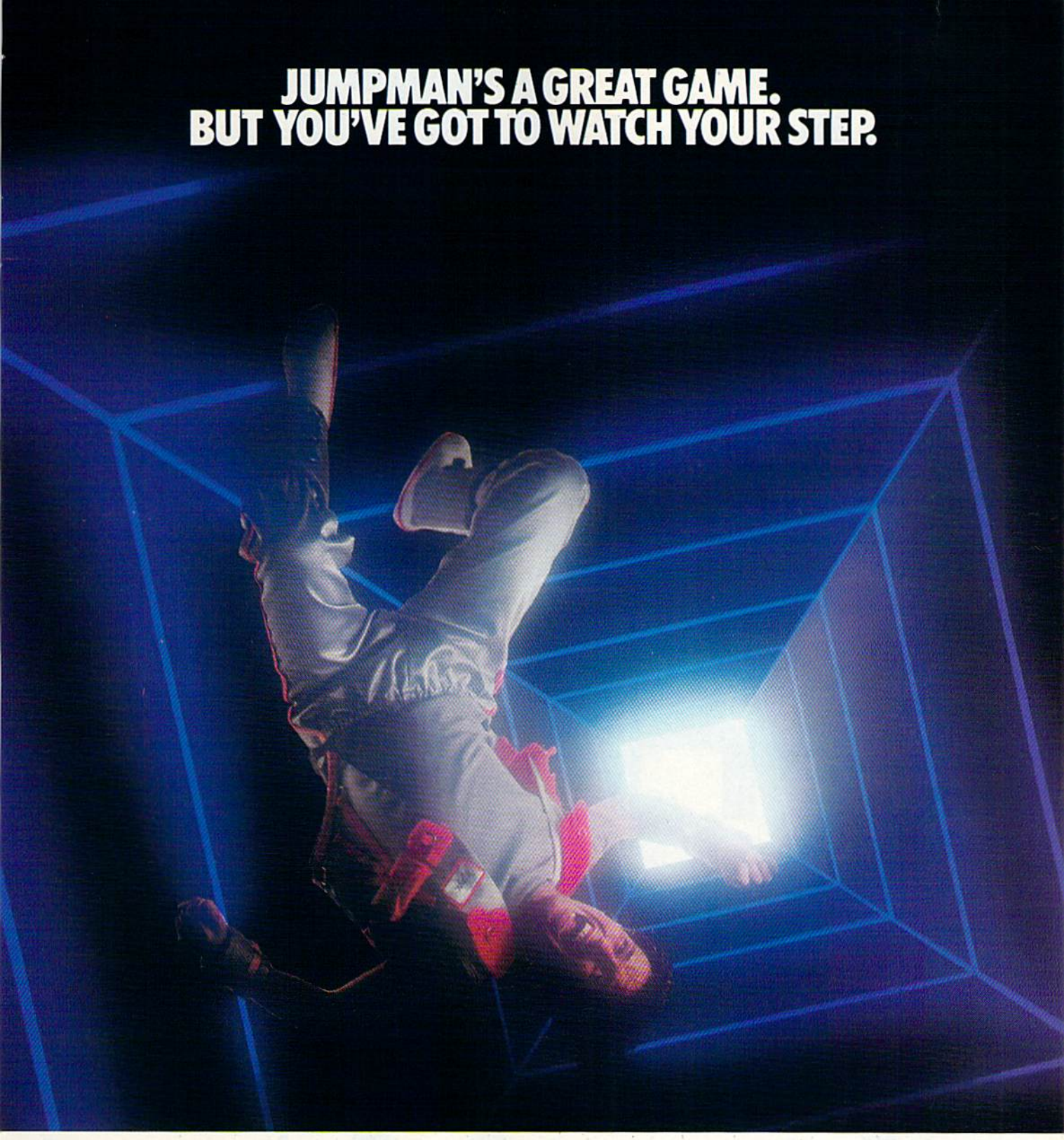

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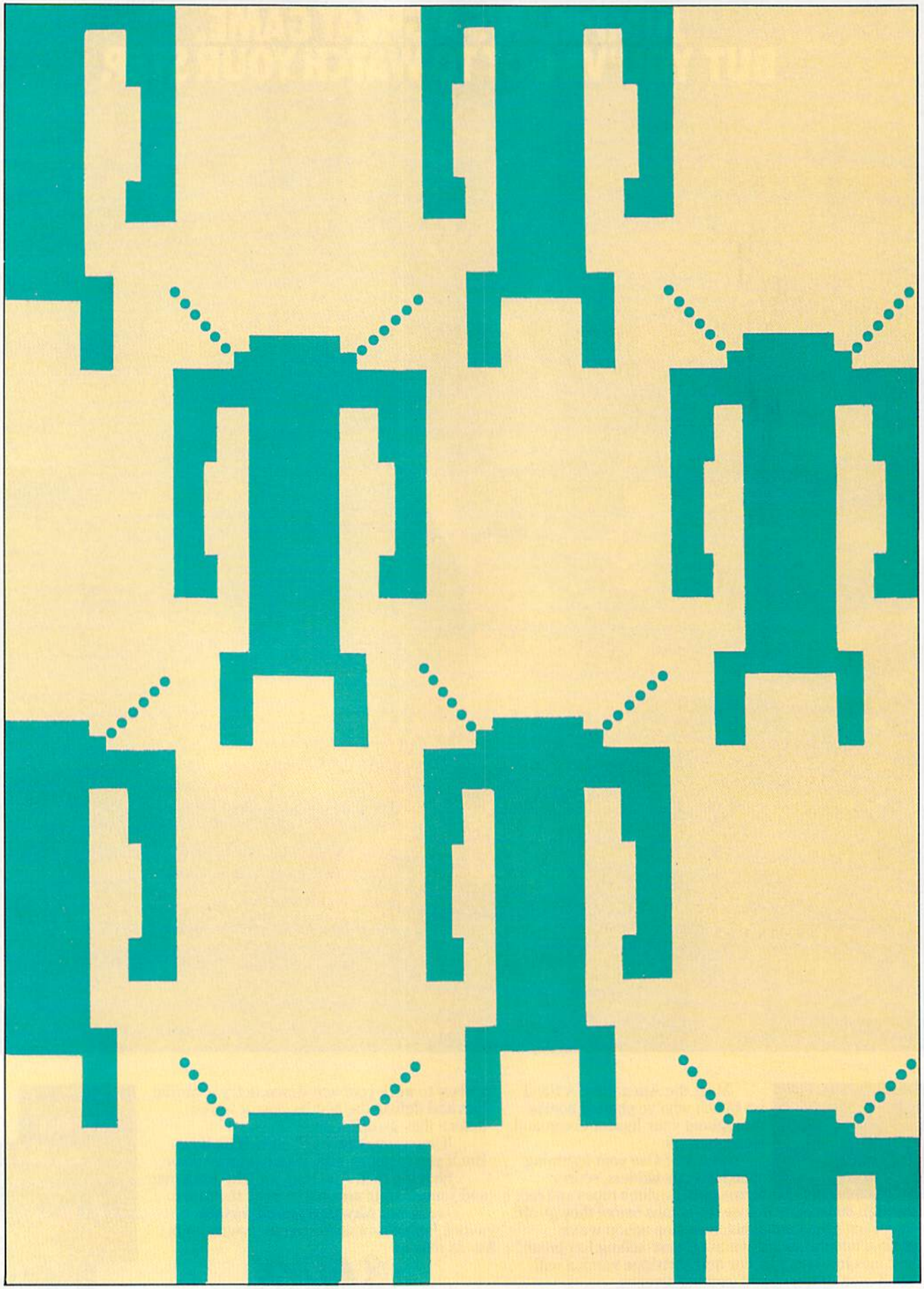

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RUN It Right

VIC-20 with 8K expansion

Nimbots

BY MICHAEL BUCKLEY

You will soon be confronted by a dozen nasty Nimbots, whose single-minded obsession is to preside over your defeat. This cunning game of the mind is both fun and challenging.

In Nimbots, you and the computer—or a human opponent—take turns removing from one to four Nimbots according to certain rules. To move, you key in the letters of the Nimbots that you want taken away and press the return key. Nimbots taken in one turn must be in a straight line, horizontally or diagonally but not vertically, and there must not be any gaps. For example, ADHL would be a legal move, but ADL would not—despite whether or not H is still in place. (The computer will not accept illegal moves.) The player forced to make the last move is the loser.

Eight Versions

The above rules describe the standard version. When you've mastered that, you can try the variation in which the

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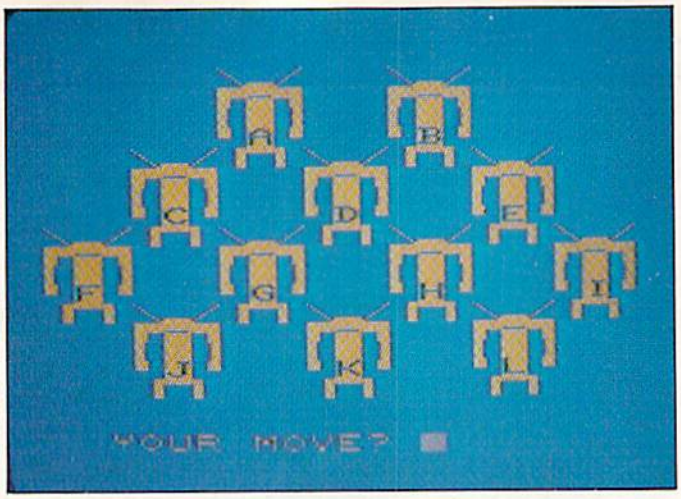

Nimbots' Ancestor

Nimbots is one of the many descendants of Nim, a game in which two players take turns removing one or more counters from any one pile. The player unable to make a move is the loser—in other words, the winner takes the last counter or counters.

After playing the game for a while, you begin recognizing certain "safe" positions from which your opponent cannot win. Two identical piles are safe: whatever your opponent does to one pile, you do to the other. Therefore, playing Nim with three piles, containing one, two and three counters is safe because you can always match your opponent's first move and force equal piles.

The VIC-20 is one of the many microcomputers built around the 6502 microprocessor. Included in the 6502 instruction set is the EOR, or "Exclusive OR," instruction. EOR compares two binary numbers, bit by bit, giving a 0 when corresponding bits are the same and a 1 when they differ.

For instance, 89 EOR'ed with 108 would give 53. This example serves to illustrate why the instruction is often called "add without carry."

```
 89 (decimal) = 1011001 (binary)
108 (decimal) = 1101100 (binary)
-------------------------------
 53 (decimal) = 0110101 (binary)
```

Obviously, any number EOR'ed with itself is 0. Also, 1 EOR'ed with 2 EOR'ed with 3 is 0.

Before there were computers, mathematicians had another name for this operation: they called it *nim-summing*. The nim-sum of any safe position in Nim is 0!

One version of Nim starts with three piles of three, five and seven counters. You compute the nim-sum to be 1. For example:

```
3 (decimal) = 011 (binary)
5 (decimal) = 101 (binary)
7 (decimal) = 111 (binary)
-------------------------
1 (decimal) = 001 (binary)
```

Taking 1 from any pile will reduce the nim-sum to 0. You can't win if you're facing 2, 5, 7 or 3, 4, 7 or 3, 5, 6 (unless your opponent makes a mistake later).

Now comes the switch. Normally this game is played in reverse: You try to make the other player take the last counter. The strategy for this version is left as an exercise for the reader.

How the Program Works

Since there are 12 Nimbots, and each one either is or isn't there, there are 4096 (2 to the 12th power) possible configurations. Each element of the A% array contains a number that tells the computer what move to make if it encounters the corresponding position. If an element contains a 0, then that position is safe (for the opponent) or unanalyzed (in the low-difficulty version), and the computer moves randomly.

Let's set up a sample game board display on which A, F, J, K and L are visible. A%(2119) represents this setup. In binary, 2119 is 100001000111. The alphabet letters A–L run from left to right in this binary number. (Include the leading zeroes so that the resultant 12-digit number will match the 12 alphabetized Nimbots.) If A%(2119) contains 6, which decodes to 000000000110, then the computer would select Nimbots J and K, leaving you with three isolated Nimbots (A, F and L) and certain defeat, assuming the standard no-gaps-last-person-loses version of the game.

How does A% get to contain these values? There are 72 legal moves, including all versions, and they are stored in the M% array. For instance, M%(13) may or may not contain 6, because this array gets shuffled to randomize the play. In binary, 6 is 000000000110, which, as you saw above, stands for Nimbots J and K.

A% is scanned from beginning to end. When an element is found to contain a zero, representing a safe position, then each legal move in M% that could lead to that position is added to the (safe) index, giving the index of an unsafe position. The move in M% is then stored in each location that is computed to be unsafe. Referring to the above example, A%(2113) contains 0—a safe position. There are many moves in M% that could lead to this position, one of which, in M% (13), is 6. Adding 6 to 2113 yields 2119. So 6 gets stored in M% (2119).

Of course, all this is done before you make your first move. It's a procedure that takes over 20 minutes in Basic, but only a couple of seconds with the included machine language subroutine. If you want to compare the two versions of the routine, Listing 2 shows the assembly code alongside the corresponding Basic statements in the comments field.

Aftermath

Here are some questions I had to answer before I could convert those few lines of Basic into machine language. This information would have been invaluable to me a few months ago—I hope it saves somebody else some needless frustration. Reference to Listing 2 will help you understand the answers; some knowledge of the 6502 assembler is assumed.

1. Where are some safe places in zero page for indirect addressing? Nimbots uses locations 163–176. I've used this area without any ill effects so far, but check your memory map to ensure that the system's use of these locations doesn't conflict with yours.

2. How do you get into Basic arrays from machine language? Use the Start of Arrays vector at addresses 47–48. It points to the prologue of the first dimensioned array—the array itself is seven bytes further along. Other arrays occur in order of appearance, each after a seven-byte offset. In lines 829–853 of the assembly listing, you'll see how I stored the address of the first byte of M%, in 163–164, and of A%, in 165–166.

3. How do you maintain relocatability when you need to jump more than 127 bytes? Use a branch as a stepping stone. Look at lines 916 and 918. They are both BNEs. Obviously, the second one can never be executed under normal circumstances—it's just a dummy instruction. Now look at line 1001. I would like to have put BNE 863 here, but that's beyond the range of relative addressing. So, instead, I put BNE 918, and then at 918, I inserted the BNE 863 right below another BNE.

Finally, I'd be interested in hearing from readers who find a simple strategy for any version of Nimbots.

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object of the game is reversed: You try to take the last Nimbot yourself.

There are also versions in which the no-gaps rule is waived—for example, FHI would be an acceptable move (regardless of the presence of G). The straight-lines rule applies to all versions, however.

All four variations may be played by one or two persons. This gives you a total of eight choices, which you select by pressing the appropriate function key, according to the table below.

Function	No. Players	Gaps	Last Player
F1	one	no	loses
F3	one	no	wins
F5	one	ok	loses
F7	one	ok	wins
F2	two	no	loses
F4	two	no	wins
F6	two	ok	loses
F8	two	ok	wins

In the one-player versions, if you do not wish to make the opening move, simply press the return key, and the computer will go first.

When asked to do so, you must choose a difficulty level from zero to nine. At the higher levels, the computer plays flawlessly—but you can still beat it if you make all the right moves. At lower levels, the computer often acts randomly.

Save It First

Nimbots is written in Basic, with a machine language subroutine that is Poked into the cassette buffer starting at address 828. To avoid losing an untested program, be sure to save it at least once before you run it.

The total of all the values in the M% array is 49680, and the sum of all the numbers Poked into memory locations 828–1003 is 24627. Before you run Nimbots, enter:

```
25 FORJ=0TO71:T=T+M%(J):NEXT:
   PRINTT:END
```

The program should display the number 49680 and stop. If you get any other number, you have an error somewhere in Data statements 30–100. When you get the correct total, replace line 25 with line 125:

```
125 FORA=828TO1003:T=T+PEEK(A):
    NEXT:PRINTT:END
```

This time, if you don't get 24627, you have a Data error in lines 828–991. When you've got it correct, take out line 125. If you have no other mistakes, you should be able to "Run It Right."

If you don't want to enter the program yourself, send me $3, a blank cassette and a self-addressed stamped mailer, and I'll send you a couple of verified, tested copies. R

Address all author correspondence to Michael R. W. Buckley, 445 East 19th St., North Vancouver, B.C. Canada V7L 2Z6.

Listing 1. *Basic program for Nimbots.*

```
10 DIMM%(71):PRINT"{SHFT CLR}{5 SPACEs}{CTR
   L 1}{2 SPACEs}NIMBOTS "
20 FORJ=0TO71:READM%(J):NEXT:S2=36875:S3=S2
   +1:S5=S3+2:CL=S5+1:C1=255.5
30 DATA1,2,4,8,16,32,64,128,256,512,1024,20
   48:DATA3,6,24,48,96,384,768,3072
50 DATA17,34,68,136,272,544,1152,2304:DATA9
   ,18,36,144,288,576,1280,2560
70 DATA7,56,112,896,273,546,1160,2320:DATA1
   46,292,1312,2624,120,2321,1316
90 DATA5,40,72,80,130,257,260,514,640,1028,
   1032,1056,2049,2064,2112
100 DATA88,104,1060,1284,2065,2305
110 Y$="{HOME}{23 CRSR DNs}":X$="{22 CRSR R
   Ts}"
120 DIMA%(4095):IFPEEK(828)-216THENFORA=828
   TO1003:READP:POKEA,P:NEXT
130 PRINT"{2 CRSR DNs}{2 SPACEs}{CTRL 7}PRE
   SS FUNCTION KEY{4 SPACEs}TO SELECT VERS
   ION:"
140 PRINT"{CRSR DN}{CTRL 9}NO. PLAYERS{SHFT
    -}GAPS{SHFT -} LAST ONE{3 SPACEs}TWO {
   SHFT -} ?? {SHFT -} MOVE"
150 PRINT"{2 SPACEs}{CTRL 3}{CTRL 9}F1{CTRL
    0}{3 SPACEs}{CTRL 9}F2{CTRL 0}{2 SPACE
   s}{SHFT -} NO {SHFT -}LOSES{2 SPACEs}{C
   TRL 9}F3{CTRL 0}{3 SPACEs}{CTRL 9}F4{CT
   RL 0}{2 SPACEs}{SHFT -} NO {SHFT -} WIN
   S";
160 PRINT"{2 SPACEs}{CTRL 9}F5{CTRL 0}{3 SP
   ACEs}{CTRL 9}F6{CTRL 0}{2 SPACEs}{SHFT
   -} OK {SHFT -}LOSES{2 SPACEs}{CTRL 9}F7
   {CTRL 0}{3 SPACEs}{CTRL 9}F8{CTRL 0}{2
   SPACEs}{SHFT -} OK {SHFT -} WINS"
170 GETA$:IFA$=""THEN170
180 F=ASC(A$)-132:Q=0:IFF<1ORF>8THEN170
190 M=0:IFF>4THENF=F-4:Q=1:M=1:GOTO250
200 PRINT"{CRSR DN}{2 SPACEs}{CTRL 7}SELECT
    DIFFICULTY:":PRINT"{CRSR DN}{6 SPACEs}
   {CTRL 3}FROM {CTRL 9}0{CTRL 0} = EASY"
220 PRINT"{3 SPACEs}THROUGH {CTRL 9}9{CTRL
   0} = HARD"
230 GETA$:IFA$=""THEN230
240 D=ASC(A$)-48:IFD<0ORD>9THEN230
250 P=110:IFF=1ORF=3THENP=25
260 POKECL,P:PRINT"{SHFT CLR}":P2=0:P3=0:Y=
   1:X=1:C=31:IFF>1THENC=5:IFF>2THENC=28:I
   FF=4THENC=158
280 B=4095:POKES2,0:POKES3,0:N=0:GOSUB710:F
   ORN=1TO12:GOSUB710:Y=1:IFN>2THENY=5
290 IFN>5THENY=9:IFN>9THENY=13
300 X=N*6:IFN>2THENX=(N*24-Y*21+45)/4
310 PRINTLEFT$(Y$,Y+1)LEFT$(X$,X);:PRINTCHR
   $(C)"{SHFT M}{COMD P}{SHFT N}{CRSR DN}{
   3 CRSR LFs}{CTRL 9}{COMD D}-{COMD F}{CR
   SR DN}{3 CRSR LFs}{CTRL 0}{COMD J}{CTRL
    9} {CTRL 0}{COMD L}{CRSR DN}{3 CRSR LF
   s}{COMD V} {COMD C}{CRSR DN}{3 CRSR LFs
   }{COMD L}{COMD Y}{COMD J}"
330 PRINTLEFT$(Y$,Y+4)LEFT$(X$,X+1)"{CTRL 9
   }"CHR$(N+64):POKES5,0:NEXT:POKES5,15
340 FORN=1TO222:NEXT:POKES5,0
350 PRINT"{3 CRSR DNs}{2 SPACEs}ONE MOMENT
   PLEASE":H=50:IFF>2THENH=71
370 POKE982,(H+1)*2:POKE856,1:IFF=2ORF=4THE
   NPOKE856,0
390 POKE1000,D*5/3:SYS828:POKE956,448-PEEK(
   956)
395 Q=Q*-1:W$="PLAYER"+STR$(2+(Q=-1)):IFQ=0
   THENW$=""
396 PRINT"{HOME}{19 CRSR DNs}{3 SPACEs}";W$
400 INPUT"{HOME}{20 CRSR DNs}{2 SPACEs}YOUR
    MOVE{11 SPACEs}{11 CRSR LFs}";Q$:IFQ$<
   >""THEN430
410 IFB=4095THEN500
420 GOTO400
430 V=0:FORN=1TOLEN(Q$):E=76-ASC(Q$):IFE>=0
   ANDE<12THENV=VOR(2{UP ARROW}E)
440 Q$=RIGHT$(Q$,LEN(Q$)-1):NEXT:FORJ=0TOH:
   IFV=M%(J)THEN460
450 NEXT:GOTO400
460 IF(VANDB)<>VTHEN400
470 B=B-V:IFB=0THENONFGOTO610,580,610,580
480 FORN=1TO12:E=2{UP ARROW}(12-N):IFEANDVT
```

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Listing 1 continued.

```
    HENGOSUB66Ø
49Ø NEXT
5ØØ IFMTHEN395
51Ø V=A%(B):IFVTHENFORN=ØTO333:NEXT:GOTO55Ø
52Ø FORJ=ØTO4:R=INT(RND(Ø)*51):V=M%(R):M%(R
    )=M%(J):M%(J)=V:NEXT
53Ø FORJ=ØTOH:V=M%(J):IF(VANDB)=VTHEN55Ø
54Ø NEXT:GOTO58Ø
55Ø FORN=1TO12:E=2{UP ARROW}(12-N):IFEANDVT
    HENGOSUB66Ø
56Ø NEXT:B=B-V:IFBTHEN4ØØ
57Ø IFF=2ORF=4THEN61Ø
58Ø PRINT"{SHFT CLR}":FORT=1TO8:N=INT(T*12/
    7):PRINTLEFT$(Y$,(1Ø-T)*2)"{2 CRSR RTs}
    {CTRL 9}{CTRL 1}>>>>> YOU WIN! <<<<"
6ØØ GOSUB71Ø:POKECL,(11-T)*9:NEXT:GOTO64Ø
61Ø FORT=13TO6STEP-1:N=INT(T*12/7):PRINT"{S
    HFT CLR}"LEFT$(Y$,(14-T)*2)"{2 CRSR RTs
    }{CTRL 1}>>>>> YOU LOSE <<<<"
63Ø GOSUB71Ø:POKECL,(T-5)*27:NEXT
64Ø FORN=ØTO666:NEXT:POKES5,Ø:FORN=ØTO666:N
    EXT:RUN
66Ø GOSUB71Ø:Y=1:IFN>2THENY=5:IFN>5THENY=9:
    IFN>9THENY=13
67Ø X=N*6:IFN>2THENX=(N*24-Y*21+45)/4
68Ø PRINTLEFT$(Y$,Y+1)LEFT$(X$,X);:PRINTCHR
    $(C)"{3 SPACEs}{CRSR DN}{3 CRSR LFs}{3
    SPACEs}{CRSR DN}{3 CRSR LFs}{3 SPACEs}{
    CRSR DN}{3 CRSR LFs}{3 SPACEs}{CRSR DN}
    {3 CRSR LFs}{3 SPACEs}"
7ØØ PRINTLEFT$(Y$,Y+4)LEFT$(X$,X+1)CHR$(N+6
    4):POKE36878,Ø:RETURN
71Ø POKES5,15:P2=C1-2{UP ARROW}(5.75-N/12):
    P3=C1-2{UP ARROW}(6-N/12):POKES2,P2:POK
    ES3,P3:RETURN
828 DATA216,24,165,47,1Ø5,7,133,163,165,48,
    1Ø5,Ø,133,164
842 DATA24,165,47,1Ø5,158,133,165,165,48,1Ø
    5,Ø,133,166
855 DATA169,1,133,167,169,Ø,133,168,165,167
    ,1Ø,133,169,165,168,42,133,17Ø
873 DATA24,165,165,1Ø1,169,133,171,165,166,
    1Ø1,17Ø,133,172
886 DATA16Ø,1,177,171,2Ø8,93,136,24Ø,249,16
    Ø,Ø
897 DATA177,163,133,174,2ØØ,177,163,133,173
9Ø6 DATA165,167,37,173,2Ø8,68,165,168,37,17
    4,2Ø8,62,2Ø8,199
92Ø DATA24,165,167,1Ø1,173,133,175,165,168,
    1Ø1,174,133,176,6,175,38,176
937 DATA24,165,165,1Ø1,175,133,175,165,166,
    1Ø1,176,133,176,152,17Ø
952 DATA16Ø,Ø,177,162,24Ø,9,177,175,2Ø8,16,
    2ØØ,177,175,2Ø8,11
967 DATA16Ø,1,165,173,145,175,136,165,174,1
    45,175,138,168
98Ø DATA2ØØ,192,1Ø2,2Ø8,168,23Ø,167,2Ø8,2,2
    3Ø,168
991 DATA165,167,2Ø1,255,2Ø8,177,165,168,2Ø1
    ,15,2Ø8,171,96
```

Listing 2. *Assembly code listing for Nimbots.*

```
                        .BA 828
828  216                CLD
829   24                CLC
830  165  47             LDA 47
832  105   7             ADC #7
834  133 163            STA 163
836  165  48             LDA 48
838  105   0             ADC #0
840  133 164            STA 164
842   24                CLC
843  165  47             LDA 47
845  105 158            ADC #158
847  133 165            STA 165
849  165  48             LDA 48
851  105   0             ADC #0
853  133 166            STA 166

855  169   1             LDA #1          ; I = 1
857  133 167            STA 167
859  169   0             LDA #0
861  133 168            STA 168

863  165 167            LDA 167         ; REM
865   10                ASL A
866  133 169            STA 169
868  165 168            LDA 168
870   42                ROL A
871  133 170            STA 170

873   24                CLC
874  165 165            LDA 165
876  101 169            ADC 169
878  133 171            STA 171
880  165 166            LDA 166
882  101 170            ADC 170
884  133 172            STA 172

886  160   1            LDY #1          ; IF A%(I) <> 0 THEN 985
888  177 171            LDA (171),Y
890  208  93            BNE 985
892  136                DEY
893  240 249            BEQ 888

895  160   0            LDY #0          ; J = 0

897  177 163            LDA (163),Y     ; K = M%(J)
899  133 174            STA 174
901  200                INY
902  177 163            LDA (163),Y
904  133 173            STA 173

906  165 167            LDA 167         ; IF (I AND K) <> 0 THEN 980
908   37 173            AND 173
910  208  68            BNE 980
912  165 168            LDA 168
914   37 174            AND 174
916  208  62            BNE 980

918  208 199            BNE 863

920   24                CLC             ; S = I + K
921  165 167            LDA 167
923  101 173            ADC 173
925  133 175            STA 175
927  165 168            LDA 168
929  101 174            ADC 174
931  133 176            STA 176

933    6 175            ASL 175
935   38 176            ROL 176

937   24                CLC
938  165 165            LDA 165
940  101 175            ADC 175
942  133 175            STA 175
944  165 166            LDA 166
946  101 176            ADC 176
948  133 176            STA 176

950  152                TYA
951  170                TAX

952  160   0            LDY #0          ; IF PEEK(PEEK(162)) = 0 THEN 967
954  177 162            LDA (162),Y
956  240   9            BEQ 967

958  177 175            LDA (175),Y     ; IF A%(S) <> 0 THEN 978
960  208  16            BNE 978
962  200                INY
963  177 175            LDA (175),Y
965  208  11            BNE 978

967  160   1            LDY #1          ; A%(S) = K
969  165 173            LDA 173
971  145 175            STA (175),Y
973  136                DEY
974  165 174            LDA 174
976  145 175            STA (175),Y

978  138                TXA             ; REM
979  168                TAY

980  200                INY             ; J = J + 1

981  192 102            CPY #102        ; IF J < 51 THEN 897
983  208 168            BNE 897

985  230 167            INC 167         ; I = I + 1
987  208   2            BNE 991
989  230 168            INC 168

991  165 167            LDA 167         ; IF I < 4095 THEN 863
993  201 255            CMP #255
995  208 177            BNE 918
997  165 168            LDA 168
999  201  15            CMP #15
1001 208 171            BNE 918

1003  96                RTS             ; RETURN

                        .EN
```

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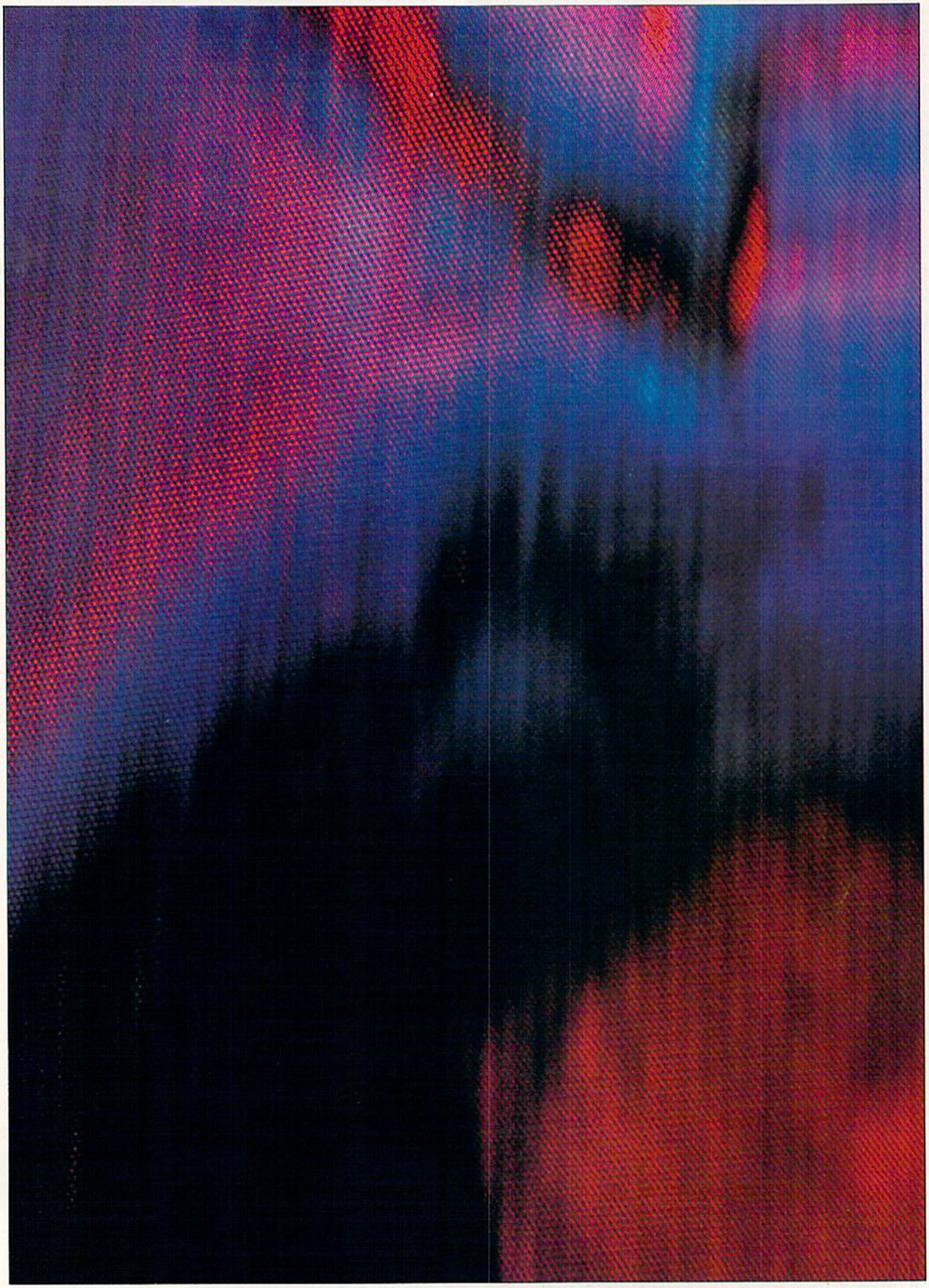

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I've seen many fine articles on multicolor programming, but I've never found an easy-to-use Editor that would design these types of characters. As a result of my futile search, I wrote the Editor program. It is designed to work on a VIC-20 with 3K memory expansion (Super Expander will also work). Simply type in this program, save it and use it.

If, however, you have an 8K or greater memory expander, type in both the Screen Relocation program and the Editor program and save each separately. Whenever you wish to use the Editor, load the Screen Relocation program and run it. This will make the VIC look like it did before you added the 8K memory. Next, load the Editor and remove line 10 (in fact, you may remove it permanently and save the new version). Now you may run the program.

The Many-Colored VIC

BY TOMMY MICHAEL TILLMAN

This Editor is an artist when it comes to designing and modifying your multicolored VIC-20 graphics characters. What's more, it's easy to use.

RUN It Right

VIC-20 with 3K expansion
Datassette; Printer (optional)

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Photo 1. The initial screen after power-up. The character shown is character 0 (the @ symbol). Notice the small high-resolution symbol and the multicolor symbol at the bottom right. In the bottom center is the large blow-up of the small multicolor symbol.

Photo 2. The same character, but the four colors have been changed. Notice how the character color of all the printed text has changed to produce contrast between the text and screen.

0—black
1—white
2—red
3—cyan
4—purple
5—green
6—blue
7—yellow
8—orange
9—light orange
10—pink
11—light cyan
12—light purple
13—light green
14—light blue
15—light yellow

Table 1. Color list.

The main screen is illustrated in Photo 1. In the upper left-hand corner is displayed the command board. If you don't know what to do, wait for a command to pop up! The following is a list and description of the commands.

C—Change colors
D—Display
G—Go to a new character number
L—Load an old character set
S—Save the character set (printer-screen-tape)

Remember that these are the main commands. If you choose one of them, they'll all be erased from the screen and replaced with new subcommands, which will give you instructions on how to continue properly. Always wait for the commands to appear! (There is a slight time lag in some subroutines.)

If you look to the right-hand corner of the screen, you'll see a large 6×6 square. This is the display area, which allows you to put your newly constructed multicolor characters on top of or beside each other to create larger multicolor characters.

If you look at the middle of the display screen, you'll see three rows of normal high-resolution characters. These are the characters that you may restructure into multicolor characters. (As you create a new character, the character corresponding to the one you're working on will change shape. The characters in these three rows will still be displayed in High-Resolution mode.)

In the left-bottom corner of the screen, you'll see the four colors with which you may color your multicolor character: screen color, border color, character color and auxiliary color. (These colors will be known, respectively, as color 1, color 2, color 3 and color 4.)

In the right-bottom corner of the screen, you'll see the character you're restructuring. It will be displayed in High-Resolution mode and, below, in its appropriate Multicolor mode.

The bottom middle of the screen is the most important. This is the work area where you'll display the multicolor character in a 4×8 display. The character will be made up of 32 large blocks, colored in one of the four colors you're allowed to use.

Around the top and left of the large character are arrows that indicate which block of color in the work area you'll be changing. Press the cursor keys to move the arrows. The right cursor moves the arrows right and the left cursor moves them left. Likewise, the down cursor moves the arrows down and the up cursor moves them up. The character number on which you're currently working will be displayed over the work area.

How To Use the Program

Load the program according to previous instructions. Run it and wait for the screen to set itself.

Now select a character to work on (0–57). Press G for Go to Character and then input the character number (0–57). Always press the return key after responding to requests for input. Also, for later reference, don't forget to make a note of what characters you are changing.

If you wish, you may change colors now. (In fact, you can change the colors anytime you are back to the main command screen.) To change colors, press C. Input your choice of screen color from the color list (see Table 1). Remember to press the return key after you input your choice.

Next, select your choice of border color, then character color, and finally, auxiliary color. (You may choose only colors 0–7 for character color.)

Now you may restructure your character. To do this, you must use the cursor keys and the number keys 1, 2, 3 and 4. Notice the arrows above and to the left of the character. These arrows indicate which color block of the character you are changing. By pressing the cursor keys (with the shift key) you may position the arrows to point to any block within the work area.

To change the color of the block, you must use keys 1, 2, 3 or 4. If you press key 1, you'll erase that block (because you are coloring it in the background color); key 2 will color that block in the border color; key 3 will color it in the character color; key 4 will color it in the auxiliary color.

Notice that as you change the blocks, the corresponding pixel dots in the multicolor example change to the proper color! The corresponding dots in the high-resolution example change to the proper configuration, too.

If you wish to display your multicolor characters on the display screen (upper right-hand corner), then press D for the display function. First you will be asked for the width and height of the display screen (the number of characters hori-

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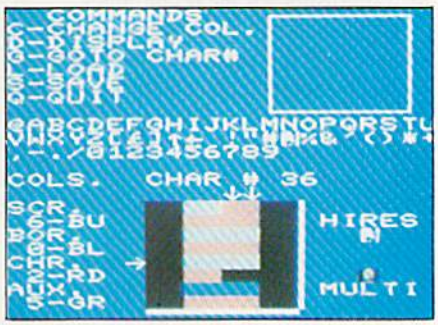

Photo 3. Character 36 after the cursor keys and keys 1–4 have been pressed to change it. The cursor keys move the arrows to point to various positions within the character, and keys 1–4 choose between the four colors available for coloring the character.

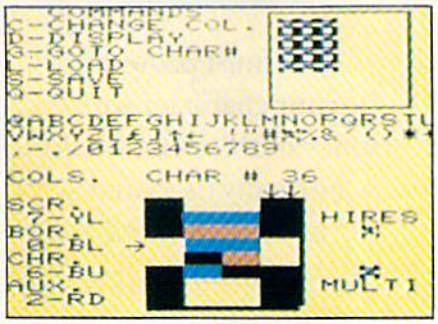

Photo 4. A different shape for character 36. Notice that this multicolor character has been placed into the display area in a 3×4 formation. The character color chosen for each individual character is blue. Note that you could pick any of the characters to go in each position of the display, and you could also choose each position with its own character color.

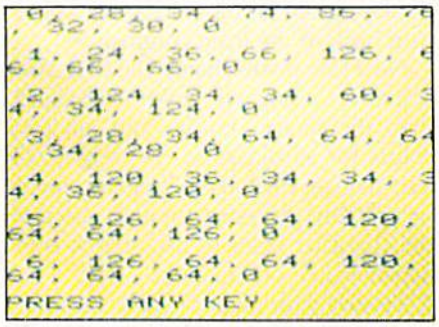

Photo 5. The data table for the first seven characters (0–6). Notice that the first number in each group is the character number for the character and the following eight numbers are the bytes representing that character.

Listing 1. *VIC Editor program.*

```
10 POKE51,0:POKE52,28:POKE55,0:POKE56,28:CL
   R
20 DIMCA$(15)
30 SC=36879:OC=32768:AU=36878:CS=7168:C=5:S
   =1:B=3:A=0:A$="":B$="":C$="":POKEAU,0
40 CO$="{CTRL 1}":D=0:E=0:F=0:X=0:Y=0:CN=0:
   H=0:W=0
50 CA$(0)="BL":CA$(1)="WH":CA$(2)="RD":CA$(
   3)="CY":CA$(4)="PU":CA$(5)="GR":CA$(6)="
   BU"
60 CA$(7)="YL":CA$(8)="OR":CA$(9)="LO":CA$(
   10)="PI":CA$(11)="LC":CA$(12)="LP"
70 CA$(13)="LG":CA$(14)="LB":CA$(15)="LY"
80 DEFFNBI(X)=(PEEK(7168+CN*8+Y)AND(2{UP AR
   ROW}(7-X)))/(2{UP ARROW}(7-X))
90 PRINT"{SHFT CLR}";:POKESC,27:PRINT"{CTRL
    7}VIC MULTIGRAFIX EDITOR"
100 PRINT"{CRSR DN}{3 SPACEs}BY TOMMY TILLM
   AN"
110 PRINT"{2 CRSR DNs}{CTRL 9}STAND-BY...
120 FORD=0TO464:POKECS+D,PEEK(OC+D):NEXTD
130 FORD=58TO63:FORE=0TO7:READF
140 POKE(CS+8*D+E),F:NEXTE,D
150 DATA8,8,8,8,73,42,28,8
160 DATA0,8,4,2,255,2,4,8
170 DATA0,0,0,0,0,0,0,0
180 DATA85,85,85,85,85,85,85,85
190 DATA170,170,170,170,170,170,170,170
200 DATA255,255,255,255,255,255,255,255
210 POKE36869,255:PRINT"{SHFT CLR}{22 CRSR
   DNs}{CTRL 9}STAND-BY!{CTRL 0}{HOME}";:F
   ORN=0TO505:POKE7680+N,60
215 NEXT N
220 GOSUB1420
230 GOSUB1560
240 PRINT"{7 CRSR UPs}"SPC(16)"{CTRL 9}HIRE
   S":PRINT:PRINT:PRINT:PRINT:PRINTSPC(16)
   "{CTRL 9}MULTI"
250 PRINT"{HOME}"SPC(13)"{CTRL 9}{COMD A}{6
    SHFT *s}{COMD S}":FORD=0TO5:PRINTSPC(1
   3)"{CTRL 9}{SHFT -}"SPC(6)"{CTRL 9}{SHF
   T -}":NEXTD
260 PRINTSPC(13)"{CTRL 9}{COMD Z}{6 SHFT *s
   }{COMD X}":FORD=0TO5:PRINT:NEXTD:FORD=0
   TO7:PRINTSPC(15)"{CTRL 9}{COMD H}":NEXT
   D
270 PRINTSPC(7)"{CTRL 9}{8 COMD Us}{HOME}"
280 FORD=0TO57:POKE38576+D,CO:POKE7856+D,D:
   NEXTD
290 GOSUB1450:GOSUB1460:GOSUB1470
300 X=0:Y=0:POKE38693,CO:POKE38694,CO:POKE3
   8714,CO:POKE7973,58:POKE7974,58:POKE799
   4,59
310 GETA$:IFA$=""THEN310
320 IFA$="C"THEN410
330 IFA$="D"THEN650
340 IFA$="G"THEN810
350 IFA$="L"THEN870
360 IFA$="S"THEN930
370 IFA$="Q"THENPOKE51,0:POKE52,30:POKE55,0
   :POKE56,30:CLR:PRINT"{SHFT CLR}";:POKE3
   6869,240:END
380 IF(A$="{CRSR UP}")OR(A$="{CRSR DN}")OR(
   A$="{CRSR LF}")OR(A$="{CRSR RT}")THEN12
   30
390 IFA$="1"ORA$="2"ORA$="3"ORA$="4"THEN131
   0
400 GOTO310
410 GOSUB1550:PRINTCO$"{HOME}{CRSR DN}{CTRL
    9}SELECT SCREEN":PRINT"{CTRL 9}COLOR (
   0-15)
420 GOSUB1650:S=VAL(B$):IFS<0ORS>15THEN410
430 POKESC,PEEK(SC)AND15OR(S*16)
440 GOSUB1420
450 FORD=0TO35:POKE38400+D,CO:NEXT
460 FORE=0TO110STEP22:FORD=0TO15:POKE38442+
   E+D,CO:NEXTD,E
470 FORD=0TO146:POKE38568+D,CO:NEXTD
480 FORE=0TO88STEP22:FORD=0TO13:POKE38723+E
   +D,CO:NEXTD,E
490 FORD=0TO2:POKE38833+D,CO:NEXTD
500 FORD=0TO9:POKE38837+D,CO:NEXTD
510 FORD=0TO13:POKE38855+D,CO:NEXTD
520 FORD=0TO28:POKE38877+D,CO:NEXTD
530 GOSUB1550:GOSUB1620:GOSUB1560
540 GOSUB1550:PRINT"{HOME}{CRSR DN}{CTRL 9}
   SELECT":PRINT"{CTRL 9}BORDER COLOR":PRI
   NT"{CTRL 9}(0-7)"
550 GOSUB1650:B=VAL(B$):IFB<0ORB>7THEN540
```

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zontally and vertically). Then you'll be asked for the character number and the character color for that particular character. Repeat this information until the display screen is full. Then you will return back to the main commands.

Note that if you change the four main colors by using the color command, then the screen, border and auxiliary colors for all blocks in the display will also change. Each block's character color will stay the same, though, because the character color of each block is independent of other colors.

To save your data for each character, press S. The screen will clear and you'll be presented with three options. If you choose T for tape, insert in the Datassette the tape to which you wish to save the character set and press T. Next, input a filename and press the record and play buttons on the Datassette. Stand by until the character set has been copied to tape. There will be a slight delay until the main screen is once again displayed.

> You must protect your character set from variables that would normally be stored in the same area of memory.

If you choose P for printer, then stand by while the character set is copied to the paper. The output will be as follows. The first number in each line is the character's number. The next eight numbers are the byte numbers that represent that character in the character set. (The first eight numbers in the set are for drawing character 0. The next eight numbers are for character 1. This continues all the way to character 57.)

Now you should make a mark beside the characters that you've changed. You should also make a note of the colors you're using and the character color you are using for each character.

If you choose S for screen, then the output will be identical to the printer output, except that only seven characters at a time will be displayed. You may copy onto paper the pertinent information that you desire. You'll be returned to the main screen after you finish going through all 58 characters.

If you wish to reload a character set for reviewing or modification, then press L. Insert the appropriate tape into the Datassette, type the name of the character set and press the return key. Press the play button on the Datassette and stand by while the character set loads. When the character set is ready, you'll be returned to the main command screen.

To quit, press Q. On a VIC with 3K memory, everything will be fine (including the new character set, which will be

Listing 1 continued

```
56Ø POKESC,PEEK(SC)AND248ORB
57Ø GOSUB155Ø:GOSUB162Ø:GOSUB156Ø
58Ø GOSUB155Ø:PRINT"{HOME}{CRSR DN}{CTRL 9}
    SELECT":PRINT"{CTRL 9}CHARACTER":PRINT"
    {CTRL 9}COLOR (Ø-7)"
59Ø GOSUB165Ø:C=VAL(B$):IFC<ØORC>7THEN58Ø
6ØØ GOSUB146Ø:GOSUB147Ø:GOSUB155Ø:GOSUB162Ø
    :GOSUB156Ø
61Ø GOSUB155Ø:PRINT"{HOME}{CRSR DN}{CTRL 9}
    SELECT":PRINT"{CTRL 9}AUXILIARY":PRINT"
    {CTRL 9}COLOR (Ø-15)"
62Ø GOSUB165Ø:A=VAL(B$):IFA<ØORA>15THEN61Ø
63Ø POKEAU,PEEK(AU)AND15OR(16*A)
64Ø GOSUB155Ø:GOSUB162Ø:GOSUB156Ø:GOSUB163Ø
    :GOTO31Ø
65Ø GOSUB155Ø:PRINT"{HOME}{CRSR DN}{CTRL 9}
    SELECT":PRINT"{CTRL 9}DISPLAY WIDTH"
66Ø GOSUB165Ø:W=VAL(B$):PRINT
67Ø PRINT"{CTRL 9}HEIGHT":GOSUB165Ø:H=VAL(B
    $)
68Ø IFW>6ORH>6THEN65Ø
69Ø FORF=ØTO5:FORE=ØTO5
7ØØ POKE(7716+E+22*F),6Ø:NEXTE,F
71Ø FORF=ØTO(H-1):FORE=ØTO(W-1)
72Ø POKE(7716+E+22*F),63:IFCO$="{CTRL 1}"TH
    ENPOKE(38436+E+22*F),Ø:GOTO74Ø
73Ø POKE(38436+E+22*F),1
74Ø GOSUB155Ø:PRINT"{HOME}{CRSR DN}{CTRL 9}
    INPUT":PRINT"{CTRL 9}CHAR. #"
75Ø GOSUB165Ø:N1=VAL(B$):IFN1>57ORN1<ØTHEN7
    4Ø
76Ø GOSUB155Ø:PRINT"{HOME}{CRSR DN}{CTRL 9}
    SELECT":PRINT"{CTRL 9}CHAR. COLOR"
77Ø GOSUB165Ø:CC$=B$
78Ø CC=VAL(CC$):IFCC<ØORCC>7THEN76Ø
79Ø POKE(7716+E+22*F),N1:POKE(38436+E+22*F)
    ,CC+8
8ØØ NEXTE,F:GOSUB155Ø:GOSUB156Ø:GOTO31Ø
81Ø GOSUB155Ø:PRINT"{HOME}{CRSR DN}{CTRL 9}
    INPUT CHAR #":GOSUB165Ø:CN$=B$
82Ø CN=VAL(CN$):IFCN<ØORCN>57THEN81Ø
83Ø GOSUB145Ø:GOSUB146Ø:GOSUB147Ø:GOSUB155Ø
    :GOSUB156Ø
84Ø GOSUB163Ø
85Ø POKE7973,58:POKE7974,58:POKE7994,59
86Ø POKE38693,CO:POKE38694,CO:POKE38714,CO:
    X=Ø:Y=Ø:GOTO31Ø
87Ø PRINT"{SHFT CLR}{CTRL 9}ENTER NAME OF":
    PRINT"{CTRL 9}FILE TO BE LOADED"
88Ø GOSUB165Ø:A$=B$
89Ø PRINT"{CTRL 9}";:OPEN1,1,Ø,A$:FORD=ØTO5
    7:FORE=ØTO7
9ØØ INPUT#1,F
91Ø POKE(7168+D*8+E),F
92Ø NEXTE,D:CLOSE1:GOTO21Ø
93Ø PRINT"{SHFT CLR}{CTRL 9}SELECT CHOICE":
    PRINT"{CTRL 9} TO SAVE CHAR. SET"
94Ø PRINT"{CTRL 9}T-TAPE":PRINT"{CTRL 9}P-P
    RINTER":PRINT"{CTRL 9}S-SCREEN"
95Ø GETA$:IFA$=""THEN95Ø
96Ø IFA$="T"THEN1ØØØ
97Ø IFA$="P"THEN1Ø5Ø
98Ø IFA$="S"THEN112Ø
99Ø GOTO95Ø
1ØØØ PRINT"{SHFT CLR}{CTRL 9}INPUT FILE NAM
    E":PRINT"{CTRL 9}4 CHARACTER MAXIMUM
1Ø1Ø GOSUB165Ø:A$=B$
1Ø2Ø PRINT"{CTRL 9}";:OPEN1,1,1,A$:FORD=ØTO
    57:FORE=ØTO7
1Ø3Ø PRINT#1,PEEK(7168+D*8+E)
1Ø4Ø NEXTE,D:CLOSE1:GOTO21Ø
1Ø5Ø REM PRINTER
1Ø6Ø PRINT"{SHFT CLR}{CTRL 9}{CRSR DN}INPUT
     CHARACTER SET":PRINT"{CTRL 9}NAME"
1Ø7Ø GOSUB165Ø:A$=B$
1Ø8Ø OPEN3,4:PRINT#3,"CHARACTER SET "A$CHR$
    (13):FORD=ØTO57:A$=STR$(D):FORE=ØTO7
1Ø9Ø B$=STR$(PEEK(7168+E+D*8)):A$=A$+","+B$
11ØØ NEXTE:PRINT#3,A$
111Ø NEXTD:PRINT#3:CLOSE3:GOTO21Ø
112Ø PRINT"{SHFT CLR}{CTRL 9}";:FORD=ØTO57:
    A$=STR$(D):FORE=ØTO7
113Ø B$=STR$(PEEK(7168+E+D*8)):A$=A$+","+B$
114Ø NEXTE:PRINT"{CTRL 9}"A$:PRINT
115Ø IFD=6ORD=13ORD=2ØORD=27ORD=34ORD=41ORD
    =48ORD=55THENB$="-1":GOTO117Ø
116Ø GOTO12ØØ
117Ø PRINT"{CTRL 9}PRESS ANY KEY
118Ø GETA$:IFA$=""THEN118Ø
119Ø IFB$="-1"THENPRINT"{SHFT CLR}{CTRL 9}"
    ;
```

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in memory locations 7168 to 7679).

On a VIC with 8K or more memory, however, don't use Q unless you permanently modify line 370. Simply delete everything between the words THEN and END. Now the VIC will work normally.

How Multicolored Characters Work

First, you must change the value of the RAM pointer, which tells the VIC where to get data to construct the characters you see on the screen. This pointer is memory location 36869. There are a few values that you may Poke in there to reset the VIC to point to your own character set. These are listed in the *VIC Programmers Reference Guide*. The two most used are 255 and 240. The former will cause the VIC to get its character set from memory locations 7168 to 7679.

But what is a character set? It is nothing more than a group of eight bytes, starting from a certain memory location and extending to some final location. In this case we start at 7168. This and the next seven bytes will define the "at" symbol (@). The next eight bytes define the A symbol, and so forth.

Since I have defined 58 symbols to work with, you'll end up at 7632 (7168+8*58).

So the first line of your programs would probably be

```
1 POKE 36869,255
```

But you must be careful to protect your character set from variables that will be stored in the same area of memory as your character set and would therefore destroy the designs you have created. To protect your designs, you must tell the VIC to lower the top of memory, thus placing the variables below the character set. The VIC's operating system will then think that you do not wish to use this memory space and will avoid using it.

Memory locations 51, 52, 55 and 56 tell the VIC where the end of memory and the bottom of string storage are located. So, if you Poke in the appropriate values here, you can trick the VIC into thinking it has less memory and, possibly, prevent it from messing up your character set, which is now in this unused area of memory.

What are the numbers to Poke in? To protect memory area 7168 and up, you would divide 7168 by 256. The integer value you get (don't round off!) is the *page* of memory you wish to protect. If you get a remainder, this will be extra memory bytes you wish to protect. In this case, you'll get page 28 with remainder 0.

Listing 1 continued

```
12ØØ NEXTD:PRINT"{CTRL 9}{CRSR DN}PRESS ANY
     KEY
121Ø GETA$:IFA$=""THEN121Ø
122Ø GOTO21Ø
123Ø X1=X:Y1=Y
124Ø X=X+2*(A$="{CRSR LF}")-2*(A$="{CRSR RT
     }"):IFX<ØTHENX=Ø:GOTO31Ø
125Ø IFX>6THENX=6:GOTO31Ø
126Ø Y=Y+(A$="{CRSR UP}")-(A$="{CRSR DN}"):
     IFY<ØTHENY=Ø:GOTO31Ø
127Ø IFY>7THENY=7:GOTO31Ø
128Ø POKE7973+X1,6Ø:POKE7974+X1,6Ø:POKE7994
     +22*Y1,6Ø
129Ø POKE7973+X,58:POKE7974+X,58:POKE7994+2
     2*Y,59
13ØØ POKE38693+X,CO:POKE38694+X,CO:POKE3871
     4+22*Y,CO:GOTO31Ø
131Ø IFA$="1"THEN136Ø
132Ø IFA$="2"THEN138Ø
133Ø IFA$="3"THEN14ØØ
134Ø POKE7995+X+22*Y,63:POKE7995+X+1+22*Y,6
     3
135Ø POKE(7168+CN*8+Y),PEEK(7168+CN*8+Y)OR(
     2{UP ARROW}(7-X))OR(2{UP ARROW}(6-X)):
     GOTO31Ø
136Ø POKE7995+X+22*Y,6Ø:POKE7995+X+1+22*Y,6
     Ø
137Ø POKE(7168+CN*8+Y),PEEK(7168+CN*8+Y)AND
     (255-(2{UP ARROW}(7-X)))AND(255-(2{UP
     ARROW}(6-X))):GOTO31Ø
138Ø POKE7995+X+22*Y,61:POKE7995+X+1+22*Y,6
     1
139Ø POKE(7168+CN*8+Y),(PEEK(7168+CN*8+Y)AN
     D(255-(2{UP ARROW}(7-X))))OR(2{UP ARRO
     W}(6-X)):GOTO31Ø
14ØØ POKE7995+X+22*Y,62:POKE7995+X+1+22*Y,6
     2
141Ø POKE(7168+CN*8+Y),(PEEK(7168+CN*8+Y)OR
     (2{UP ARROW}(7-X)))AND(255-(2{UP ARROW
     }(6-X))):GOTO31Ø
142Ø IFCO$="{CTRL 1}"AND((S=Ø)OR(S=2)OR(S=4
     )OR(S=6)OR(S=8))THENCO$="{CTRL 2}":CO=
     1:GOTO144Ø
143Ø IFCO$="{CTRL 2}"AND((S=1)OR(S=3)OR(S=5
     )OR(S=7)OR(S=>9))THENCO$="{CTRL 1}":CO
     =Ø:GOTO144Ø
144Ø RETURN
145Ø PRINT"{HOME}{12 CRSR DNs}"SPC(14)"{CRS
     R LF}{CTRL 9}{4 SPACEs}{4 CRSR LFs}"CN
     "{HOME}":RETURN
146Ø POKE3877Ø,CO:POKE8Ø5Ø,CN:POKE38836,C+8
     :POKE8116,CN:RETURN
147Ø FORY=ØTO7:FORX=ØTO7:BI=FNBI(X)
148Ø A$=RIGHT$(STR$(BI),1):X=X+1:BI=FNBI(X)
     :B$=RIGHT$(STR$(BI),1):C$=A$+B$
149Ø IFC$="ØØ"THENN=6Ø:GOTO153Ø
15ØØ IFC$="Ø1"THENN=61:GOTO153Ø
151Ø IFC$="1Ø"THENN=62:GOTO153Ø
152Ø N=63
153Ø X=X-1:POKE38715+X+22*Y,C+8:POKE7995+X+
     22*Y,N:X=X+1
154Ø POKE38715+X+22*Y,C+8:POKE7995+X+22*Y,N
     :NEXTX,Y:RETURN
155Ø PRINT"{HOME}":FORD=ØTO5:PRINT"{CTRL 9}
     {13 SPACEs}":NEXTD:RETURN
156Ø PRINTCO$"{HOME}{CTRL 9}{2 SPACEs}COMMA
     NDS"
157Ø PRINT"{CTRL 9}C-CHANGE COL.":PRINT"{CT
     RL 9}D-DISPLAY":PRINT"{CTRL 9}G-GOTO C
     HAR#"
158Ø PRINT"{CTRL 9}L-LOAD":PRINT"{CTRL 9}S-
     SAVE":PRINT"{CTRL 9}Q-QUIT"
159Ø PRINT"{5 CRSR DNs}{CTRL 9}COLS.{2 SPAC
     Es}CHAR #":PRINT"{CRSR DN}{CTRL 9}SCR.
     "
16ØØ PRINT"{CTRL 9}"S"{CRSR LF}-"CA$(S):PRI
     NT"{CTRL 9}BOR.":PRINT"{CTRL 9}"B"{CRS
     R LF}-"CA$(B)
161Ø PRINT"{CTRL 9}CHR.":PRINT"{CTRL 9}"C"{
     CRSR LF}-"CA$(C):PRINT"{CTRL 9}AUX.":P
     RINT"{CTRL 9}"A"{CRSR LF}-"CA$(A):RETU
     RN
162Ø PRINT"{HOME}{12 CRSR DNs}";:FORD=ØTO9:
     PRINT"{CTRL 9}{6 SPACEs}":NEXTD:PRINT"
     {CTRL 9}{6 SPACEs}{HOME}":RETURN
163Ø FORD=ØTO7:POKE7973+D,6Ø:NEXTD:FORD=ØTO
     7:POKE7994+D*22,6Ø:NEXTD
164Ø POKE7973,58:POKE7974,58:POKE7994,59:X=
     Ø:Y=Ø:RETURN
165Ø B$=""
166Ø GETA$:IFA$=""THEN166Ø
167Ø IFASC(A$)=13THENA$=LEFT$(B$,1):RETURN
168Ø IFASC(A$)=2ØANDLEN(B$)=ØTHEN166Ø
169Ø IFASC(A$)=2ØTHENB$=LEFT$(B$,LEN(B$)-1)
     :PRINT"{CRSR LF} {CRSR LF}";:GOTO166Ø
17ØØ IFLEN(B$)>4ORASC(A$)<31THEN166Ø
171Ø B$=B$+A$:PRINT"{CTRL 9}"A$;:GOTO166Ø
```


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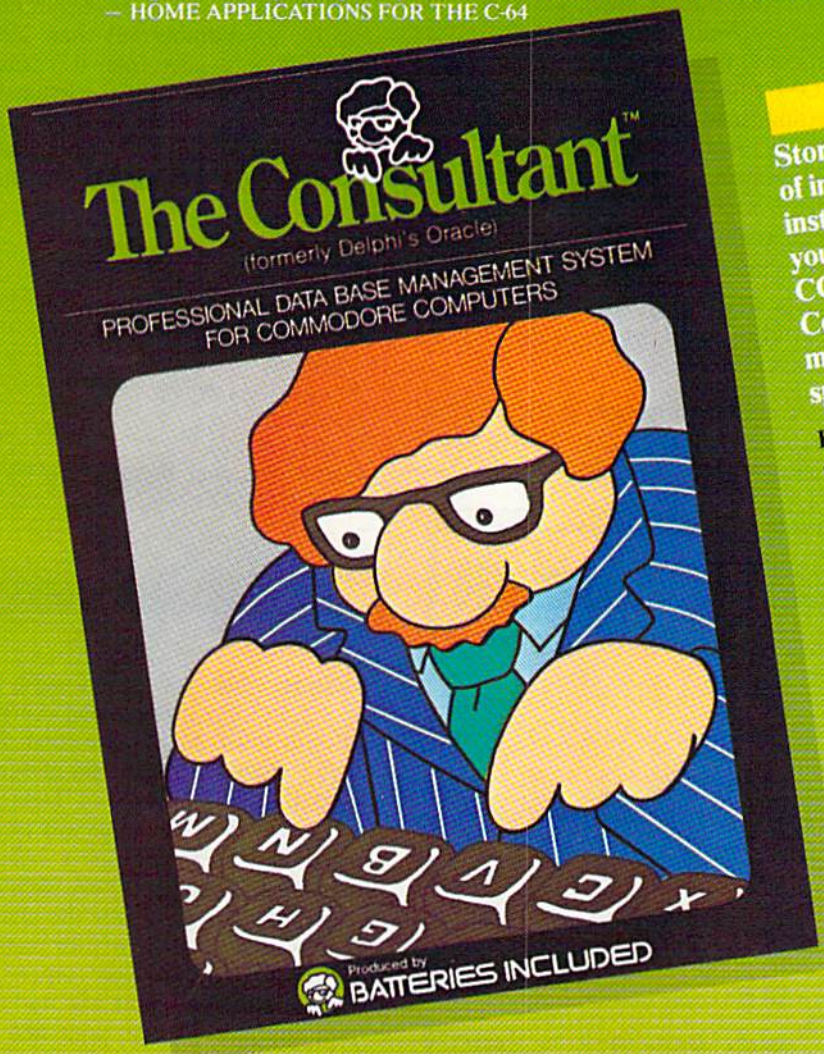

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Listing 2. *Screen Relocation program.*

```
 1 REM * SCREEN RELOCATION PROGRAM
1Ø POKE8192,Ø
2Ø POKE44,32
3Ø CLR
4Ø POKE648,3Ø
5Ø POKE36866,15Ø
6Ø POKE36869,24Ø
7Ø PRINT"{SHFT CLR}":REM CLEAR HOME
8Ø NEW
```

The remainder will be Poked into 51 and 55 (the low bytes) and the page into 52 and 56 (the high bytes).

```
1 POKE 51,0: POKE 52,28: POKE 55,0: POKE
  56,28: CLR
```

Notice the CLR at the end of the line. Its purpose is to reset important page zero pointers. Don't forget it!

Now, the second line can be:

```
5 POKE 36869,255
```

At this point, the screen turns to garbage! This is because you have nothing but random garbage at memory locations 7168 and up. You must put some meaningful data designs here to allow the VIC to design and print your characters properly.

Would you like to be able to use the letters and number designs that you had before? Well, you can simply transfer (or copy) the designs from the character ROM chip (which is where you were getting them before, when memory location 36869 contained 240). The following is a simple loop that will move them for you from the ROM character chip to the RAM area you've chosen (7168 and up).

```
10 FOR D=0 TO 512
12 POKE 7168 + D , PEEK ( 32768 + D )
14 NEXT D
```

As you run this part of the program, the garbage will quickly turn to meaningful and readable information.

Now for your character set! All you have to do is copy from your data sheet or paper the correct data bytes you've created for your newly designed characters and place them into the new character set RAM.

Suppose you wish to replace the letter A with whatever character you had designed for the purpose (not a good idea, since we use the letter A so much, but this is only an exercise).

On your data sheet or your paper, you'll have, let's say, 1,255,255,255, 255,255,255,255,255. You could have anything, but the first number must be a 1, because this is the character number for the letter A. The next eight numbers can be any number less than 256 and equal to or greater than 0. (This particular set of bytes for the letter A will produce a reversed blank space.)

To transfer this data to its correct position in the character set, use the following loop (and notice the flag −1).

```
20 RESTORE
23 READ A
25 IF A=-1 THEN 40
28 FOR B=0 TO 7
30 READ D
32 POKE 7168+A*8+B, D
34 NEXT B
36 GOTO 23
40 REM THIS WILL BE THE REST OF
   YOUR PROGRAM
—
—
999 END
1000 DATA1,255,255,255,255,255,255,255,255
1010 DATA -1
```

Notice that you could easily have used even more user-defined characters. All you must do is place them in the Data statements at the end of the program (but before the −1 Data statement). Do those the same way as the A character (the first number being the character number and next eight numbers being the design for the character from your data sheet or your paper).

Now, whenever you enter Poke (screen location),1 you will not get an "A," but you will get your new character. You'll also get your new character if you type PRINT "A".

How to Use Multicolor

To set this space to Multicolor mode, you must Poke the corresponding color memory location with whatever character color you have selected *plus eight*. In this case, you can simply enter Poke (screen location + 30720), (character color + 8). This simple formula will always work and is the simplest way to keep a one-to-one correspondence between your character screen and your

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color screen. (Actually, this will always work unless you reset the screen or color memory to a different place in memory.)

So, whenever you place a character to the screen in multicolor, first Poke the color memory with the above formula, then Poke the screen memory with this formula: POKE screen location, character number.

Another way to activate Multicolor mode is by printing with a color code greater than 7. Memory location 646 is the location for the current printing color. Normally, it's from 0 to 7, but if you Poke it with a number from 8 to 15, you'll then be printing in Multicolor mode.

The color you will Poke in will be the color character number from the list (0 to 7), plus 8 added to activate the mode.

For example, to begin printing in Multicolor mode using red as the character color, enter POKE 646, 2+8 (the 2 for red and the 8 to activate Multicolor). To cut off multicolor printing, just enter POKE 646 with a number less than 8, or just use a regular color command inside a Print statement.

How About Colors?

To set the four multicolor colors in the VIC, use the following four Pokes.

1. Screen color.

   POKE 36879, PEEK (36879) AND 15 OR (SCREEN COLOR * 16)

2. Border color.

   POKE 36879, PEEK (36879) AND 248 OR (BORDER COLOR)

Note that the border color must be from 0 to 7 only!

3. Character color. This is individually set for each space on the screen as discussed above. Note that character color is from 0 to 7 only, but you must add 8 to it to activate Multicolor mode in that space on the screen.

4. Auxiliary color.

   POKE 36878, PEEK (36878) AND 15 OR (16 * AUXILIARY COLOR)

Note that auxiliary colors range from 0 to 15.

For those of you who do not wish to type in this program, I would be glad to make a copy for you. Send me a self-addressed stamped mailer for cassette or disk and a clean, good-quality tape or 5¼-inch disk with a check or money order for $3. R

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Does your youngster need help in learning his/her weekly list of spelling words? Well, meet Chippy, who's the best spelling buddy your child could have.

Spelling Friend

By WILLIAM W. BRAUN

In Spelling Friend, your child can practice spelling with a simulated computer friend, Chippy. My daughters, ages nine and six, enjoy using the program to study their weekly spelling assignments. Even the six-year-old is now able to enter her weekly list of words.

Chippy, who appears as a large smiling face with curly hair, first shows you the list of spelling words contained in his memory. He then asks you if the words are all right for the current spelling session. If you answer no, then Chippy tells you that you must type in 20 new words and prompts you when to do so. After you've entered the 20 words, Chippy displays the new word list, asking if those are all right. You may repeat this process until satisfied.

When you indicate that the words are correct, Chippy presents the program's instructions. He tells you that a word will be displayed for a few seconds. After it vanishes, Chippy will ask you to type it in correctly. After the instructions are displayed, you are given the option of seeing them again or of continuing.

When you choose to continue, Chippy shows the first word in his list. The word is enclosed in a multicolor border and appears one letter at a time, each one accompanied by a short tone, which increases in pitch with each letter.

After the word disappears, you must try to type it in from memory. If you succeed, Chippy appears with a big smile, gives a short message of encouragement and winks at you. If you spell it incorrectly, Chippy frowns and instructs you to try again. If you spell it incorrectly *twice*, Chippy shows you the correct spelling. Periodically during the program, at least some of the initially misspelled words will be shown again, giving you more practice with them.

After all 20 words have been used, Chippy shows you your score and gives a message about your performance. At this point, you may choose to start over again, see a list of the words you misspelled or end the program. If you choose to stop, Chippy informs you that you may resave the program if you want to have the same words for the next practice session.

About the Program

Through Chippy, I tried to create a feeling of personal communication between the child and the computer. Thus, the computer is no longer only a machine that displays words and responds negatively or positively to a child's input—it has a personality.

If you have a speech synthesizer, you can replace or supplement the messages on the screen with verbal statements from Chippy.

Unfortunately, to code this program to run on the unexpanded VIC, I would have had to sacrifice most of the features that make it interesting. However, I coded it so that you can use it with any amount of expansion. Some programs will run only if a particular amount of RAM is present. This is because the VIC operating system changes the screen and

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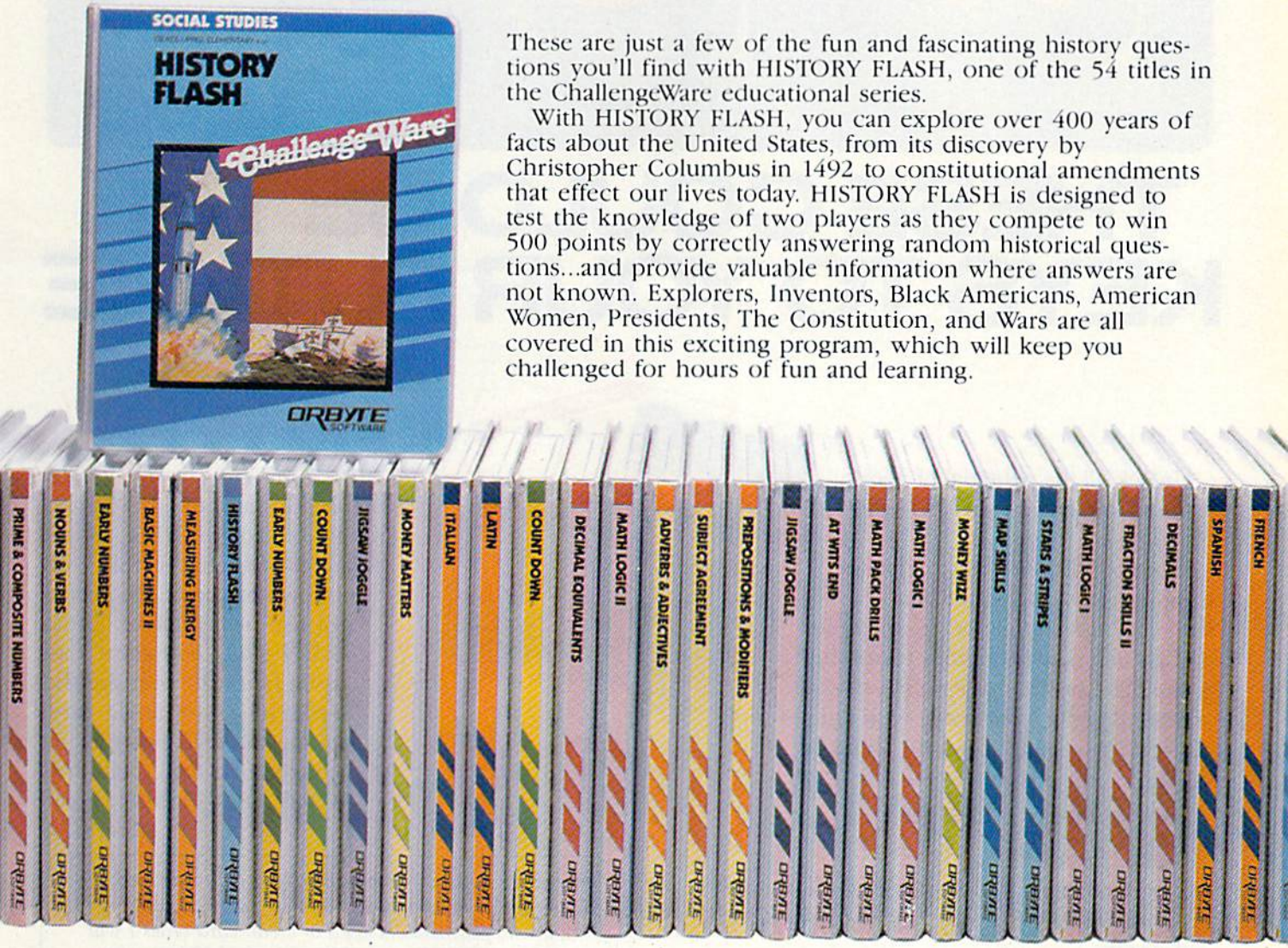
Who was the only president to serve more than 3 terms?
The purchase of what state was known as Seward's Folly?



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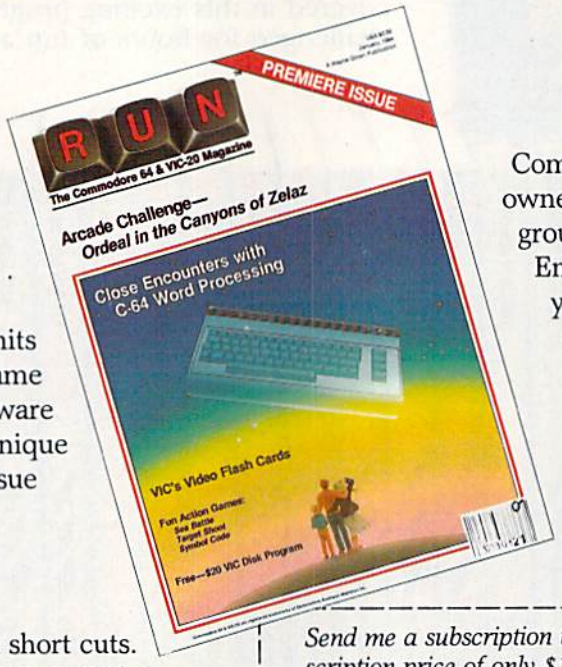

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Program documentation.

Line number(s)	Comments
6–17	Title screen graphics and sound effects (subroutine at 9300–9380 draws the border with letters of the alphabet).
20	Dimensions arrays to hold spelling words and incorrectly spelled words. A$ is for spelling words and W$ is for incorrectly spelled words. Reads Data statements to fill A$ array.
25–30	Initialize variables, set border/screen colors.
39–49	Instructions to student.
50	Variable A counts number of spelling words displayed. If A equals 20, program branches to give score.
57	Variable P is used to display incorrectly spelled words a second time.
75	Detects incorrectly spelled word.
77	Detects correctly spelled word.
550–573	Print Chippy's faces. Value of FA decides if frown or smile.
600–620	Routine to show correct spelling after two wrong answers.
700–729	Display score and decide upon message about student progress based upon score.
1990–2005	Routine to print spelling words to screen, one letter at a time with ascending tones and centered in the multicolored box.
3016	Prints list of incorrectly spelled words.
6000–6001	Sound effects and border colors with correctly spelled words.
6200–6210	Blink Chippy's eye.
6500	Buzzing sound with incorrect answer.
8000–8003	Create multicolor border around spelling words.

Definitions of variables.

SM—Screen memory location
CM—Color memory location
R—Number of words spelled correctly
A—Subscript of A$(A), number of words displayed
W—Number of words spelled wrong
C—Variable to detect two incorrect spellings in a row
B$—Variable to hold typed-in spelling words
W$—Incorrectly spelled words
FA—Value decides if Chippy has smile or frown
T—Variable in delay routines

color memory locations when you add more than 3K of memory.

If your program does not take this into account by providing for variable screen and color memory locations, you must run the program on a VIC with a specific RAM configuration. This can be frustrating if you have a variety of programs, and it can be rough on the expansion-port connectors as you switch around the RAM expansion cartridges.

In Spelling Friend, line 9100 takes care of this problem. The program Peeks location 44, which will hold the number 18 if the VIC has more than 3K of memory expansion. It then chooses the proper screen and color memory constants, which are based on the result of the Peek. If your programs will be Poking things around the screen, you'll save yourself a lot of trouble by including this option in your programs.

You can also save yourself a lot of coding if you create subroutines to handle repetitive tasks. This program uses many subroutines. For example, there are routines to create Chippy's smiling or frowning face, to make sound effects, to produce delays in the program action, to respond to correct and incorrect spelling inputs and to create the multicolor border around the spelling words.

Kids love to play with the keyboard, just to see what will happen. This can be a problem if they decide to try out the run/stop key in the middle of a program. Line 6 anticipates this problem; by Poking 114 to location 808, it turns off the run/stop key. The restore key doesn't become disabled, since the child would have to press the run/stop and restore keys at the same time, which would be unlikely to happen.

Programming Techniques

While writing Spelling Friend, I had to find a way to prevent the child from typing in the word while it was still on the screen, for I found that the keyboard buffer would accept the typed characters while the word was still displayed. Then, when the Input statement was executed after the word vanished, the program would use the word in the keyboard buffer. A smart kid would soon discover this and make the program pointless.

To prevent this, it finally occurred to me to use POKE 198,0 to clear the keyboard buffer immediately after the word disappears and before the actual Input statement is executed. This is done in line 61. The child may now type in the word while it is being displayed, but it will not be picked up by the Input statement, and the child will have to reenter it after the word disappears.

New words are placed in Chippy's spelling list by utilizing the "dynamic keyboard" technique. Lines 463–468 contain the routine that creates new Data statements with the new words. As the new words are entered, they are placed into an array, NW$.

Five lines, beginning with number 9000, are then printed on the screen. These lines are the Data statements containing the new words. A sixth line, without a line number, is printed on the screen to define a variable and enter a command to go to line 9100. The cursor is moved to the home position.

The CHR$ code for RETURN, 13, is then Poked into the keyboard buffer six times. When the End statement is reached, in line 468, the six returns in the keyboard buffer are executed, putting the new Data statements into the program (while erasing the old ones) and executing the GOTO 9100 command.

The variable VB is used in line 9117 to decide whether or not the program should continue at line 6 or line 20. The first time the program is executed, it goes through lines 9100–9120 to initialize variables, and then returns to line 6.

The only other time line 9100 is executed is when new words are being entered into the program. At this point, it's necessary to start at 9100, since the program actually ended (albeit only for a split second) in line 468; however, this time you jump to line 20, since you needn't go to line 6 to see the program title screen again.

The only other way I could find to change the spelling-word list was to actually exit the program and type in new Data statements, then restart the pro-

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gram from the beginning. The dynamic-keyboard technique, which you can probably find many uses for in your own programs, is much cleaner and easier to use, especially for children. It can also be used to place commands in the keyboard, to erase the current program and to load and run another program.

If you put two programs, one after the other, on tape, you can use this technique to load and run the second one as the first is ending. This would be very useful if your program exceeded 3.5K, as you can split it up into two sections. You can even load a third program when the second is completed, and so on. With this trick, you can make the VIC run some very long programs, providing they are of a type that can be split up into parts.

Looking at lines 9110–9112, you will notice that several string variables have been defined as being equivalent to CHR$ commands. I use these string variables right after a Print statement to execute the CHR$ commands, which perform the same functions as familiar keyboard programming commands.

For example, CD$ is equivalent to moving the cursor down one line; BLK$ changes the print color to black; CH$ clears the screen and moves the cursor home; and LC$ changes the characters to upper-/lowercase. This technique produces listings that are much easier to understand. Instead of getting confusing graphics symbols, you get easy-to-read string variables.

The string variables, with their well-chosen names, make it much easier for you to remember their functions. Defining string variables in this manner also clarifies which symbols in a listing are commands and which are actually graphics characters. The only drawback I have found to using this method is that each defined string variable eats up a good chunk of memory. If you are confined to the unexpanded VIC, it could use up too much.

Lines 200–205 contain subroutines to produce delays of varying length. Rather than writing out a For-Next statement each time I want a delay, I simply call up the appropriate subroutine. I put longer delays in consecutively higher line numbers to make it a bit easier to remember which line the GOSUB should access. If your program will call for using the same length delay repeatedly, this method can save you time and bytes.

Making programs as user-friendly as possible is an important aspect of programming. This includes trying to anticipate problems with Input statements. For example, lines 46–49 control the program's response to the child's input as to whether or not the instructions should be repeated or the spelling words commence.

I chose to use a Get statement rather than an Input statement, since only one key needs to be pressed. Line 46 freezes the action until a key is actually pressed. Line 47 checks to see if the S key was pressed and takes appropriate action. Line 48 watches for the I key to be pressed and repeats the instructions if it finds that it has.

If any key other than S or I is pressed, the program falls through to line 49, which prints an error message to the screen informing the child that he or she can enter only I or S, and then branches back to line 46.

The same technique of editing the input is used in lines 418–430, but this time with an Input statement. This type of editing simply ensures that the program is not stopped with an inappropriate input, and makes it clear just what input is actually needed.

If you don't want to type in this program, just send me a blank cassette, a self-addressed, stamped cassette mailer and $4, and I will send you a verified copy of the program. R

Address all author correspondence to William W. Braun, 3164 Wellington Way, Arnold, MO 63010.

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

```
1 REM{2 SPACEs}SPELLING FRIEND
3 REM{3 SPACEs}WILLIAM BRAUN
6 POKE8Ø8,114:GOTO91ØØ
7 PRINTHC$SPC(245)BLK$"SPELLING FRIEND":GOS
  UB93ØØ:POKES1,Ø:GOSUB2Ø5
15 PRINTHC$CHR$(157)CHR$(157):FORT=1TO11:PR
   INTCD$:NEXT
16 FORM=1TO11:PRINTCD$:POKES1,M+221:FORT=1T
   O5Ø:NEXT:POKES1,Ø
17 NEXT:PRINTCH$
2Ø DIMA$(19):DIMW$(19):FORX=ØTO19:READA$(X)
   :NEXT:IFVB=9THENPRINTBU$:GOTO4Ø3
21 PRINTLC$:GOTO4ØØ
25 X=Ø
3Ø A=Ø:W=Ø:R=Ø:P=Ø:L=Ø:POKEBC,31
39 GOSUB55Ø:PRINTCD$CD$BLK$LC$"{SHFT I} WIL
   L SHOW YOU A WORD"
4Ø PRINT"FOR A FEW SECONDS.":GOSUB2Ø5:PRINT
   CH$:GOSUB92ØØ:GOSUB55Ø
41 PRINTCD$CD$BLK$:PRINT"{SHFT W}HEN THE WO
   RD VANISHES":PRINT"TYPE IN THE WORD YOU"
42 PRINTCD$"SAW AND PRESS "RO$"{SHFT R}{SHF
   T E}{SHFT T}{SHFT U}{SHFT R}{SHFT N}"RF$
   ".":GOSUB2Ø5:GOSUB92ØØ
44 GOSUB55Ø:PRINTCD$CD$" {SHFT T}O START PR
   ESS{3 SPACEs}"RO$"{SHFT S}"CD$CD$
45 PRINT" {SHFT T}O SEE THE":PRINT" INSTRUC
   TIONS":PRINT" AGAIN, PRESS"SPC(5)RO$"{SH
   FT I}"
46 GETD$:IFD$=""THEN46
47 IFD$="S"THENPRINTCH$:GOTO5Ø
48 IFD$="I"THEN39
49 PRINTCD$" ENTER ONLY S OR I":GOTO46
5Ø PRINTUC$:POKES,241:FORT=ØTO5Ø:NEXT:POKES
   ,Ø
57 P=P+1:IFP=3ANDW$(L)<>""THENGOSUB199Ø:GOS
   UB2Ø4:PRINTCH$:GOSUB67ØØ:GOTO1ØØØ
58 IFP=4THENP=Ø
6Ø IFA=2ØGOTO7ØØ
61 PRINTCH$:GOSUB8ØØØ:GOSUB1998:GOSUB2Ø4:C=
   Ø:PRINTCH$:POKE198,Ø
7Ø GOSUB92ØØ:GOSUB55Ø:PRINT:PRINTBLK$"TYPE
   WORD,PRESS ";
71 PRINTRO$"RETURN"RF$RED$
73 PRINTSPC(49);:INPUTB$
75 IFB$<>A$(A)THEN9Ø
77 IFB$=A$(A)THENGOSUB55Ø:PRINTLC$
78 GOSUB63ØØ:GOSUB6ØØØ:GOSUB2Ø1:GOSUB62ØØ:G
   OSUB2ØØ
85 R=R+1:A=A+1:PRINTCH$UC$:GOTO5Ø
9Ø C=C+1:IFC=2THENGOSUB6ØØ:W=W+1:A=A+1:GOTO
   6Ø
```


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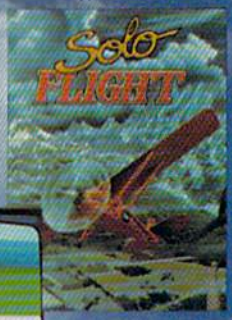

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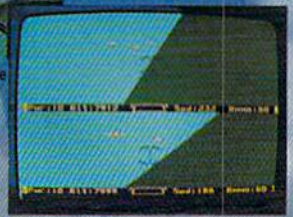

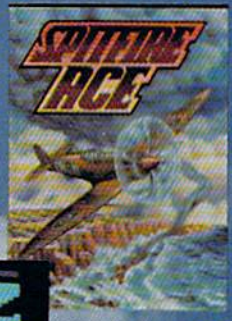

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Circle 157 on Reader Service card.

Listing Continued

```
100 FA=1:GOSUB550:FA=0
105 GOSUB6400:GOSUB6500
110 GOSUB2002:PRINTCH$UC$:GOTO700
200 FORT=1TO500:NEXT:RETURN
201 FORT=1TO1000:NEXT:RETURN
202 FORT=1TO1500:NEXT:RETURN
203 FORT=1TO2000:NEXT:RETURN
204 FORT=1TO4000:NEXT:RETURN
205 FORT=1TO5000:NEXT:RETURN
400 GOSUB550:PRINTCD$CD$BLK$"{3 SPACEs}{SHF
    T H}I!{2 SPACEs}{SHFT I}'M "RO$"{SHFT C
    }{SHFT H}{SHFT I}{2 SHFT Ps}{SHFT Y}"RF
    $"."CD$
401 PRINT" {SHFT H}ERE ARE THE WORDS {SHFT
    I}":PRINTCD$" CAN HELP YOU SPELL":PRINT
    CD$" BETTER.
402 FORT=0TO8000:NEXT
403 PRINTCH$UC$
404 GOSUB9200:FORT=0TO22:PRINTCHR$(29)"*"SP
    C(18)"*":NEXT:PRINTHC$
405 PRINTBLK$:FORB=0TO19:PRINTTAB(8)A$(B):N
    EXT
406 PRINT:PRINTCHR$(159)"ARE THESE OK(YES/N
    O)";
418 INPUTD$
419 IFD$="YES"THENGOSUB9200:GOTO25
420 IFD$="NO"THEN459
430 GOSUB6500:PRINT:PRINT"ENTER YES OR NO O
    NLY!":GOTO418
459 GOSUB9200:GOSUB550
460 PRINTBU$LC$:PRINT" {SHFT T}YPE 20 NEW W
    ORDS FOR":PRINT" ME. {SHFT A}FTER EACH
    WORD"
461 PRINT: PRINT" PRESS "RO$"{SHFT R}{SHFT
    E}{SHFT T}{SHFT U}{SHFT R}{SHFT N}"RF$"
    .":GOSUB205
462 PRINTCH$:PRINT"START NOW:":PRINT
463 PRINTUC$:GOSUB9200:DIMNW$(19):FORNW=0TO
    19:PRINTNW+1;:INPUTNW$(NW)
464 NEXT:PRINTCH$CHR$(5):PRINT:PRINT
465 FORT=0TO17STEP4
466 PRINT9000+T;"DATA"QM$NW$(T)QM$;","QM$NW
    $(T+1)QM$;
467 PRINT","QM$NW$(T+2)QM$;","QM$NW$(T+3):N
    EXT
468 PRINT"VB=9:GOTO9100":PRINTHC$:POKE198,6
    :FORI=0TO5:POKE631+I,13:NEXT:END
550 PRINTCH$BU$
551 FORT=0TO11:PRINTHC$SPC(27+T)"@";:NEXT:P
    RINT
552 PRINTSPC(4)"@";:FORT=1TO12:PRINT"{COMD
    +}";:NEXT:PRINT"@
553 PRINTSPC(4)"@{COMD +}"SPC(10)"{COMD +}@
554 PRINTSPC(4)"@{COMD +} {2 COMD +s}{4 SPA
    CEs}{2 COMD +s} {COMD +}@
555 PRINTSPC(5)"{COMD +} {2 COMD +s}{4 SPAC
    Es}{2 COMD +s} {COMD +}
556 FORT=1TO2:PRINTSPC(5)"{COMD +}{4 SPACEs
    }{2 COMD +s}{4 SPACEs}{COMD +}":NEXT
557 IFFA=1THEN568
560 PRINTSPC(5)"{COMD +} {COMD +}{6 SPACEs}
    {COMD +} {COMD +}
561 PRINTSPC(5)"{COMD +}{2 SPACEs}{COMD +}"
    SPC(4)"{COMD +}{2 SPACEs}{COMD +}"
562 PRINTSPC(5)"{COMD +}{3 SPACEs}{4 COMD +
    s}{3 SPACEs}{COMD +}"
563 PRINTSPC(5)"{COMD +}"SPC(10)"{COMD +}"
564 PRINTSPC(5);:FORT=1TO12:PRINT"{COMD +}"
    ;:NEXT:PRINT:RETURN
568 PRINTSPC(5)"{COMD +}"SPC(10)"{COMD +}"
569 PRINTSPC(5)"{COMD +}{3 SPACEs}{4 COMD +
    s}{3 SPACEs}{COMD +}"
570 PRINTSPC(5)"{COMD +}{2 SPACEs}{COMD +}{
    4 SPACEs}{COMD +}{2 SPACEs}{COMD +}
571 PRINTSPC(5)"{COMD +} {COMD +}{6 SPACEs}
    {COMD +} {COMD +}
572 PRINTSPC(5)"{COMD +}"SPC(10)"{COMD +}
573 PRINTSPC(5);:FORT=1TO12:PRINT"{COMD +}"
    ;:NEXT:PRINT:RETURN
600 FA=1:GOSUB550:FA=0
602 PRINT:PRINTSPC(4)"SORRY, FRIEND!":PRINT
    CD$" CORRECT SPELLING IS
603 AW$=A$(A):AW=LEN(AW$):AT=(22-AW)/2
605 PRINTSPC(AT+22)CHR$(30)A$(A):GOSUB6500
610 W$(X)=A$(A):GOSUB2004:POKES,236:FORT=0TO
    50:NEXT:POKES,0
620 PRINTCH$UC$:X=X+1:RETURN
700 GOSUB550:PRINTLC$:PRINT" {SHFT O}{SHFT
    K}, FRIEND!":PRINT:PRINT" {SHFT H}ERE I
    S YOUR SCORE."
710 GOSUB2003:GOSUB550::PRINTUC$SPC(28)R" RI
    GHT":PRINTSPC(28)W" WRONG":GOSUB2004
711 IFR=20THENPRINTCD$" THAT'S FANTASTIC!!!
    !!":GOTO729
712 IFR=19THENPRINTCD$"THAT'S EXCELLENT!!!!
    !":GOTO729
713 IFR>=17THENIFR<19THENPRINTCD$"THAT'S QU
    ITE GOOD!!":GOTO729
714 IFR>13THENIFR<17THENPRINTCD$"THAT'S NOT
     BAD!":GOTO729
715 IFR>8THENIFR<14THENPRINTCD$"THAT'S A FA
    IR SCORE.":GOTO729
716 IFR>5THENIFR<9THENPRINTCD$"BETTER TRY A
    GAIN!":GOTO729
717 PRINTCD$"PLEASE DO THESE WORDS":PRINT"A
    GAIN. YOU NEED MORE"
718 PRINT"PRACTICE!!!!!!!":GOTO729
729 GOSUB205

730 GOSUB550:PRINTCD$"PRESS "RO$"W"RF$" TO
    SEE THE
735 PRINTCD$"WORDS YOU MISSED."CD$:PRINT"PR
    ESS "RO$"S"RF$" TO START OVER.
740 PRINT"PRESS "RO$"E"RF$" TO END."
750 GETS$:IFS$=""THEN750
751 IFS$="E"THEN7000
755 IFS$="S"THEN21
760 IFS$="W"THEN3000
765 PRINTCD$"ENTER{2 SPACEs}S,W, OR E ONLY!
    ":GOTO750
1000 C=0
1010 GOSUB550:PRINTCD$UC$"TYPE WORD,PRESS "
    RO$"RETURN"RF$
1013 PRINTSPC(30);:INPUTE$
1015 IFE$<>W$(L)THEN1025
1020 GOSUB550:PRINTCHR$(14):GOSUB6300:GOSUB
    6000
1021 GOSUB6200:GOSUB201
1022 P=0:L=L+1:PRINTCH$UC$:GOTO50
1025 C=C+1:IFC=2THENFA=1:GOSUB550:FA=0:GOSU
    B6500:GOSUB6600:GOTO1027
1026 PRINTLC$:GOTO1030
1027 GOSUB204:P=0:L=L+1:GOTO50
1030 FA=1:GOSUB550:GOSUB6400:GOSUB6500:GOSU
    B203:PRINTCH$:FA=0:GOTO1010
1990 PRINTCH$:GOSUB8000:A$=W$(L):GOTO1999
1998 A$=A$(A)
1999 L1=230-(LEN(A$))/2
2000 D=1:FORO=1TOLEN(A$):PRINTHC$SPC(L1+D):
    PRINTBLK$MID$(A$,D,1):D=D+1
2001 POKES,231+O:FORT=0TO30:NEXT:POKES,0
2005 GOSUB200:NEXT:RETURN
3000 GOSUB550:PRINTSPC(66)"HERE ARE THE WOR
    DS YOU":PRINT"SPELLED WRONG, FRIEND."
3015 GOSUB202:PRINTCHR$(147):GOSUB9200
3016 FORX=0TOW:PRINTW$(X),TAB(11)W$(X+1):X=
    X+1:PRINT:NEXT
3020 FORT=1TO4:PRINT:NEXT:PRINT" ...PRESS A
    NY KEY..."
3030 GETP$:IFP$=""THEN3030
3031 GOSUB6700:GOTO730
```


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A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want, but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We wanted to give our customers the best printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the GP-550CD from Seikosha, a division of Seiko (manufacturers of everything from wrist watches to space hardware). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing up to a respectable (and honest) 86 characters per second, and with a very readable 9 (horizontal) by 8 (vertical) character matrix. At this rate, you will get an average 30 line letter printed in only 28 seconds.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The GP-550CD has a print mode termed Near Letter Quality printing (NLQ mode). This is where the GP-550CD outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 9 (horizontal) by 16 (vertical). This equates to 14,400 addressable dots per square inch. Now we're talking ***quality*** printing. You can even do graphics in the high resolution mode. The results are the best we've ever seen. The only other printers currently available having resolution this high go for $500 and more *without* the interface or cable needed to hook up to your Commodore!

Features That Won't Quit

With the GP-550CD your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 18 font styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy software commands right from your keyboard.

One of the fonts we like best is "Proportional" because it looks most like typesetting. The spacing for thin characters like "i" and "l" are given less space which "tightens" the word, making reading easier and faster. This is only one example of the careful planning put into the GP-550CD.

Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) to make the words stand out. Or, if you wish to be even more emphatic, underline the words. Or do both. You may also wish to "headline" a title. Each basic font has a corresponding elongated (double-wide) version. You can combine any of these modes to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line.

You can now do virtually any line spacing you want. You may select 6, 8, 7½ or 12 lines per inch. PLUS you have variable line spacing of 1.2 lines per inch to infinity (no space at all) and ***97*** other software selectable settings in between. You control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and . . . VOILA! The letter now fits on one page.

Forms? Yes! Your Letterhead? Of Course!

Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4½ to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, anything you choose. Any size under 10" in width. Multiple copies? **Absolutely!** Put forms or individual sheets with carbons (up to 3 deep), and the last copy will be as readable as the first. Spread sheets with many columns? **Of course!** Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" page.

Consistent Print Quality

Most printers have a continuous loop ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade after a while. To keep the printers' output looking consistently dark, the ribbons must be changed more often than is healthy for the pocketbook. The GP-550CD solves this problem completely by using a replaceable, inexpensive ink cassette which is separately replaceable from the actual ribbon. It keeps the ribbon loaded with ink at all times. You only replace the ribbon when it truly wears out, not when it starts to run low on ink. Just another example of the superb engineering applied to the GP-550CD. (When you finally do wear out your ribbon, replacement cost is only $14.95. Ink cassette replacement cost is only $6.95, and each will last for over 1,000 pages.)

The Best Part

When shopping for a quality printer with all these features, you could expect to pay around $500 or more. *Not any more!* We have done our homework. You don't have to worry about interfaces or cables. Everything is included. We are now able to sell this fantastic printer for **only $259.95!** The GP-550CD is built especially for the Commodore 64 and the VIC-20. All Commodore graphics are included. This printer does everything the Commodore printers do but has more features. **You need absolutely nothing else to start printing – just add paper.** We also have specific models for other computers. Call for details.

No Risk Offer

We give you a 15-day satisfaction guarantee. If you are not completely satisfied for any reason we will refund the full purchase price. A 1-year warranty is included with your printer. The warranty repair policy is to repair or replace and reship to the buyer within 72 hours.

The Bottom Dollar

The GP-550CD is only $259.95. Shipping and insurance is $8.00 — UPS within the continental USA. If you are in a hurry, UPS Blue (second day air) is $18.00. Canada, Alaska, Mexico are $25.00 (air). Other foreign is $60.00 (air). California residents add 6% tax. These are cash prices — VISA and MC add 3% to total. We ship the next business day on money orders, cashiers' checks, and charge cards. A 14-day clearing period is required for checks.

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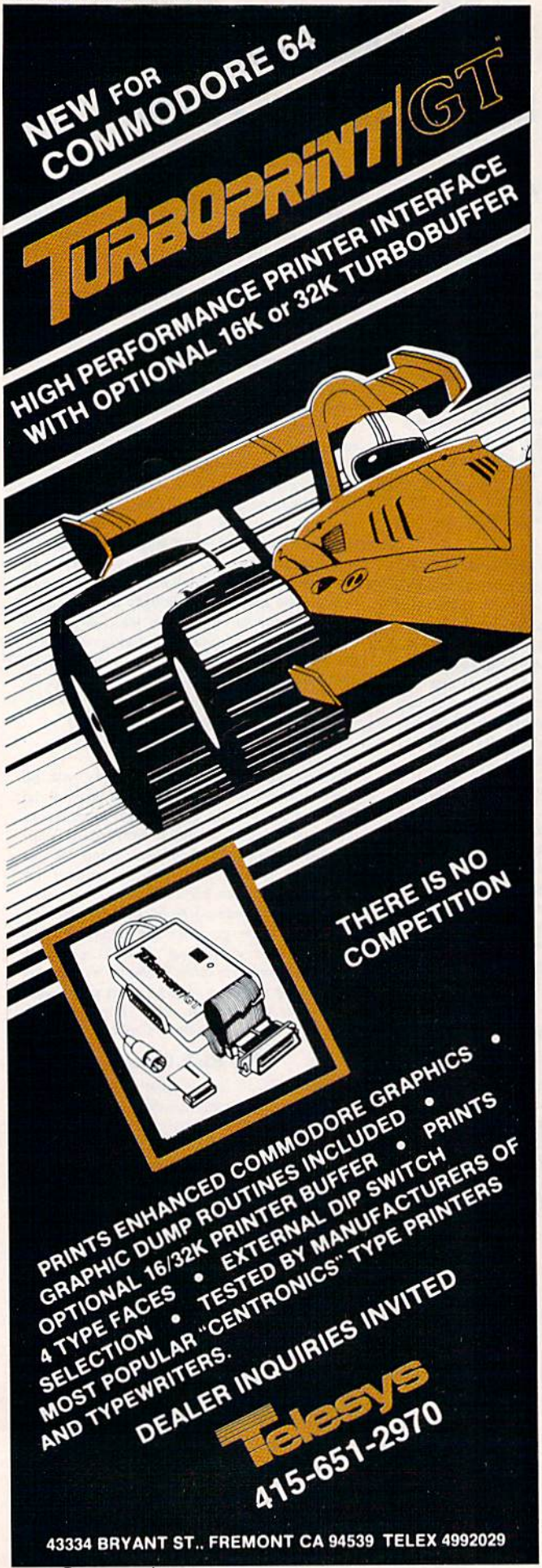
Circle 321 on Reader Service card.



Listing Continued

```
4ØØ5 FORT=1TO2ØØ:NEXT:POKES1,231:FORT=1TO7Ø
     Ø:NEXT:POKES1,Ø:RETURN
5ØØØ POKES,143:FORT=1TO4ØØ:NEXT:POKES,Ø:RET
     URN
6ØØØ FORML=26TO28:FORCT=215TO241STEP2:POKES
     1,CT:FORT=1TO4Ø:NEXT:NEXT
6ØØ1 POKEBC,ML:NEXT:POKEBC,27:POKES1,Ø:RETU
     RN
62ØØ POKESM+123,32:POKESM+124,32:POKESM+1Ø2
     ,32:POKESM+1Ø1,32:FORT=1TO3ØØ:NEXT
62Ø5 POKESM+123,1Ø2:POKESM+124,1Ø2:POKESM+1
     Ø1,1Ø2:POKESM+1Ø2,1Ø2
621Ø GOSUB2Ø1:RETURN
63ØØ PRINTSPC(47)"{SHFT C}ORRECT, FRIEND.":
     RETURN
64ØØ PRINTCD$SPC(4)BLK$LC$"{SHFT W}RONG, FR
     IEND!":PRINTSPC(28)"{SHFT T}RY AGAIN!"
     :RETURN
65ØØ POKES,147:GOSUB2ØØ:POKES,Ø:RETURN
66ØØ PRINTUC$SPC(4)"SORRY, FRIEND!":PRINT:P
     RINT:PRINT" CORRECT SPELLING IS"
661Ø AW$=W$(L):AW=LEN(AW$):AT=(22-AW)/2
6615 PRINTSPC(AT+22)CHR$(3Ø)W$(L):GOSUB2Ø1:
     RETURN
67ØØ FORZZ=ØTO9:POKES,231+ZZ:NEXT:POKES,Ø:R
     ETURN
67Ø1 FORT=ØTO5STEP5:POKES,221+T:FORH=ØTO25:
     NEXT:POKES,Ø:FORH=ØTO4Ø:NEXT:RETURN
7ØØØ GOSUB55Ø:PRINT" OK, FRIEND!":PRINT:PRI
     NT" IF YOU WANT TO USE":PRINT
7ØØ1 PRINT" THE SAME WORDS NEXT":PRINT:PRIN
     T" TIME, RESAVE MY":PRINT:PRINT" PROGR
     AM."
7ØØ2 GOSUB2Ø5:GOSUB55Ø:PRINT:PRINT:PRINT" L
     ET'S DO THIS AGAIN"
7ØØ3 PRINT:PRINTSPC(5)"REAL SOON!!
7ØØ5 GOSUB2Ø3
7Ø1Ø GOSUB55Ø:PRINTSPC(53)"BYE!":GOSUB2Ø2:G
     OSUB67ØØ:PRINTCH$:POKEBC,8:END
8ØØØ POKE646,15:PRINTSPC(135)"{16 SHFT Qs}"
8ØØ1 FORT=1TO5:PRINTSPC(3)"{SHFT Q}"SPC(14)
     "{SHFT Q}":NEXT
8ØØ3 PRINTSPC(3)"{16 SHFT Qs}":POKE646,6:RE
     TURN
9ØØØ DATA"A","B","C","D
9ØØ4 DATA"E","F","G","H
9ØØ8 DATA"I","J","K","L
9Ø12 DATA"M","N","O","P
9Ø16 DATA"Q","R","S","T
91ØØ PRINTCHR$(147):IFPEEK(44)=18GOTO911Ø
91Ø5 SM=768Ø:CM=384ØØ
911Ø SM=4Ø96:CM=37888
9111 LC$=CHR$(14):CD$=CHR$(17):CH$=CHR$(147
     ):UC$=CHR$(142):HC$=CHR$(19):BLK$=CHR$
     (144)
9112 BU$=CHR$(31):RF$=CHR$(146):RO$=CHR$(18
     ):RED$=CHR$(28):QM$=CHR$(34)
9115 BC=36879:VO=36878:POKEVO,15:S=36875:S1
     =36876:POKEBC,26:
9117 IFVB=9THEN2Ø
912Ø GOTO7
92ØØ POKES1,241:FORT=1TO3Ø:NEXT:POKES1,Ø:RE
     TURN
93ØØ C7=6:FORT=ØTO21:T1=129+T:POKESM+T,T1:P
     OKECM+T,C7:POKES1,221+T:NEXT
932Ø FORT=ØTO21:T1=129+T:POKESM+T+484,T1:PO
     KECM+484+T,C7:POKES1,221+T:NEXT
934Ø FORT=ØTO44ØSTEP22:T1=13Ø+T/22:POKESM+T
     +22,T1:POKECM+T+22,C7:POKES1,221+T/22:
     NEXT
936Ø FORT=ØTO462STEP22:T1=13Ø+T/22:POKESM+T
     +21,T1:POKECM+T+21,C7:POKES1,221+T/22:
     NEXT
938Ø RETURN
```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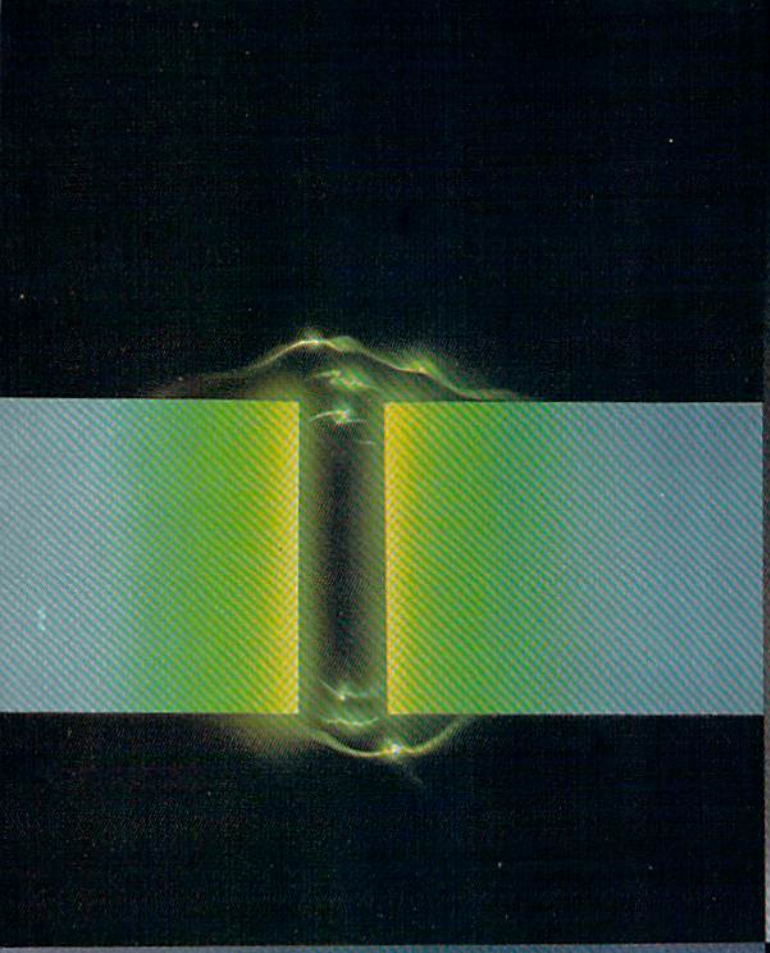

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PLENTY OF K

With this article and program, you can create various sizes and shapes of graphics characters, based on letter and number patterns.

By Elizabeth Oman

As Janelle enters her first computer class, the computer screen displays HELLO JANELLE in extra large letters. Janelle stares at the screen in disbelief—talk about a friendly computer! Janelle will be an enthusiastic student from day one!

My husband and I teach "Introduction to Personal Computers" at a recreational vehicle (RV) park in the Rio Grande Valley in Texas, and we use this form of greeting on our students. We teach the class in our motor home, so some improvising is necessary.

We do not have a traditional blackboard, and a 9- × 12-inch magnetic memo board doesn't always do the job. One day we entered some Basic terms such as bit, byte, RAM, ROM and K on the monitor in large letters so our students could better see and remember them. By using cross-stitch patterns for the letters, their sizes ranged from 3 × 5 inches to 22 × 24 inches.

Try It

A good source of different sized and shaped letters and number patterns is a sampler, which originally was a piece of embroidery.

A sampler was used before the days of printed material and later was often used as a reference for stitches and patterns. Sometimes, it was hung on the wall so the young children in the household could practice their alphabet and numbers from it. Samplers were popular during the Colonial period in this country, and people still make them today.

You can use these same patterns on your computer. There are hundreds of "stitches" available, plus many patterns for pictures, including some that will fit into the grid for a sprite. There are also magazines and books on cross stitching and needlepoint.

You'll find a few books to get you

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started in the library's 740s section, if your library uses the Dewey decimal system of classification, or the TT section, if it uses the Library of Congress classifications.

Plenty of K

The program with this article works with the letter K. The program shows 12 different sized Ks, from 3×5 inches to 22×24 inches. Various graphics, letters and colors are used to demonstrate them in the sampler section of the program.

After you view the various sizes and techniques used, you can go on to modify the large K, in as many ways as you can imagine, by changing the graphics and the color of the stitch. Black is used as the background color for the whole program, as more colors show up better on black than on any other color. White is a close second, but on our TV monitor, it created too much of a glare.

When you are experimenting with the large K, do not use a colon, comma, quotation mark, RVS on or RVS off by itself. If you use more than one letter (for example, WW), you'll find that on pressing the return key, the newly created letter will be too large for the screen. Try again with only one character. Later, you can try more involved graphics by using "[RVS on] [any character]".

Using a space after the RVS on will give a nice block effect to an otherwise fancy K. Always remember to use the return key after entering your choice of stitch. If you want to try another, press any key or the space bar. Some incorrect entries will make the screen scroll. By pressing the run/stop key and then entering RUN, you may get back into the program.

This program has uses in the classroom, for advertising bulletins, for the visually impaired, for titles in a slide show, to name just a few.

To exit this part of the program, use ZZ for your character, and you'll be returned to the menu, where you may then go on to the third part of the program. Use it to help you design your own sampler, title page, vocabulary features and so on.

First, determine how many lines of text you will have (no more than four). If you were going to do the title (SAMPLERS FOR THE MAKING, for example), you could put each word on a separate line. Going through the exercise, you would enter 4 and be told that the maximum height of the letters would be seven. You would then enter the number for the line with the longest text in it. In this case, SAMPLERS is eight letters long, so you would enter 8. The maximum width for any letter would be six.

The program takes care of putting one space between each letter and row. If you want more than one space between each letter or row, you must refigure by subtracting 1 from the answers given for each additional space, then going to your sampler book of patterns and finding appropriately sized letters.

To exit the whole program, just press the run/stop and restore keys. Otherwise, you'll keep returning to the menu.

This program should have uses in the classroom, for advertising bulletins, for the visually impaired or for titles for a slide show. If you develop any new ideas while you're experimenting, I'd like to hear about them. R

Address all author correspondence to Elizabeth Oman, Rt. 1, Box 301-D #388, Pharr, TX 78577.

Listing *of Sampler program for the C-64.*

```
3 REM ** PLENTY OF K, A COMPUTER SAMPLER
4 REM BY ELIZABETH OMAN
6 POKE53280,0:POKE53281,0
7 GOSUB6000
9 GOSUB5000
10 REM EXPERIMENT WITH K
19 PRINT"{SHFT CLR}"
20 A$="{CTRL 2}%"
30 GOSUB1000
100 PRINTTAB(11)C$SPC(3)C$SPC(8)B$
120 PRINTTAB(10)A$SPC(3)A$SPC(1)A$SPC(3)A$S
    PC(6)A$SPC(2)A$
130 PRINTTAB(10)A$SPC(1)A$SPC(1)A$SPC(1)A$S
    PC(1)A$SPC(1)A$SPC(6)B$SPC(1)B$
135 PRINTTAB(11)B$SPC(1)C$SPC(1)B$SPC(10)B$
140 PRINTTAB(14)A$SPC(1)A$SPC(12)C$
150 PRINTTAB(14)A$SPC(1)A$SPC(11)C$
160 PRINTTAB(14)A$SPC(1)A$SPC(10)C$
170 PRINTTAB(14)A$SPC(1)A$SPC(8)D$
180 PRINTTAB(14)A$SPC(1)A$SPC(5)F$
190 PRINTTAB(14)A$SPC(1)A$SPC(3)E$
200 PRINTTAB(14)A$SPC(1)A$SPC(2)G$
210 PRINTTAB(14)A$SPC(1)D$SPC(4)C$
220 PRINTTAB(14)A$SPC(1)A$SPC(2)B$SPC(4)B$
230 PRINTTAB(14)A$SPC(1)A$SPC(3)C$SPC(1)B$
240 PRINTTAB(14)A$SPC(1)A$SPC(5)B$
260 PRINTTAB(14)A$SPC(1)A$SPC(3)A$SPC(1)D$
270 PRINTTAB(14)A$SPC(1)A$SPC(3)A$SPC(1)B$S
    PC(1)B$
280 PRINTTAB(14)A$SPC(1)A$SPC(4)B$SPC(2)B$
290 PRINTTAB(14)A$SPC(1)A$SPC(9)B$
300 PRINTTAB(14)A$SPC(1)A$SPC(9)B$
310 PRINTTAB(11)B$SPC(1)A$SPC(1)A$SPC(1)B$S
    PC(7)B$
320 PRINTTAB(10)A$SPC(1)A$SPC(1)A$SPC(1)A$S
    PC(1)A$SPC(1)A$SPC(6)B$
330 PRINTTAB(10)A$SPC(3)C$SPC(3)A$SPC(7)B$S
    PC(1)A$
340 PRINTTAB(11)C$SPC(3)C$SPC(9)C$
350 GETA$:IFA$=""GOTO350
355 GOSUB6000: PRINT"CHANGE CURSOR COLOR IF
     YOU WANT TO"
360 FORX=1TO6:PRINT{2 SPACEs}:NEXT:PRINT"WH
    AT SYMBOL DO YOU WISH TO CHANGE TO?"
361 PRINT"(1 ONLY)"
365 FORX=1TO5:PRINT{2 SPACEs}:NEXT:PRINT"DO
     NOT USE A COMMA, COLON,{2 SPACEs}REVER
    SE "
366 PRINT:{2 SPACEs}PRINT"ON, REVERSE OFF,
    OR QUOTES, PLEASE"
367 FORX=1 TO2:PRINT:NEXT:PRINT"ZZ WILL EXI
    T THIS PART OF PROGRAM"
370 PRINT:INPUTA$
371 IFA$="ZZ"GOTO7
372 GOSUB1000
380 GOTO100
1000 B$=A$+A$
1010 C$=A$+A$+A$
1020 D$=A$+A$+A$+A$
1030 E$=A$+A$+A$+A$+A$
1040 F$=A$+A$+A$+A$+A$+A$
1050 G$=A$+A$+A$+A$+A$+A$+A$:RETURN
2000 REM SAMPLER
```

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Signature _____

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		Shipping and Handling	$4.00
		CA residents add 6.5% Sales Tax	_____
		TOTAL PRICE	_____

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Listing continued.

```
2001 GOSUB6000
2009 PRINT
2010 PRINT"{COMD 7} {SHFT Q}{SHFT SPACE}{SH
     FT Q}"SPC(3)"{CTRL 8}LLL L"SPC(3)"{CTR
     L 4}X{2 SPACEs}XX"SPC(2)"{CTRL 7}{3 SH
     FT Qs}{2 SHFT SPACEs}{2 SHFT Qs} {COMD
      3}//// ///"
2011 PRINT"{COMD 7} {SHFT Q}{SHFT SPACE}{SH
     FT Q}"SPC(4)"{CTRL 8}L L"SPC(4)"{CTRL
     4}X XX"SPC(4)"{CTRL 7}{SHFT Q}{2 SHFT
     SPACEs}{SHFT Q}"SPC(4)"{COMD 3}//"SPC(
     3)"/"
2012 PRINT"{COMD 7} {2 SHFT Qs}"SPC(4)"{CTR
     L 8}LLL"SPC(5)"{CTRL 4}XXX"SPC(5)"{CTR
     L 7}{4 SHFT Qs}"SPC(4)"{COMD 3}//{2 SP
     ACEs}/"
2013 PRINT"{COMD 7} {SHFT Q}{SHFT SPACE}{SH
     FT Q}"SPC(4)"{CTRL 8}L L"SPC(4)"{CTRL
     4}X XX"SPC(4)"{CTRL 7}{SHFT Q}{2 SHFT
     SPACEs}{SHFT Q}"SPC(4)"{COMD 3}////"
2014 PRINT"{COMD 7} {SHFT Q}{SHFT SPACE}{SH
     FT Q}"SPC(3)"{CTRL 8}LLL L"SPC(3)"{CTR
     L 4}X{2 SPACEs}XX"SPC(2)"{CTRL 7}{SHFT
      Q}"SPC(4)"{SHFT Q}"SPC(3)"{COMD 3}//
     ///"
2015 PRINTTAB(21)"{CTRL 7}{3 SHFT Qs}{2 SPA
     CEs}{3 SHFT Qs}"SPC(2)"{COMD 3}//{2 SP
     ACEs}///"
2016 PRINTTAB(30)"////{2 SPACEs}///"
2017 PRINT"{CTRL 8}{COMD +}"SPC(3)"{COMD +}
     "SPC(2)"{COMD 8}X X{2 SPACEs}X"SPC(2)"
     {COMD 6}{SHFT W}{SHFT SPACE}{SHFT W}"S
     PC(3)"{SHFT W}"
2018 PRINT"{CTRL 8}{COMD +} {SHFT SPACE}{CO
     MD +}"SPC(3)"{COMD 8} X{2 SPACEs}X "SP
     C(2)"{COMD 6} {SHFT W}"SPC(3)"{SHFT W}
     "
2019 PRINT"{CTRL 8}{COMD +} {COMD +}"SPC(5)
     "{COMD 8}X X"SPC(5)"{COMD 6}{SHFT W}{2
      SPACEs}{SHFT W}"
2020 PRINT"{CTRL 8}{2 COMD +s}"SPC(5)"{COMD
      8}X X"SPC(5)"{COMD 6}{SHFT W}{SHFT SP
     ACE}{2 SHFT Ws}"
2021 PRINT"{CTRL 8}{COMD +}{SHFT SPACE}{COM
     D +}"SPC(5)"{COMD 8}X X"SPC(5)"{COMD 6
     }{SHFT W}{2 SHFT SPACEs}{SHFT W}"SPC(6
     )"{CTRL 5}+++{2 SPACEs}+"SPC(3)"++"
2022 PRINT"{CTRL 8}{COMD +}{2 SHFT SPACEs}{
     COMD +}"SPC(4)"{COMD 8}X{2 SPACEs}X"SP
     C(4)"{COMD 6}{SHFT W}"SPC(3)"{SHFT W}"
     SPC(4)"{CTRL 5}+"SPC(3)"+++{2 SPACEs}+
     + +"
2023 PRINT"{CTRL 8}{COMD +}"SPC(3)"{COMD +}
     "SPC(2)"{COMD 8}X{2 SPACEs}X X"SPC(2)"
     {COMD 6}{SHFT W}{SHFT SPACE}{SHFT W}"S
     PC(3)"{SHFT W}"SPC(2)"{CTRL 5}+";
2024 PRINTSPC(5)"+{2 SPACEs}++"SPC(3)"+"
2025 PRINTTAB(24)"+ +{2 SPACEs}++ +++{2 SPA
     CEs}+"
2026 PRINT"{CTRL 2}{2 SHFT Qs}"SPC(4)"{2 SH
     FT Qs}{2 SPACEs}{COMD 2}{5 COMD +s} {4
      COMD +s}"SPC(5)"{CTRL 5}++ ++{2 SPACE
     s}++"
2027 PRINT"{CTRL 2} {SHFT Q}"SPC(4)"{SHFT Q
     }"SPC(4)"{COMD 2}{COMD +} {COMD +}"SPC
     (3)"{COMD +}"SPC(10)"{CTRL 5}++ +"
2028 PRINT"{CTRL 2} {SHFT Q}"SPC(3)"{SHFT Q
     }"SPC(5)"{COMD 2}{3 COMD +s}{3 SPACEs}
     {COMD +}"SPC(9)"{CTRL 5}++++ ++"
2029 PRINT"{CTRL 2} {4 SHFT Qs}"SPC(6)"{COM
     D 2}{COMD +} {COMD +}{SHFT SPACE}{2 CO
     MD +s}"SPC(9)"{CTRL 5}+++"SPC(3)"++"
2030 PRINT"{CTRL 2} {SHFT Q}"SPC(3)"{SHFT Q
     }"SPC(5)"{COMD 2}{6 COMD +s}"SPC(4)"{C
     TRL 5}++"SPC(3)"++"SPC(3)"+++{2 SPACEs
     }+"
2031 PRINT"{CTRL 2} {SHFT Q}"SPC(4)"{SHFT Q
     }"SPC(4)"{COMD 2}{COMD +}{SHFT SPACE}{
     COMD +}{SHFT SPACE}{COMD +}{SHFT SPACE
     }{COMD +}"SPC(3)"{CTRL 5}+"SPC(3)"++"S
     PC(4)"+"SPC(3)"+"
2032 PRINT"{CTRL 2} {SHFT Q}"SPC(4)"{SHFT Q
     }"SPC(4)"{COMD 2}{3 COMD +s}{SHFT SPAC
     E}{3 COMD +s}"SPC(4)"{CTRL 5}+++"SPC(7
     )"+++"
2033 PRINT"{CTRL 2}{2 SHFT Qs}"SPC(4)"{2 SH
     FT Qs}"SPC(3)"{COMD 2}{COMD +}{SHFT SP
     ACE}{COMD +}{2 SHFT SPACEs}{COMD +}{SH
     FT SPACE}{COMD +}"
2034 PRINTTAB(10)"{COMD 2}{5 COMD +s}{SHFT
     SPACE}{4 COMD +s}"
2035 GETA$:IFA$=""GOTO2035
2036 PRINT:GOSUB6000
2038 GOTO5000
2800 GETA$:IFA$=""THEN2800
2810 GOSUB6000
2820 GOTO5000
2850 REM TABLE FOR HEADINGS
2900 GOSUB6000
2910 FORX=1TO10:PRINT:NEXT:PRINT"DO YOU WIS
     H TO FIGURE SIZES OF LETTERS"
2920 PRINT"FOR A HEADING?"
2930 FORX=1TO2:PRINT:NEXT:PRINT"Y/N"
3000 GETA$:IFA$=""GOTO3000
3010 IF A$="Y"THENPRINT"{SHFT CLR}":GOTO302
     0
3011 IFA$="N"GOTO7
3019 GOSUB6000
3020 FORX=1TO2:NEXT:PRINT"HOW MANY ROWS(1-4
     )?"
3025 FORX=1TO2:NEXT:PRINT:INPUT M
3030 IFM>4THEN PRINT"{CTRL 8}TOO MANY" :GOT
     O3020
3031 IFM=0GOTO3020
3035 IFM<=4THENY=INT(25/M-1)
3040 FORX=1TO2:PRINT:NEXT:PRINT"{CTRL 2}THE
      MAXIMUM HEIGHT OF THE LETTERS IS "{2
     SPACEs}Y
3050 PRINT:PRINT"{CTRL 5}GIVE THE NUMBER OF
      LETTERS IN THE"
3055 PRINT"LONGEST ROW, PLEASE (1-10)"
3060 PRINT:PRINT:INPUTQ
3070 IFQ>10THENPRINT"{CTRL 2}TOO MANY":GOTO
     3060
3071 IFQ=0GOTO3050
3080 IFQ<=10THENW=INT(40/Q-1)
3090 FORX=1TO2:PRINT:NEXT:PRINT "{CTRL 2}TH
     E MAXIMUM WIDTH OF THE{2 SPACEs}LETTER
     S IS" W
3990 GETA$:IFA$=""GOTO3990
4000 GOSUB 6000
5000 FORX=1TO4:PRINT:NEXT:PRINTTAB(18)"{CTR
     L 2}MENU"
5010 FORX=1TO4:PRINT:NEXT:PRINT"{CTRL 2}S{C
     TRL 7}AMPLER":PRINT:PRINT"{CTRL 2}E{CT
     RL 7}XPERIMENT WITH K":
5015 PRINT:PRINT"{CTRL 2}T{CTRL 7}ABLE FOR
     HEADINGS"
5020 FORX=1TO6:PRINT:NEXT:PRINT"{CTRL 2}SEL
     ECT BY PRESSING THE FIRST LETTER OF"
5025 FORX=1TO2:PRINT:NEXT:PRINT"YOUR SELECT
     ION"
5030 GETC$:IFC$=""GOTO5030
5031 IFC$="S"GOTO2000
5032 IFC$="E"GOTO19
5033 IFC$="T"GOTO2900
5040 IFC$<>"S"THENPRINT"{SHFT CLR}"
5050 GOTO5000
6000 PRINT"{SHFT CLR}":RETURN
```


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DATAFILE, PART II

BY MIKE KONSHAK

The first part of this article, a description of the Datafile program, appeared in the November issue of RUN. Here, in the second part, you'll find descriptions and listings of Datafile's subprograms, DFMail and DFReport, as well as a useful appendix.

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DFMail Instructions

You load DFMail using the print options found in Datafile. It is assumed that a datafile is currently held in memory; otherwise, there will be nothing to print. The screen shows:

[LABEL SIZE]

[S]TANDARD—5 ROWS PER LABEL
15/16 BY 3½ INCHES

[L]ARGE—8 ROWS PER LABEL
1 7/16 BY 3½ INCHES

[O]THER—CUSTOM LABEL SIZE OR NUMBER OF CHARACTERS PER ROW

NOTE: LABELS ARE SEPARATED BY ONE ROW
32 CHARACTERS PER ROW IS STANDARD

[PRESS THE APPROPRIATE KEY]

DFMail uses "One-up" tractor-feed labels and is adaptable to any length or width of label. The standard size labels (with 5 rows of text) are the most popular and most easily obtainable, with the large size (8 rows) being next in line. Press either the S or L key. If you have labels of a non-standard size, choose the O option instead.

OTHER is adaptable to let you choose the number of rows, from 1 to ?, and the number of characters can be expanded from the standard 32 up to 136. Putting your printer into compressed mode will allow more characters on labels of standard length.

Some labels that fit the non-tractor-feed printers give you two across the page. These labels, which measure four inches long, are used if the printer has only pin feed (Okidata and Epson, for

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example). These longer labels can accomodate 38 characters per row, if desired. DFMail, however, will only print on the leftmost labels. You can, of course, feed the labels in backwards to use the other side.

If <O> is pressed, the screen will display:

ENTER NUMBER OF ROWS ON LABEL?
ENTER NUMBER OF CHARACTERS PER ROW?

Enter your modifications when prompted. The next screen shows the main menu for the mailing labels program, as follows:

[MAILING LABELS MENU]

[P]RE-DEFINED FORMAT OR
[D]EFINE NEW FORMAT
[C]HANGE LABEL SIZE

[E]XIT TO MAIN PROGRAM OR
[R]EPORT/LISTING PROGRAM
[Q]UIT PROGRAM

[PRESS THE APPROPRIATE KEY]

Pressing the E key reloads Datafile into memory without disturbing the record data. Q closes the files and terminates the entire program. Ending here wipes out all data. Do this only if you have not updated any records and if you have your current datafile stored on disk. You will be warned if you have not done so.

R loads the subprogram DFReport directly, instead of having to go back to the Datafile program. C sends you back to the first screen that you encountered when you entered DFMail. This allows you to alter the size of your labels and printouts.

Formatting Your Labels

Formatting of printer outputs may be the most confusing aspect of a database. You must be able to visualize how you want the final result to appear. This may seem difficult at first, but being able to customize your outputs is considered a strong feature of a database.

Fortunately, once you have formatted a label or report (when using DFReport), you'll be able to save your design for future recall. From then on, when you want to print your labels, you'll be able to breeze by the formatting routines.

Let's design a sample mailing label that will probably meet most of your needs. Before doing this, you must have a previously created datafile that's compatible with your label format. The datafile will have the following structure:

Name of datafile: MAIL LIST
Number of fields: 8

Field #	Field name	Field length
1	LAST NAME	15
2	FIRST NAME	10
3	CODE	5
4	STREET	32
5	CITY	23
6	STATE	2
7	ZIP	5
8	PHONE	12

Modifications to the above datafile might include a second address line (e.g., COMPANY NAME). The phone number is included in the datafile, but will not be printed on the labels. The field Code may be used for classifying the records (e.g., R = relatives, F = friends, B = business associates), or for an employee number, a professional title or an account number for business purposes.

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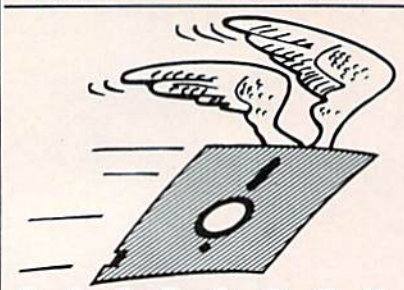

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Define New Format

Now that the datafile is defined, and assuming that records are present, let's return to where we left DFMail. Pressing D in the Mailing Labels menu results in this display, which will indicate, by rows and characters, which label size has been chosen:

```
[ MAILING LIST FORMAT ]

THIS FORMAT USES SINGLE ROW LABELS.
EACH LABEL CONTAINS UP TO 5 ROWS.
EACH ROW CAN CONSIST OF 1 TO 3
FIELDS.
IF THE LENGTH OF MULTIPLE ITEMS
EXCEEDS 32 CHARACTERS, SOME
DATA WILL BE CUT OFF.

[NUMBER OF ROWS?]
```

At this point, let's pause to discuss what your label will look like. Row 1 will include record fields 1, 2 and 3 (LAST NAME + FIRST NAME + CODE), in that order. Row 2 will only have record field 4 (STREET). Row 3 will consist of record fields 5, 6 and 7 (CITY + STATE + ZIP). Rows 4 and 5 will not be used.

The label shown on the screen is divided into 3 fields per row. These are *format* fields, not *record* fields. Try not to get them confused. Enter 3 for the NUMBER OF ROWS and press the return key.

```
CHOOSE WHICH FIELDS GO IN
WHICH ROW
ENTER [0] IF ADDITIONAL FIELDS ARE
NOT DESIRED.

1  LAST NAME   ROW 1
2  FIRST NAME  FIELD 1? 0
3  CODE
4  STREET
5  CITY
6  STATE
7  ZIP
8  PHONE
```

Field 1, in this case, refers to the first field or item of the first row. In this field we will place record field 2, which is displayed on the left of the screen. Respond to the prompts on the right of the screen as follows:

```
ROW 1          press the return key
FIELD 1? 2     after each entry
FIELD 2? 1
FIELD 3? 3

ROW 2
FIELD 1?4
FIELD 2?0
FIELD 3?0

ROW 3
FIELD 1? 5
FIELD 2? 6
FIELD 3? 7
```

The screen will now display:

```
DO YOU WISH TO REVIEW YOUR FOR-
MAT AND/OR MAKE CORRECTIONS? [Y]
OR [N]
```

Pressing Y will repeat the last screen, except that the record-field numbers will appear after the format-field prompts. Press N to advance into the program.

```
[SAVE FORMAT] [Y] OR [N]? Y

SAVE UNDER WHAT FILE NAME?
? MAIL TEST
```

You will notice that the program preprints the filename that was determined when your datafile was saved or loaded during a disk operation. This links record and format files together so that you will not have to remember different names. At this point any format files with the name Mail List will be scratched as this new format is saved. Unlike the datafiles, format files will not be given a backup when a file of the same name is resaved after changes. Change the name of the format file at this time if you want to retain the old format, and press the return key.

The program will then advance to where the labels are aligned in the printer. Jump there now if you wish, because the next few paragraphs will discuss the situation where the user loads in a pre-defined format.

Pre-defined Format

After pressing P at the Mailing Labels menu, the screen will display:

```
LOAD FORMAT FROM WHAT FILE?
? MAIL TEST
```

The prompt should pre-print the last-used filename. If MAIL TEST is the correct format file, press return. As soon as the file is loaded, the program will display:

```
DO YOU WISH TO REVIEW YOUR FORMAT
AND/OR MAKE CORRECTIONS? [Y] OR [N]
```

This is the same question asked when you first designed the format. If you are not sure if the format you loaded was the correct one, you may check it at this time. This is also a good opportunity to make a slight change for a one-of-a-kind job. Press N. The screen will display:

```
SAVE FORMAT? [Y] OR [N]
```

This may seem repetitive, but it allows you to save a changed format, or to save the current one under a new name, or on a new disk. Press N. The program will next display:

```
INSERT SINGLE ROW TRACTOR FEED
LABELS
RUN TEST LABELS TO HELP POSITION
LABELS
```


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```
PRESS [T]EST LABEL
      [C]HOOSE RECORDS
```

Pressing T will print rows of asterisks. The number of rows and characters should reflect your label size and format. Position the labels in your printer so that the rows appear centered in the label. Once the labels are aligned, press C to advance to the Print Options menu, where you will choose the records to print.

```
PRINT OPTIONS MENU

[A]LL RECORDS IN FILE
[S]ELECT INDIVIDUAL RECORD
[F]IND RECORDS WITH COMMON FIELDS
[E]XIT TO MAIN MENU

[PRESS THE APPROPRIATE KEY]
```

At this time, you actually decide which records you want to print, and then begin printing. (If, at any time, you decide that you want to leave this section—before or after printing—press E to get back to the main menu.) The choices are as follows:

All Records in File

The printer will start printing from record number 1 until it has printed your entire datafile. Sit back with a cup of coffee if you have a large file.

Select Individual Record

This gives you the opportunity to print just one label of your choice. This assists you in making last-minute corrections or printing just a few records out of your datafile. The screen displays PRINT WHICH RECORD? Enter the record number, then press return. If you type in a number higher than the size of your datafile, you will receive an error message. You must print *something* to get back to the menu.

Find Records with Common Fields

This search routine operates identically to the one in the view option of the Datafile program. The screen will display all the field names in your datafile to help you search. The following list is from the datafile called MAIL LIST. For this example, we will search for all last names beginning with S.

```
FIND RECORDS WITH COMMON FIELDS

1  LAST NAME
2  FIRST NAME
3  CODE
4  STREET
5  CITY
6  STATE
7  ZIP
8  PHONE

WHICH FIELD IS TO BE SEARCHED? 1

ENTER [COMMON ITEM]
(THE ENTIRE STRING IS NOT REQUIRED)

[LAST NAME] ? S

SEARCHING RECORD #
```

If you followed the above sequence, the # symbol will be an incrementing number that will stop when the program finds a record with a last-name field beginning with S. It will then print out that record and then start looking for another. If you had previously sorted this file by last name, all the Ss would be printed one after another. The program will continue searching until it runs out of records. It will then send you back to the Print Options menu.

If you had typed in SWYKOWSKI for the last name, only those records that perfectly matched, or began with SWYKOWSKI, would be printed.

For a business application, you could use this feature to group mail by zip code. It is also possible to print only those records that have a special code that was previously entered in the code field of the record.

DFReport Instructions

Just as with DFMail, you load DFReport using the print options in Datafile, and again it's assumed that a datafile is in memory; otherside, there is nothing to print. The screen shows:

```
[ REPORT PRINTOUT MENU ]

[L]IST RECORDS UNFORMATTED OR
[P]RE-DEFINED FORMAT
[D]EFINE NEW FORMAT

[E]XIT TO MAIN PROGRAM OR
[M]AILING LABEL PROGRAM
[Q]UIT PROGRAM

[ PRESS THE APPROPRIATE KEY ]
```

This menu functions like DFMail. Pressing E reloads Datafile back into memory for further updates without disturbing the record data. Q closes the files and terminates the entire program. Ending here wipes out all data. Do this only if you have not updated any records and if you have your current datafile stored on disk. You will be warned if you fail to do so. M loads the program DFMail directly without first having to load Datafile.

We'll be using the datafile MAIL LIST, as described in the DFMail instructions, as an example file to demonstrate the formatting and printouts of DFReport. Dummy data will be used.

List Records Unformatted

This function is by far the simplest way to get a hard copy of your datafile.

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JANUARY 23, 1984

Last/First.Name	Street Address	City	St & Zip	Phone Number
Konshak Mike	4821 Harvest Court	Colorado Springs	CO 80917	303-596-4243
Mouse Mickey	1984 Disney Road	Orlando	FL 10001	800-555-1212
Bunny Bugs	21 Carrot Lane	Whatsupdoc	CA 99999	111-222-3333
Daniels Jack	555 Sobriety Blvd	Sourmash	TN 70707	000-876-5432

Table 1. *Mail List report.*

Pressing L results in:

```
[ PRINT OPTIONS MENU ]

[A]LL RECORDS IN FILE
[S]ELECT INDIVIDUAL RECORD
[F]IND RECORDS WITH COMMON FIELD
[E]XIT TO MAIN MENU

POSITION PAPER IN PRINTER AT TOP OF
PAGE

[ PRESS THE APPROPRIATE KEY ]
```

This menu functions exactly as the one in DFMail, with one exception. Instead of centering your mailing label, you are required to advance your printer to the top of the next page. Refer to the mail program for instructions on the above menu. An unformatted record will resemble the following:

```
[RECORD#1] ----------------------------------------
LAST NAME  ---------KONSHAK
FIRST NAME ---------MIKE
CODE       ---------AUTHOR
STREET     ---------4821 HARVEST COURT
CITY       ---------COLORADO SPRINGS
STATE      ---------COLORADO
ZIP        ---------80917
PHONE      ---------303/596-4243

[RECORD#2] ----------------------------------------
LAST NAME -      etc.
```

As you can see, the record data is printed in rows, which wastes considerable paper. Although this printout is quick-and-dirty, it can be cut out and pasted onto cards or filed in small cabinets or folders.

Pre-Defined Format

Pressing P results in:

```
LOAD FORMAT FROM WHAT FILE
? MAIL LIST
```

Enter the datafile format to be used for printing your report, then press the return key. The name of the last datafile loaded in Datafile will be pre-printed for you after the prompt. Change the name by overstriking. The screen then displays:

```
DO YOU WISH TO REVIEW YOUR FORMAT
AND/OR MAKE CORRECTIONS[Y] OR [N]?
```

Pressing Y sends you through the Define New Format routine. The current values of your format will be displayed. Alter by overstriking the values and pressing return. Also press return to accept the values. Pressing N gives you:

```
SAVE FORMAT [Y] OR [N]?
```

If you made any changes, go ahead and resave your new format by pressing Y. Keeping the same filename will scratch the old format. After N, you will progress to the Print Options menu, which has been previously described.

Define New Format

This routine creates a custom form based on your design. It would be a good idea to sketch out on a sheet of graph paper or programmer's pad what you want your report to look like. You will

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need to decide the following:

1. How many characters wide will the report be? Up to 136 characters may be printed, if your printer is capable of compressing text. Eighty characters is normal. Report widths less than 80 characters will be printed left-justified on the paper.
2. How should your title read? Up to four lines are possible, which will be centered at the top of the page.
3. How many columns will you need? This will depend on which fields of your datafile you will want listed. Up to eight columns are allowed.
4. What is the width, in characters, of each column? This will depend on the combined character length of the record fields that you choose for each column. The total number of characters permissible in all the columns combined is 80 (or 136 with printers in compressed print mode), with two characters between columns. Choosing eight columns leaves you 76 characters for record fields (14 characters used in spacing).
5. Which record fields will be in each of the columns? As in formatting DFMail mailing labels, you will be able to combine up to three record fields in each column.
6. What will be the header name of each column? A header name cannot be longer than the chosen width of the column.

Try to remember the length of each field in the datafile that will be on this report. If the record data contained within the field is longer than the width of the report column, some end characters will be cut off.

Let's design a report using the datafile Mail List, which will give us a reference list of the records in the file. We will use first and last names (16 characters), street address (20), city (16), state and zip code (8), and phone number (12). This comprises a total of 72 characters, which we will put into five columns (with two spaces between columns) for a total of 80 characters. The report will look like Table 1.

Now go back to the program to format the above report. Pressing D from the Report Printout menu sends you to:

```
[REPORT SIZE] UP TO 136 CHARACTERS
WIDE

PRINTER MUST BE INITIALIZED FOR
WIDTHS GREATER THAN 80
CHARACTERS.
CHECK YOUR PRINTER MANUAL ON
HOW TO PRINT 136 CHRS

NUMBER OF CHARACTERS? 80

[TITLE FORMAT] PROVIDES FOR 4 LINES
OF INFORMATION AT THE TOP OF THE
FORM:

TITLE #1? MAIL LIST RECORDS
TITLE #2? JANUARY 23, 1984
TITLE #3?
TITLE #4?

[COLUMN FORMAT] UP TO 8 COLUMNS
WITH 2 SPACES BETWEEN COLUMNS:

NUMBER OF COLUMNS? 5
POSITION OF COLUMN #1? 1
          COLUMN #2? 19    <1+16+2>
          COLUMN #3?
          41               <19+20+2>
          COLUMN #4?
          59               <41+16+2>
          COLUMN #5?
          69               <59+8+2>

[HEADING FORMAT] COLUMN
HEADINGS CANNOT EXCEED WIDTH
OF COLUMNS:

COLUMN 1 HEADING? LAST/FIRST
NAME
COLUMN 2 HEADING? STREET
ADDRESS
COLUMN 3 HEADING? CITY
COLUMN 4 HEADING? ST & ZIP
COLUMN 5 HEADING? PHONE NUMBER

CHOOSE WHICH FIELDS GO UNDER
THE COLUMNS

ENTER [0] IF ADDITIONAL FIELDS ARE
NOT DESIRED

1 LAST NAME     COLUMN 1   FIELD 1? 1
2 FIRST NAME               FIELD 2? 2
3 CODE                     FIELD 3? 0
4 STREET        COLUMN 2   FIELD 1? 4
5 CITY                     FIELD 2? 0
6 STATE                    FIELD 3? 0
7 ZIP           COLUMN 3   FIELD 1? 5
8 PHONE                    FIELD 2? 0
                           FIELD 3? 0
                COLUMN 4   FIELD 1? 6
                           FIELD 2? 7
                           FIELD 3? 0
                COLUMN 5   FIELD 1? 8
                           FIELD 2? 0
                           FIELD 3? 0

DO YOU WISH TO REVIEW YOUR FORMAT
AND/OR MAKE CORRECTIONS [Y] OR [N]?
<N>

[SAVE FORMAT] [Y] OR [N] <Y>

SAVE UNDER WHAT FILE NAME?
? MAIL LIST
```

The program now jumps to the Print Options menu for choosing the records that are to be printed. Now you should refer back to the mailing label program instructions. R

See appendix, pp. 88–89.

Address all author correspondence to Mike Konshak, 4821 Harvest Court, Colorado Springs, CO 80917.

Listing 1. *DFMail program.*

```
1000 REM-DATAFILE 2.6 SUBPROGRAM DFMAIL BY
     MIKE KONSHAK
1002 REM-FOR 1525E, MPS801, GEMINI 10X, OKI
     DATA 92A, EPSON RX80 AND OTHERS
1004 IFT%=0THENT%=6
1006 IFLW=0THENLW=32
1008 OPEN4,4:B$=CHR$(32):B1$=CHR$(10):CR$=C
     HR$(13):GOSUB1280:GOTO1102
1010 REM----LOAD SUBPROGRAMS
1012 PRINT"{SHFT CLR}{2 CRSR DNs}{7 SPACEs}
     LOADING MAIN PROGRAM"
1014 LOAD"DATAFILE",8
1016 PRINT"{SHFT CLR}{2 CRSR DNs}{2 SPACEs}
     LOADING REPORT/LISTING SUBPROGRAM"
1018 LOAD"DFREPORT",8
1020 REM----QUIT ROUTINE
1022 PRINT"{SHFT CLR}{2 CRSR DNs}QUITTING N
     OW WILL ERASE CURRENT DATA"
1024 PRINT"{CRSR DN}ARE YOU SURE YOU WANT T
     O QUIT?":PRINT"{2 CRSR DNs} {CTRL 9}Y{
     CTRL 0} OR {CTRL 9}N{CTRL 0} ?
1026 GETA$:IFA$="" THEN1026
1028 IFA$="N"THEN1102
1030 IFA$="Y"THEN1034
1032 GOTO1026
1034 PRINT"{SHFT CLR}{2 CRSR DNs}SUBPROGRAM
      TERMINATED"
1036 PRINT"{CRSR DN}{CTRL 9}DATAFILE{CTRL 0
     } BY MIKE KONSHAK (C)1983":END
1038 REM ----SEARCH ROUTINES
1040 PRINT"{SHFT CLR} {CTRL 9}{11 SPACEs}PR
```

(Listing 1 continued on p.90)

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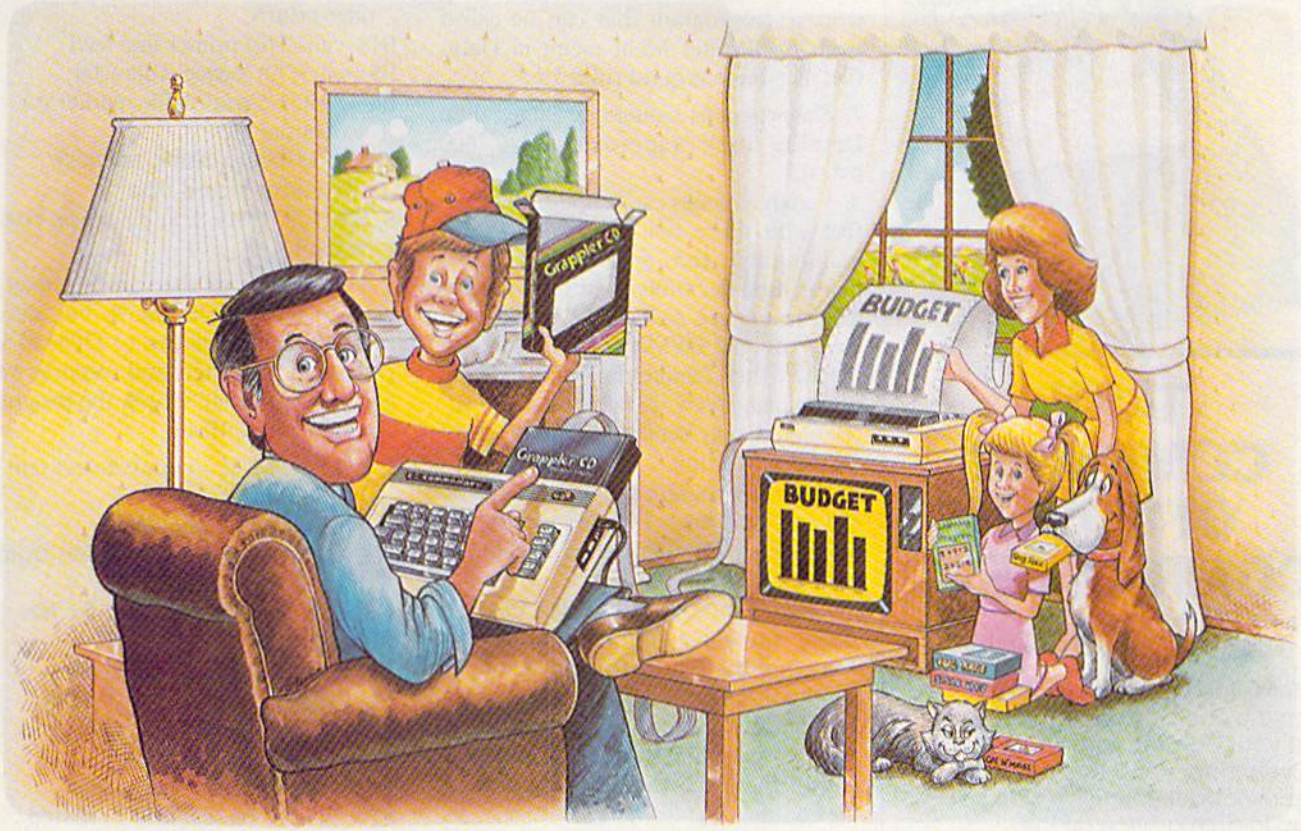

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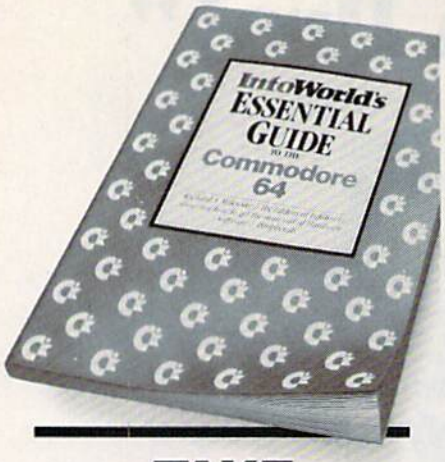

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Appendix to Datafile

Programming User Programs

Datafile is flexible, in that you may write a subprogram that can be called from the Printer Main menu in Datafile. The basic ground rules are:

1. Subprograms cannot be larger than Datafile itself (approximately 7400 bytes).
2. Variable names used should not conflict with those that are necessary for maintaining the datafiles. Variable names used in counters, sorting routines and menus are safe to be duplicated. Try to mimic DFMail or DFReport in the way they handle data and perform operations. New variable names encountered may send the computer off garbage collecting.
3. Your subprogram should have the facility to load back Datafile so you can continue to update and manipulate your data.
4. Open printer and disk files properly when entering a routine. Ensure that you close the files before advancing to another routine or subprogram.
5. Include disk-checking routines to prevent program crashes. Check out any of the three Datafile programs for the routine.
6. It is easiest to modify or expand DFMail or DFReport instead of writing your own subprogram. You should safely be able to add 2000 bytes to DFMail and 1000 bytes to DFReport.

Variable Identification

The following is a list of all the variables used in Datafile and its subprograms. Do not use these variable names except for accessing data. These variables never change in use or purpose.

R = number of possible records
X = number of current records in file
F = number of fields in each record
NF$ = Name of current data or format file in memory
REC$(R,F) = record data array
F$(F) = field name array
L%(F) = length of field array
T%(F) = sorting buffer array
K%(R) = pointer array, keeps records in sorted order
ML$(9,4) = array for combining fields in printing labels and reports
PC(10) = character position array for report columns
TT$(5) = report title array
HC$(9) = column heading array for reports
D$ = chr$(0) dummy string
CR$ = chr$(13) printer and disk carriage return
B1$ = chr$(10) printer line feed
B$ = chr$(32) 'space' character
E$ = "EOF" end-of-file marker on sequential files
MEM = 31000 available memory (bytes) for record data
S, ST, EN, EM$, ET, ES = disk error variables

The balance of the variables may be used in user subprograms, but should be avoided in additions to DFMail and DFReport. Counters and response variables are excepted. Check the programs carefully for conflicts.

I, J, L, N, M, Z = counters and temporary buffers
K = print routine pointer
A$, C$, MR$, DR$ = responses from menus
CK = check whether or not file has been saved
RL = calculated length of record
F1, F2, F3 = field pointer buffers
HN$, ID$ = new disk header name and I.D.
SB$ = user subprogram name
SF = field to be searched or sorted
A1$, A2$, A3$, A0 = buffers for loading disk directory
PW = paper width of report (characters)
CW = column width buffer
RW = number of rows (lines) per label
NL = number of lines for report title
NC = number of columns in report
PG = line counter for automatic paging of reports
I$ = input record selection
T$ = input common string to be searched
B = tab for centering titles and first column of report
LW = number of characters per row on labels
T% = number of rows on labels

Printer Codes for Compressed Print

Many Commodore 64 owners have chosen to add standard ASCII parallel printers to their computer systems. These printers cost more, but have many capabilities and qualities that make the price secondary. Interfaces that convert the serial port on the 64 to parallel ASCII must also be purchased.

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One feature that Datafile is able to utilize is that of compressed characters, allowing reports to be printed that have widths up to 136 characters. The Commodore 1525E and MPS801 do not have this feature, so you are limited to reports 80 characters (ten characters or columns per inch) wide. Some printers with 15-inch carriages will print 132 characters in the normal mode, but will need to be compressed in order to print 136 characters on a standard 8½ by 11 piece of paper.

Table 2 shows the printer codes and procedures to use to set your printer into compressed mode. This should be done *before* you load and run Datafile (while you are in terminal, instead of program, mode).

If you are already into the program, and you want to send the printer commands, you must use the following procedures to keep from losing your datafile and pointers in memory:

1. While in the program, you must be at one of the many menus in Datafile, DFReport or DFMail. There should *not* be a flashing cursor.

2. Press the run/stop key. At the bottom of the screen, you'll see:

```
BREAK IN 30   (30 is the line number where the
READY          computer stopped the program)
[]
```

3. Type in your respective printer commands exactly as shown below if you are in the Datafile program. If you have entered DFReport or DFMail, enter just the line that begins with PRINT#4. The printer files are already open when you are in these programs.

4. Type in GOTO 30, then press return. The number will be different, depending on which menu and subprogram you are in.

5. You will now be back in the program at exactly the place you left. To advance into the next part of the program, press one of the keys that the menu was previously showing. In some instances, you might lose part of your menu as the screen scrolls up, so try to remember which selection you want to press at this stage. E will normally exit you to the previous menu or send you to another program.

(Note: This technique may be used to send any printer commands, not just compressed mode. Just make the appropriate changes to the CHR$ codes.)

If you have a printer that is not shown in Table 2, review your manual for the proper printer codes. Other commands or modes that you might want to consider when printing reports or labels are Expanded (for making double size letters); Double-strike (for darker letters); and Changing Fonts (different letter styles).

(NOTE: Do not use modes that skip over the perforations in the paper. Labels do not need it, and reports are automatically paged by the program.)

Type in the following commands exactly as shown to put your printer into compressed mode. Press return after each line.

GEMINI 10X:

96 characters (12 CPI):	136 characters (17 CPI):
OPEN4,4 PRINT#4,CHR$(27)CHR$(66)CHR$(2) CLOSE4	OPEN4,4 PRINT#4,CHR$(27)CHR$(66) CHR$(3) CLOSE4

OKIDATA 82A:

132 characters (16.5 CPI):
OPEN4,4 PRINT#4,CHR$(29) CLOSE4

OKIDATA 92A:

96 characters (12 CPI):	136 characters (17 CPI):
OPEN4,4 PRINT#4,CHR$(28) CLOSE4	OPEN4,4 PRINT#4,CHR$(29) CLOSE4

EPSON RX80 F/T:

96 characters (12 CPI):	137 characters (17.1 CPI):
OPEN4,4 PRINT#4,CHR$(27)CHR$(77) CLOSE4	OPEN4,4 PRINT#4,CHR$(15) CLOSE4

CITOH Prowriter:

96 characters (12 CPI):	136 characters (17 CPI):
OPEN4,4 PRINT#4,CHR$(27)CHR$(69) CLOSE4	OPEN4,4 PRINT#4,CHR$(27)CHR$(81) CLOSE4

NOTE: Changing CPI or pitch on daisywheel printers requires that a suitable daisywheel be installed. Although a command code may be sent, it is easiest to move the pitch switch on the keyboard to the proper setting (10, 12 or 15 CPI; i.e., 80, 96 or 120 characters on an 8½-inch paper width).

Table 2. *Compressed mode commands for various printers.*

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(from p. 86)

```
    INT OPTIONS MENU{8 SPACEs}"
1042 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}A{CTR
    L Ø}LL RECORDS IN FILE
1044 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}S{CTR
    L Ø}ELECT INDIVIDUAL RECORD
1046 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}F{CTR
    L Ø}IND RECORDS WITH COMMON FIELDS
1048 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}E{CTR
    L Ø}XIT TO MAIN MENU
105Ø PRINT"{CRSR DN} {CTRL 9}{6 SPACEs}PRES
    S THE APPROPRIATE KEY{7 SPACEs}"
1052 GETC$:IFC$="" THEN1Ø52
1054 IFC$="A"THEN1Ø98
1056 IFC$="S"THEN1Ø66
1058 IFC$="F"THEN1Ø74
106Ø IFC$="E"THEN11Ø2
1062 GOTO1Ø52
1064 REM----SELECT INDIVIDUAL RECORD
1066 INPUT"{CRSR DN}PRINT WHICH RECORD";I$:
    I=VAL(I$)
1068 IFI>XTHENPRINT"NO SUCH RECORD EXISTS,
    TRY AGAIN{3 CRSR UPs}":GOTO1Ø66
107Ø GOSUB1268:GOTO1Ø4Ø
1072 REM----FIND COMMON RECORDS
1074 PRINT"{SHFT CLR}{CRSR DN} {CTRL 9}{4 S
    PACEs}FIND RECORDS WITH COMMON ITEMS{4
     SPACEs}{CRSR DN}"
1076 FOR N=1TOF:PRINT" {CTRL 9}";N;"{CTRL Ø
    } ";F$(N):NEXTN
1078 INPUT"{CRSR DN}WHICH FIELD IS TO BE SE
    ARCHED";SF
108Ø IFSF<ØORSF>F THENPRINT"{3 CRSR UPs}":G
    OTO1Ø78
1082 PRINT"{CRSR DN}ENTER {CTRL 9}COMMON IT
    EM{CTRL Ø} ":PRINT"{CRSR DN}(THE ENTIR
    E STRING IS NOT REQUIRED)"
1084 PRINT"{CRSR DN}{CTRL 9}";F$(SF);"{CTRL
     Ø} ";:INPUTT$
1086 FORI=1TOX
1088 PRINT"{CRSR DN}SEARCHING RECORD";I;"{2
     CRSR UPs}"
109Ø IFT$=LEFT$(REC$(K%(I),SF),LEN(T$))THEN
    GOSUB1268
1092 NEXTI
1094 GOTO1Ø4Ø
1096 REM----PRINT ALL RECORDS
1098 PRINT"{SHFT CLR}{CRSR DN}":FORI=1TOX:P
    RINT"{CRSR UP} PRINTING RECORD #";I:GO
    SUB1268:NEXTI:GOTO1Ø4Ø
11ØØ REM----MAILING LABELS MENU
11Ø2 PRINT"{SHFT CLR} {CTRL 9}{8 SPACEs}MAI
    LING LABELS MENU{11 SPACEs}"
11Ø4 PRINT"{2 CRSR DNs}{6 SPACEs}{CTRL 9}P{
    CTRL Ø}RE-DEFINED FORMAT OR"
11Ø6 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}D{CTR
    L Ø}EFINE NEW FORMAT"
11Ø8 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}C{CTR
    L Ø}HANGE LABEL SIZE"
111Ø PRINT"{2 CRSR DNs}{6 SPACEs}{CTRL 9}E{
    CTRL Ø}XIT TO MAIN PROGRAM OR"
1112 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}R{CTR
    L Ø}EPORT/LISTING PROGRAM"
1114 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}Q{CTR
    L Ø}UIT PROGRAM"
1116 PRINT"{2 CRSR DNs} {CTRL 9}{6 SPACEs}P
    RESS THE APPROPRIATE KEY{7 SPACEs}"
1118 GETC$:IFC$="" THEN1118
112Ø IFC$="P"THEN122Ø
1122 IFC$="C"THENGOSUB128Ø:GOTO11Ø2
1124 IFC$="E"THENPRINT#4:CLOSE4:GOTO1Ø12
1126 IFC$="R"THENPRINT#4:CLOSE4:GOTO1Ø16
1128 IFC$="D"THEN1136
113Ø IFC$="Q"THENPRINT#4:CLOSE4:GOTO1Ø22
1132 GOTO1118
```

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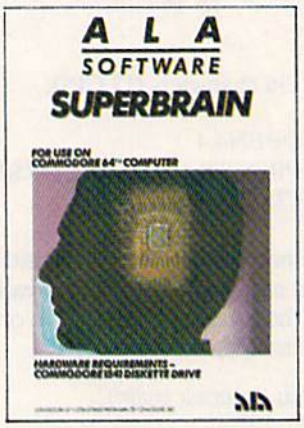

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Listing 1 continued.

```
1134 REM------MAILING LIST FORMAT
1136 PRINT"{SHFT CLR} {CTRL 9}{8 SPACEs}MAI
     LING LIST FORMAT{11 SPACEs}"
1138 PRINT"{CRSR DN}{2 SPACEs}THIS FORMAT U
     SES SINGLE ROW LABELS.
114Ø PRINT"EACH LABEL CONTAINS UP TO"T%-1"
     ROWS.
1142 PRINT"EACH ROW CAN CONSIST OF 1 TO 3 F
     IELDS.
1144 PRINT"IF THE LENGTH OF MULTIPLE ITEMS
     EXCEEDS
1146 PRINT"{CRSR LF}"LW"CHARACTERS, SOME DA
     TA WILL BE CUTOFF"
1148 PRINT"{CRSR DN}{CTRL 9}NUMBER OF ROWS?
     ":PRINT"?{3 SPACEs}{3 CRSR LFs}";RW:IN
     PUT"{CRSR UP}";RW
115Ø IFRW>T%-1THENPRINT"{3 CRSR UPs}":GOTO1
     148
1152 IFRW=ØTHEN11Ø2
1154 PRINT"{SHFT CLR}CHOOSE WHICH FIELDS GO
      IN EACH ROW"
1156 PRINT"ENTER {CTRL 9}Ø{CTRL Ø} IF ADDIT
     IONAL FIELDS ARE":PRINT"NOT DESIRED.{C
     RSR DN}"
1158 FORN=1TOF:PRINT"{CTRL 9}";N;"{CTRL Ø}
     ";F$(N):NEXTN
116Ø FOR J=1TORW:PRINT"{HOME}{4 CRSR DNs}";
     TAB(25)"ROW";J;"{2 CRSR DNs}"
1162 FORL=1TO3:PRINTTAB(25)"{CRSR UP}FIELD"
     ;L;" Ø {4 CRSR LFs}";ML$(J,L)
1164 PRINTTAB(32);"{CRSR UP}";:INPUTML$(J,L
     )
1166 NEXTL
1168 NEXTJ
117Ø PRINT"{SHFT CLR}{2 CRSR DNs}DO YOU WIS
     H TO REVIEW YOUR FORMAT AND/OR"
1172 PRINT"MAKE CORRECTIONS?{2 SPACEs}PRESS
      {CTRL 9}Y{CTRL Ø} OR {CTRL 9}N{CTRL Ø
     }"
1174 GETA$:IFA$=""THEN1174
1176 IFA$="Y"THEN1136
1178 IFA$="N"THEN1184
118Ø GOTO1174
1182 REM-----SAVE MAILING LABEL FORMAT
1184 PRINT"{CRSR DN}{CTRL 9}SAVE FORMAT{CTR
     L Ø}?{13 SPACEs}{CTRL 9}Y{CTRL Ø} OR {
     CTRL 9}N{CTRL Ø}"
1186 GETA$:IFA$=""THEN1186
1188 IFA$="N"THEN1246
119Ø IFA$="Y"THEN1194
1192 GOTO1186
1194 PRINT"{CRSR DN}SAVE UNDER WHAT FILE NA
     ME?"
1196 PRINT"{CRSR DN}{2 SPACEs}";NF$:INPUT"{
     CRSR UP}";NF$:IFNF$=""THEN11Ø2
1198 OPEN15,8,15:PRINT#15,"SØ:ML] "+NF$:GOS
     UB1316
12ØØ OPEN5,8,5,"Ø:ML] "+NF$+",S,W":GOSUB131
     6
12Ø2 PRINT#5,RW
12Ø4 FORI=1TORW:FORN=1TO3
12Ø6 PRINT#5,ML$(I,N):GOSUB1316
12Ø8 NEXTN
121Ø NEXTI
1212 PRINT#5,"EOF":GOSUB1316
1214 CLOSE5:CLOSE15
1216 GOTO1246
1218 REM-----LOAD MAILING LABEL FORMAT
122Ø PRINT"{2 CRSR DNs}LOAD FORMAT FROM WHA
     T FILE?"
1222 PRINT"{CRSR DN}{2 SPACEs}";NF$:INPUT"{
     CRSR UP}";NF$:IFNF$=""THEN11Ø2
1224 OPEN15,8,15:OPEN5,8,5,"Ø:ML] "+NF$+",S
     ,R":GOSUB1316
```

(continued on p. 172)

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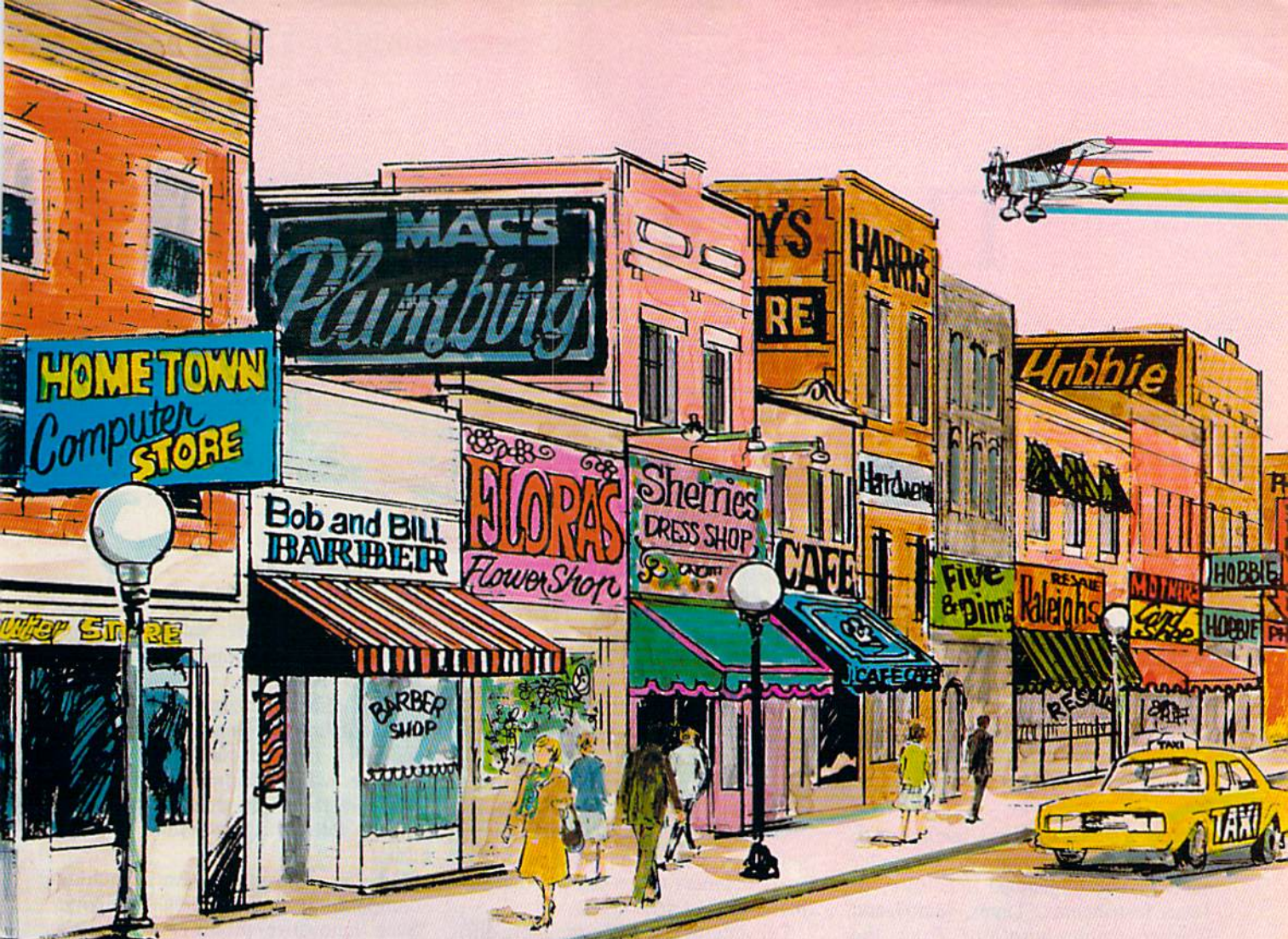

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The Latest Look In Software

By JIM STRASMA

This article explores the ways in which the software industry is rapidly changing and how these changes will affect you, the consumer. It also provides you with hints on how and where to select software.

Most *RUN* readers are familiar with the ongoing shakeout of computer makers. The unplanned departures of Texas Instruments, Timex, Mattel and Warner Communications from the home computer market have been widely described.

Less widely described, but equally important, is a similar shakeout in the software industry. Gone, but not forgotten, are Sirius Software, UMI, Dr. Daley Software, Samurai Software, Programma International and others. In some cases (Channel Data and Palo Alto ICs come to mind), the company is still in business, but it's no longer advertising its wares. In others, the people involved have formed another company—Dr. Dick Daley, for example, is now at Tamarack Software—and Automated Simulations has changed its name to Epyx. What does all this mean for shoppers?

Observations and Speculations

On the face of it, failed companies mean fewer products from which consumers may choose. Past failures also make it more difficult for new companies to get started. Until recently, anyone with a good enough idea could be a success in the microcomputer industry. Now analysts are saying that it takes five million dollars to start a successful new software company today. True or not, that attitude among bankers and investors makes it harder for newcomers to get started this year than it did last year.

The failures also make life more difficult for the survivors—loans needed for expansion are becoming more difficult to arrange, and going public with a stock offering is now nearly impossible. As in many other industries, the software industry is beginning to see the bulk of its sales concentrated in a few large firms. In uncertain times, consumers prefer to buy from companies they know well, ones they are sure will still be in business when support is needed months or years later. Unfortunately, this, too, diminishes consumer choices, as the largest companies are rarely the first to offer important innovations. Massive size makes rapid change difficult.

Another important change in the software market is that many of the well-known types of computer programs are now available in excellent versions from so many companies that judging between them is difficult at best. It is becoming increasingly unimportant which of several fine word processors, databases or spreadsheets you use.

In the short run, it is good news for consumers that many commercial programs are becoming similar enough that it no longer matters much which one you buy. That allows you to shop for the best price and support. Having only one or a few clearly established market leaders also eliminates many of the compatibility problems of the past. It's far easier, for example, to write a data manager whose information can be sent to a spreadsheet program, if you know which spreadsheet everyone will be using.

In the long run, however, requiring compatibility might limit creativity. Such innovative products as Apple's new Macintosh computer would be impossible in a world requiring full compatibility with an existing market leader such as IBM's PC.

Quality More Than Quantity

One other change is obvious in the software industry. As available memory increases, more and more combination programs are appearing that are already set up to do several different chores and pass information back and forth from one chore to another.

Commodore, for example, is reportedly under pressure from software companies frightened by the implications of its new Plus/4 model coming already loaded with an integrated word processor, data manager, spreadsheet and graph maker. Also, the Tandy 100 has yet to inspire a single highly successful program its owners will rush to buy, largely because everything needed to make it useful is already built-in.

In the old days, you could judge the quality and popularity of a home computer by the number of programs available for it. Apple still advertises its IIc model this way, emphasizing a claimed 10,000 programs available for it.

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On the other hand, what does it matter how many other word processors are available, as long as the one you have does everything you want? With 200 word processors available in the IBM PC market, over half of the PC owners use a single highly successful word processing program. Most of them probably couldn't care less about the other 199 programs they *could* have bought instead.

Commodore emphasized this approach in introducing the new Plus/4 and Commodore 16 models earlier this year, saying it doesn't matter that these models can't run many programs written for the VIC and 64, as long as the best programs are immediately available for the new models. To assure that, Commodore supervised the conversion of those programs and had several finished long before the new models were scheduled to be released. Personally, I prefer Apple's approach in this matter, but Commodore may be right.

Types of Software Available

As far as types of software available for Commodore owners, a recent index of my own reviews over the past two years included: business programs (accounting, databases and mail lists, integrated packages, spreadsheets, word processors), church programs, educational programs (administrative, or computer-assisted instruction [CAI]) games (adventure, arcade, strategy and simulation), language (assemblers, compilers, high- and low-level languages), ham radio programs, science and engineering programs, sports programs, terminal programs and utility programs (combination aids, cassette and disk aids, graphics and screen aids, monitors, music and sound aids, printer aids and programming aids).

The list of companies offering programs for Commodore computers is very long—several hundred in all. How can you choose among such a wealth of offerings?

General Hints

Popularity is one characteristic of good programs. A program's popularity is no guarantee that it is better than less popular competitors, but quality and success do go together frequently enough to make popularity important. Occasionally, a company that has no concern for the consumer will mislead you by exaggerating a product's capabilities, but usually the products whose names you hear most are worth considering carefully.

A second characteristic of most good programs is that they fare well in independent reviews. Although it is nearly impossible to find reviews of all the new products for Commodore computers, enough are reviewed to warrant your keeping back issues of magazines that include reviews.

Also look for reviews in user's group's newsletters and dealer catalogues. Fellow users have no reason to praise a poor program except perhaps to hide their own folly in buying it; most people will gladly tell you exactly what they think of programs they've bought.

Likewise, though some dealers are woefully ignorant of the products they carry, others aren't and insist on stocking only the best wares. In most cases, programs that are widely available have something to offer. Most dealers need repeat sales and will dissuade you from buying a poor product.

Perhaps the best indication of a quality program is an actual demonstration. One of the blessings of being in a user's group is being able to see fellow users demonstrate the power and pitfalls of particular programs. Many dealers also provide demonstrations of programs you are considering for purchase, and they allow you to study the manual.

One way professionals review programs is by trying to run them without first reading the manual. The theory is that if a skilled user can't use a program without a manual, a beginner won't be able to use it *with* the manual. It's also true that many people simply don't read manuals until they get in trouble with a product. Many of the better programs include full menus of choices and special help screens that make the manual expendable.

However, also look at the manual. Does it include step-by-step guidance in using the key parts of the program? How about a reference section to remind you how to do a particular chore? Pay attention to such things as spelling—manuals that are full of errors say something about the company that wrote the program. If the manual wasn't carefully checked for accuracy, the program probably wasn't either.

Business Programs

Accuracy is especially important in business programs. If a game occasionally loses a score, it's not nearly as serious as if a magazine's mail list occasionally loses a subscriber. Worse yet is a payroll program that slips a decimal place on paychecks or an accounts receivable package that loses its customer file. Companies have gone bankrupt for less!

A second requirement of business programs is an audit trail—a printed record of every transaction made by the computer. This assures your accountant and the IRS that your computer is operating in a business-like manner, and it makes it more difficult for a dishonest employee to steal from the company without the theft showing up in the books.

A third requirement of business programs is that they have adequate capacity and speed for your needs. A general ledger program limited to 50 accounts and 100 transactions per month isn't much good to a company with 75 accounts and 200 transactions per month. Neither is a database manager that takes 14 hours to re-sort a 1,500-name customer list prior to a zip-code order mailing, or a word processor that takes more than a minute to insert a blank line in a large file.

Any business program looks good with only a few records. A fair test should involve hundreds. Look for products with respectably large sample data files. If you already have large files of information created by another program, any new program you consider should also accept data from those files without needing retyping.

Educational Programs

A key requirement of educational programs is that their authors must fully understand the concepts being taught. A multi-digit addition tutor, for example, should encourage students to calculate the answer from right to left, writing in carry values for each column as they go, rather than simply typing in the final answer from left to right. Similarly, a flight simulator should use the joystick as a joystick is used in a real airplane, even though that seems backwards to arcade gamers.

Another characteristic of the better educational programs is that they are fun. The days of drill and practice (also known as drill and kill) are over, unless you want to stand over your children and force them to use a program they hate. There's nothing wrong with turning education into a game—what we call play is, for children, a very serious business of learning about life.

All the educational programs I buy are also realistic simulations. Most children, and especially the gifted,

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Help is built right into the program so you can't get lost or confused. The manual is even capsulized on the disk for reference from the program when you need it. VIP Terminal also has a chiming clock for the quarter hour and the hour, and an alarm you can set. There's even a musical alarm to let you know when you have a call. VIP Terminal has put it all together to make the perfect communication program!

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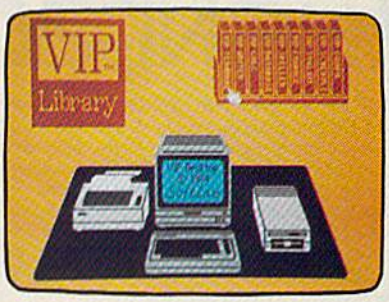

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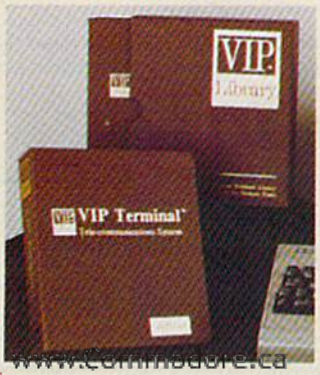

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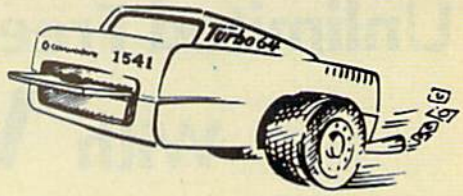

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prefer programs that let them become part of a real situation, such as running a nuclear power plant or a lemonade stand. Better yet are programs that simulate events that cannot be experienced directly.

When buying educational programs, double-check their suitability for your child. We've all seen pre-school programs that assume the child can already read, tutorials that use technical terms without defining them and programs that are vulnerable to accidental or intentional crashes by a student.

Less obvious are programs that work acceptably, but have a philosophy of teaching incompatible with your own. I have no sympathy, for example, for programs that reward wrong answers by calling the user a dummy or making a Bronx cheer.

Games and Utilities

Good features in a game include a variety of activities: a way to suspend the action if the phone rings, a way to save your scores or progress in the game, a way to see or practice each board without working all the way up from the bottom each time, and a way for two or more to play at once, preferably on the same team rather than against each other.

However, the most important characteristic of a good game is that it encourages, rather than discourages, human values. The primary message of too many games is that strangers are for shooting, stealing is okay and winning is all that matters.

Regarding utility programs, a key feature of the best ones is not that they have the most commands, but that they make the most of the commands they do have. What value is it to have 114 new commands if you can't remember the 72 already in your computer?

On the other hand, a dozen flexible commands suited to your needs could greatly ease your work. For example, the DOS wedge included with the 1541 disk drive is a near-miracle of usefulness, despite its extreme brevity.

Another characteristic of the best utilities is that their use is almost intuitive—they work the way a reasonable person would expect, preferably the same as similar commands in Basic itself. A drawing utility, for example, should place the origin of a graph at the lower left of a page or screen, just as students are taught to do in algebra classes. Similarly, the best music programs work with the notation already familiar to musicians, rather than some new system.

A final characteristic of the best programs of every kind, but especially of utilities, is that they do not paralyze the computer and programmer. Copy protection is an understandable nuisance in programs only used alone and never changed. Utilities, however, often share memory with other programs and must coexist peacefully with them. Many utilities are also used constantly. Be sure any copy protection in such programs does not stress the hardware and won't intrude when you're using the program.

Where to Buy Software

My favorite place to shop for computer programs is at a full-line Commodore dealership. The dealers at such stores are usually familiar with the programs they sell, are able to help you choose an appropriate package, and are then able to train you in its use. They will usually let you try out the program in the store (and sometimes even in your own home or office), before you buy. This is a huge advantage and can save you from many foolish purchases.

On the other hand, local dealers have to pay and charge more for their programs than other sources, selection is sometimes limited, and such dealerships are very scarce in many areas.

Another local software source is a discount store that sells Commodore products. Most discount stores feature low prices and a refund on any purchase you don't like, as long as you return it within about ten days. You will rarely be able to try a product before you buy it, however.

A third alternative, and the first one open to many people in remote areas, is a mail-order dealer. Typically, mail-order houses feature low prices, home delivery (but check the cost) and convenient ordering by phone, often toll-free. They may also be the first to get the latest programs and updates, due to their large sales volume. The worst thing about mail order is the wait for the package to arrive. At best, it will be a couple of days; at worst, it can take three or more months.

Unfortunately, some mail-order houses may mislead you about what's in stock. It's also possible you'll be sent the wrong product, accidentally or on purpose. At best, this delays things; at worst, you'll discover Master Card and Visa are not on your side in such disputes, and will insist on being paid for any such purchases from an out-of-state supplier unless the supplier is within 100 miles of your home.

Good mail-order vendors may have people trained to help you use the programs, and the best even offer refunds if you are dissatisfied with your purchase. The worst may take your money and run. I often go by this rule: If the deal sounds too good to be true, it probably isn't. Other vendors bend the truth heavily in touting their products, then hide their profits in such hidden extras as large shipping fees.

One more alternative is to buy directly from the company that developed the program. No one will know more about it, and you'll always get the latest version. Unfortunately, many software companies no longer sell directly to consumers (some don't even sell directly to dealers!), and if they do sell direct, nearly all charge the full list price, to avoid competing with their dealers. They will also have fewer selections than most dealers and are unlikely to steer you to a competing product. Shipping delays and refund policies will vary, as with other mail-order sources.

Final Hints

It isn't possible to cover everything you need to know about buying software in a single article, or even in an entire book. That's one good reason for subscribing to a magazine like *RUN* and reading it regularly. I leave you with four final hints:

- Know your dealer. Some are skilled hobbyists themselves, perhaps with degrees in computer science, and have been around for years; others were selling washing machines last year and will be selling stereos by summer.
- When asking about a product, it helps already to know the answer to some of your questions. That gives you a way to judge the truth of what you are told.
- If you order by mail, consider asking for C.O.D. delivery. This adds a bit to your cost, but guarantees you won't pay for a product until you receive it.
- Return products that don't work as claimed, regardless of any disclaimers of warranty packed with the product. If the company or dealer won't cooperate, you can easily buy elsewhere next time. R

Address all author correspondence to Jim Strasma, Commodore Clinic, 1238 Richland Ave., Lincoln, IL 62656.

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Penny-Pinching Software

KARL THURBER, JR.

Library services and user's groups are here to serve you. Discover how you can acquire lots of software ***without*** *spending lots of money.*

A surprising amount of Commodore-compatible programs are available in popular computer magazines and other specialized publications, and they're generally reliable. Two particularly useful program sources are Public Domain, Inc., and the Toronto Pet User's Group (TPUG), which also publishes *The TORPET* magazine.

Lots to Offer

Public Domain, Inc. (5025 S. Rangeline Road, West Milton, OH 45383), provides an extensive library service geared to the PET, VIC-20 and Commodore 64. The company does not actually sell the programs it offers; rather, it provides a service through which users may obtain more than 800 non-copyright programs that have been contributed by other users.

Disks or tapes (most collections come on both) are available for $10 each. They contain an average of 35 or more programs, or up to 70 or more programs in the several VIC-20 collections offered.

No documentation is provided with these collections—just a brief line item description on the disk's or tape's directory, which is enough to get you started. I found that most of the programs for the VIC and 64 could be used without problems, since few programs in the series were so complex as to require separate documentation.

A recent Public Domain catalogue shows three VIC disks, two Commodore 64 disks and nine PET disks. Each disk is chock-full of various games, educational, utility and business programs or combinations of these. Many of the PET disks will run on the 64 with some editing, or with little modification if a PET emulator is used (though I have not tried the latter).

At a total cost of only $60 for six disks, I now own more than 325 Public Domain programs for the VIC-20 and Commodore 64, the cost per unit being about 18.5 cents per program! This software bonanza represents more software than most computerists would have time to use!

A similar library service is offered on a membership basis by the Toronto PET User's Group (TPUG) (PO Box 100, Station S, Toronto, Ontario, Canada M5M 4L6). This is the largest, most active Commodore user's group in North America. The $20 annual associate membership fee gives you access to the club library of well over 3000 programs; a subscription to the club's lively 32- to 48-page magazine, *The TORPET*; and, through the magazine and other services, the latest information about the CBM, PET, VIC-20, Super PET and Commodore 64 computers.

The fastest way to build up a program library in almost any classification—games, utilities, music, business, communications, education and so on—for any of these computers is probably through the TPUG software library.

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Although the library is primarily PET oriented, in the past year many programs for both the VIC-20 and Commodore 64 have been added, and a number of older PET programs have been adapted for use on the two newer computers. Disks are $10 each for the 4040/2031/1540/1541 format and $12 each for the 8050/8250 format. Most disk offerings are also available on tape at $6.

The club's library benefits greatly from the expertise of such club members as Jim Butterfield, Steve Punter, Dave Hook, Robert Baker and others who write regularly for popular computer magazines. With several thousand programs in the library, membership in the TPUG is something the novice hobbyist should not pass up.

Pick and Choose

There are other user's groups supporting Commodore machines, though most are highly specialized, either by type of program material or geographically, and some are clearly commercial firms in user's group garb. However, another Public Domain-type operation with an international membership is the ASM/Ted User's Group (ATUG), founded by Jim Strasma.

This group is associated with *The Midnite Software Gazette/The Paper* and the Central Illinois PET User's Group. ATUG has no dues; users become members simply by ordering ATUG disks and contributing useful public domain material.

The group's offerings have a rather pronounced technical bent, as opposed to the general-purpose character of the two other groups' software. However, recent disk offerings include several for the VIC-20 and Commodore 64, and new disks are planned for both computers.

Information on the ATUG disks may be obtained from the librarian, Brent Anderson (200 S. Century, Rantoul, IL 61866). You should include a self-addressed business-sized, triple-stamped envelope and request ATUG information when writing. Disks are $10, or $5 if you send your own formatted disks along with protective mailer, self-addressed return label, acknowledgment postcard and postage. R

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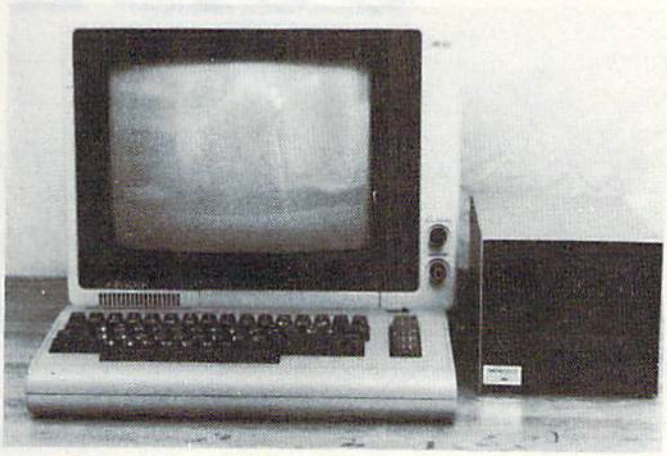
CLOSE



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

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SOFTWARE BUYER'S GUIDE

A multitude of programs are available for your Commodore

To help you find those software programs you need and want among the hundreds on the market, we have compiled this buyer's guide. It is organized under the topic areas of business and finance, education, games, graphics, hobbies, personal productivity, telecommunications, tutorials and utilities. In each area, programs are listed under the vendor's name. Refer to the alphabetical list beginning on page 137 for each vendor's address and telephone number. While *RUN* has tried to make this list as comprehensive and accurate as possible, the information was derived from a questionnaire sent to the vendors, and we are therefore not responsible for any omissions or misinformation contained herein.

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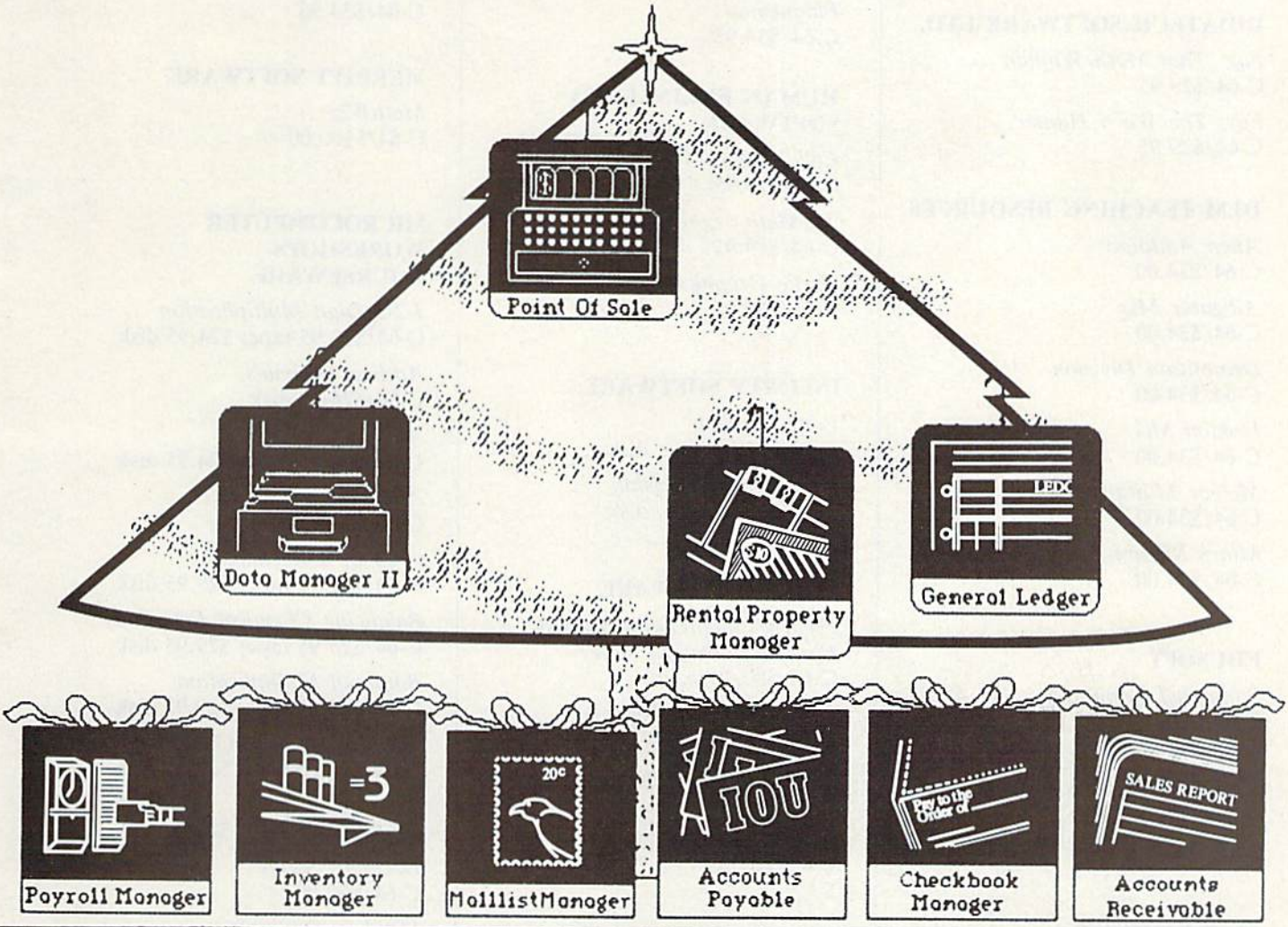

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Continued on p. 112.

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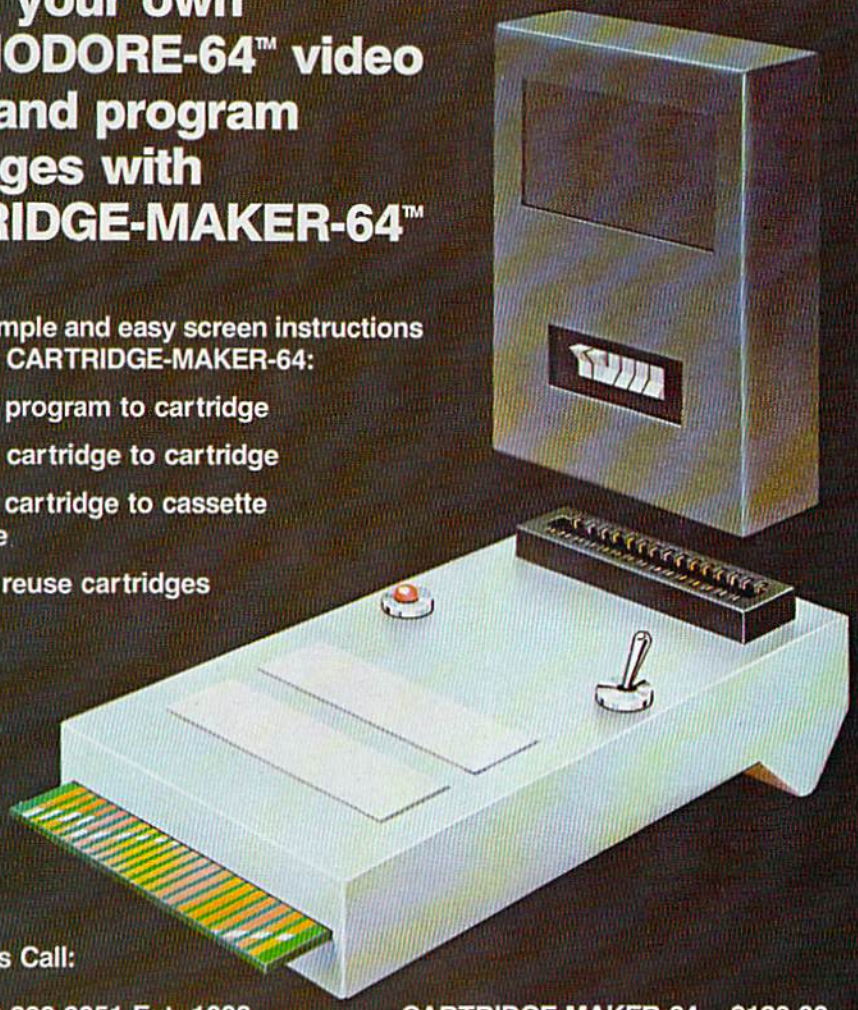

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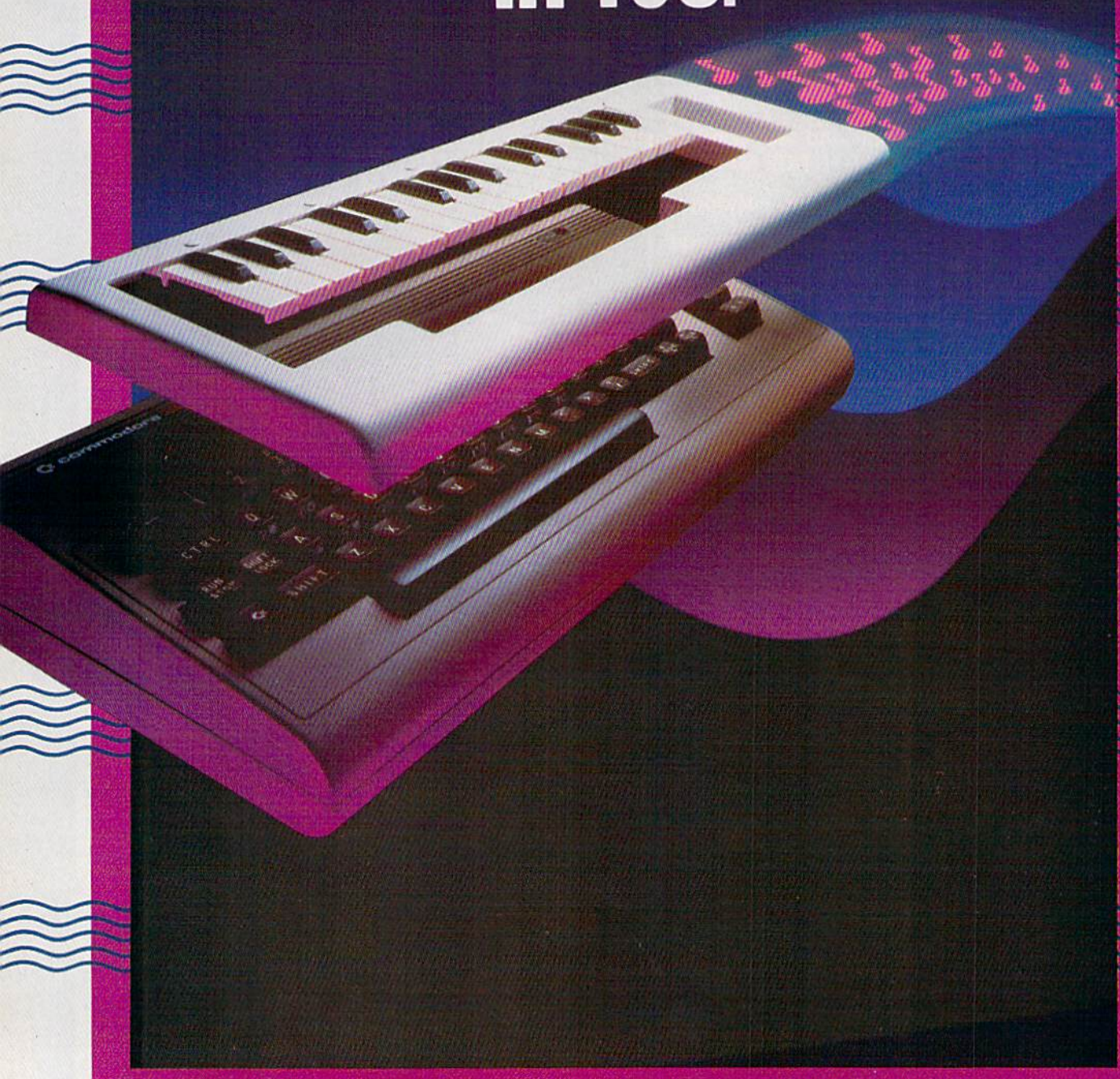

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From p. 108.

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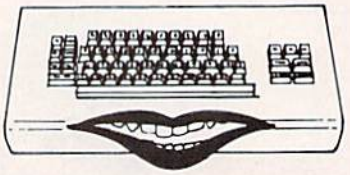

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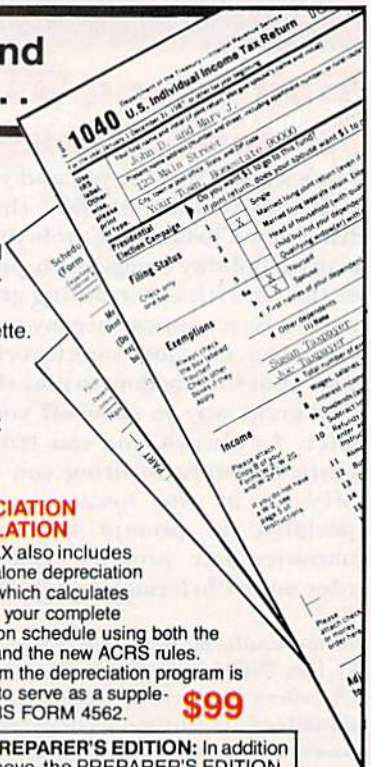

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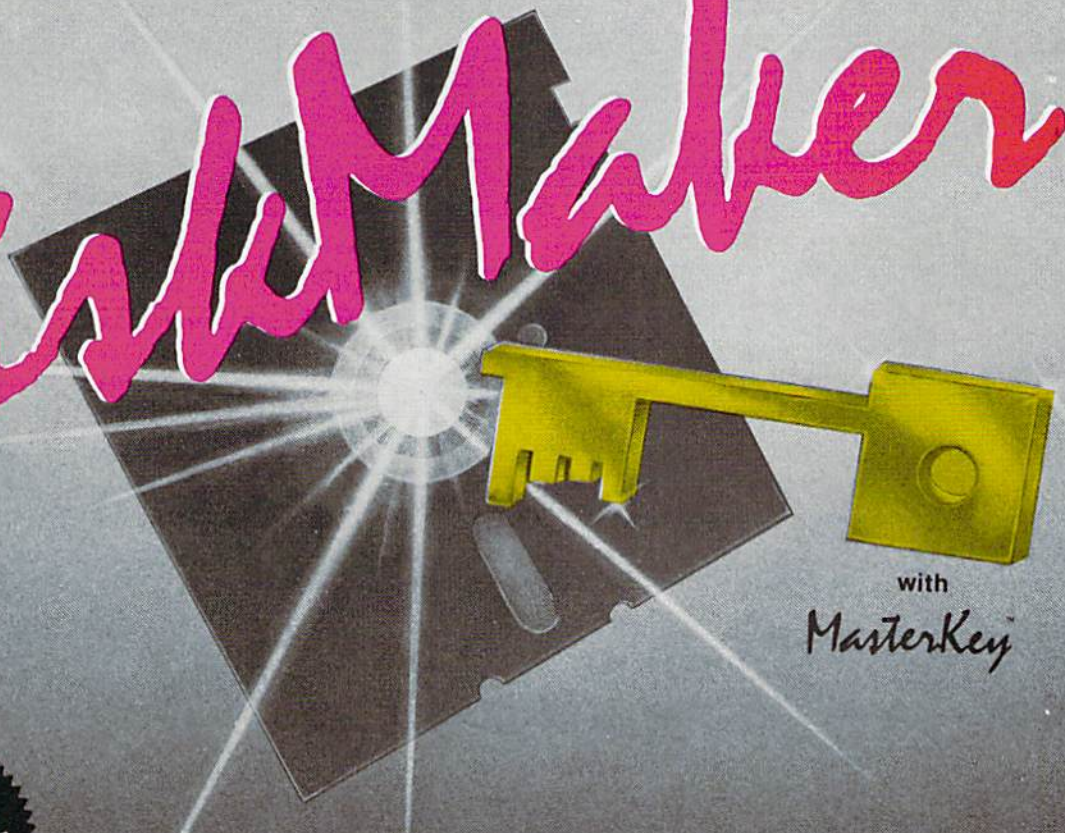

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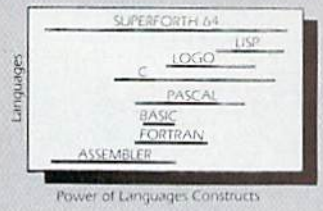

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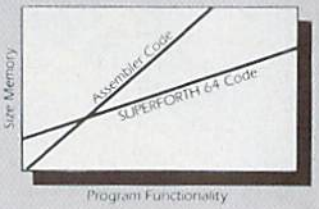

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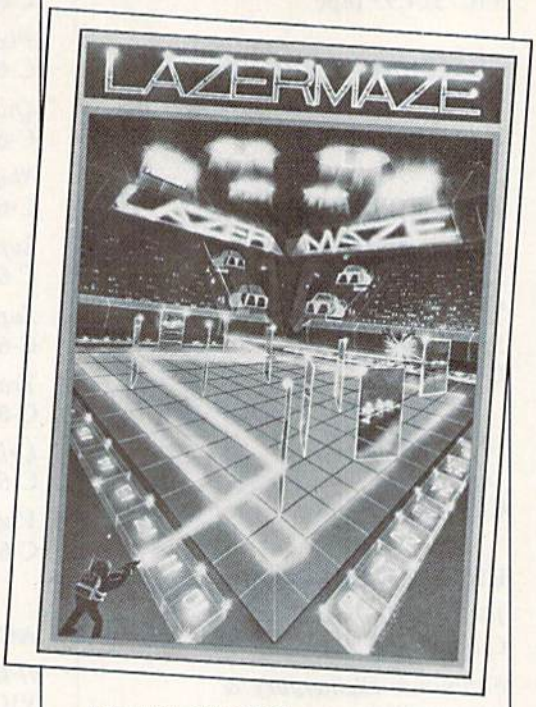

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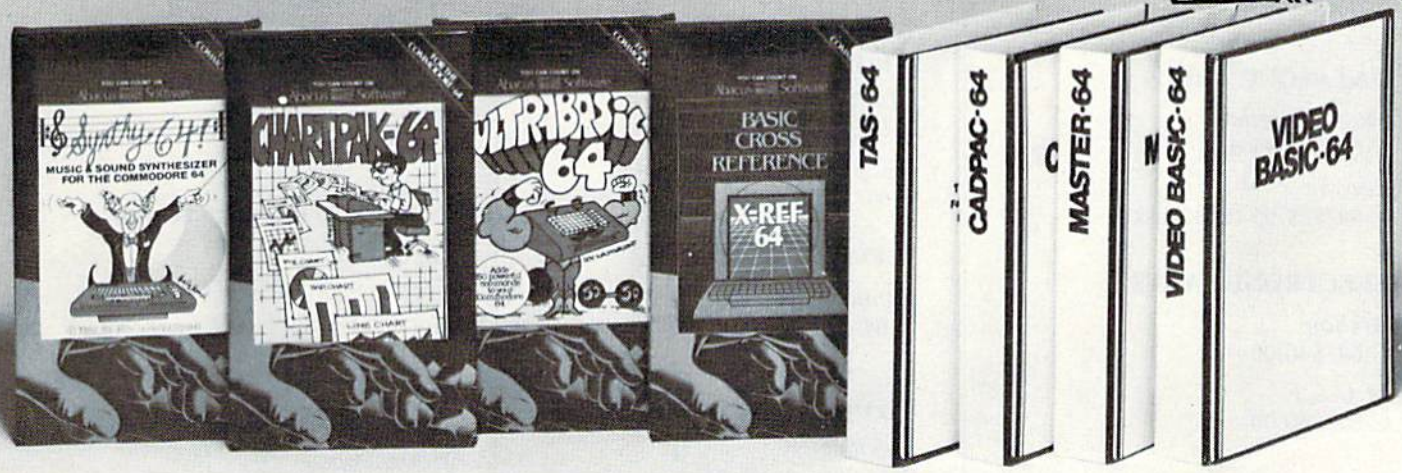

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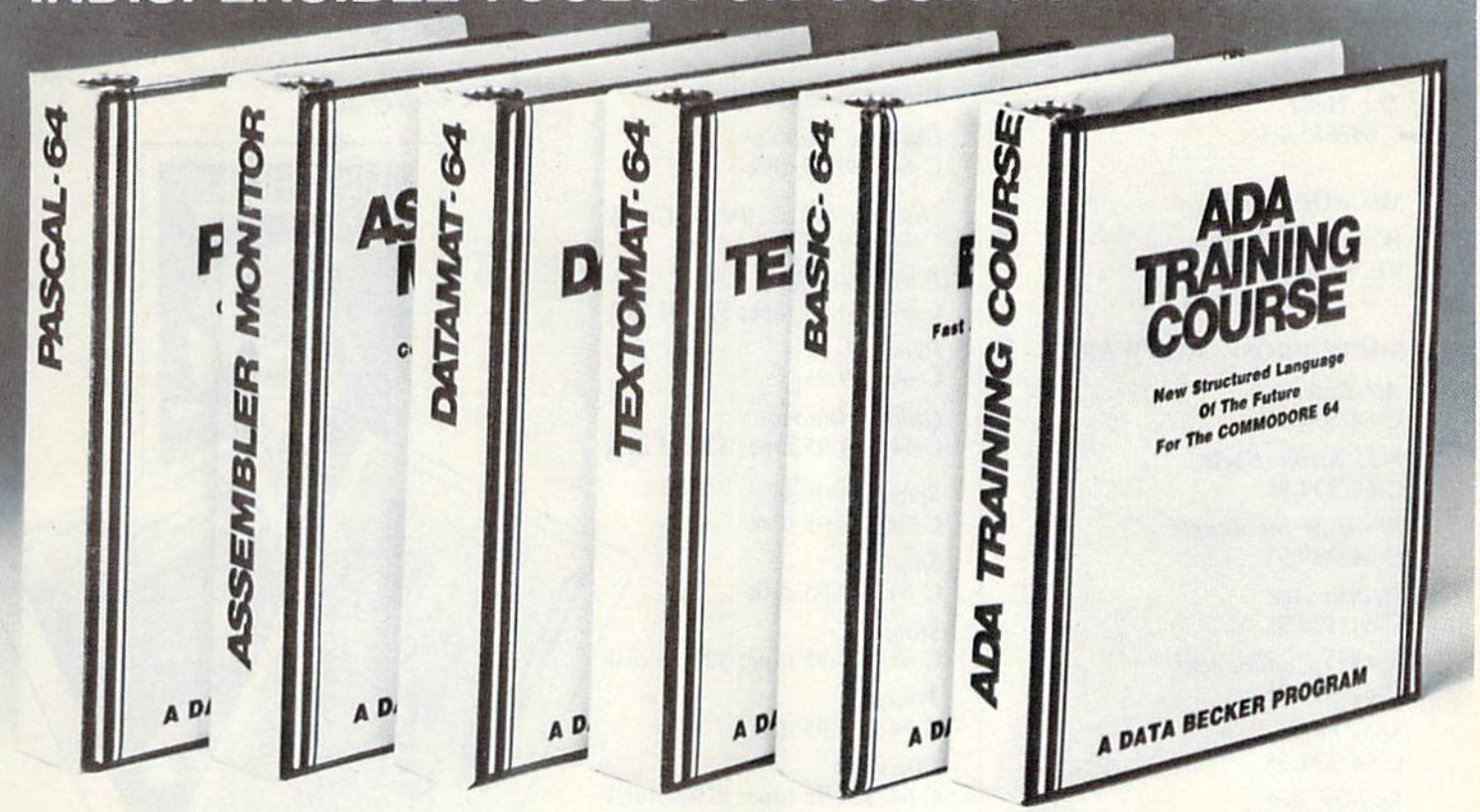

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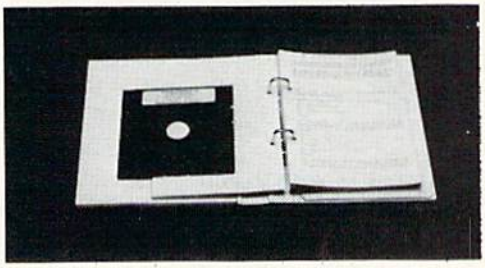

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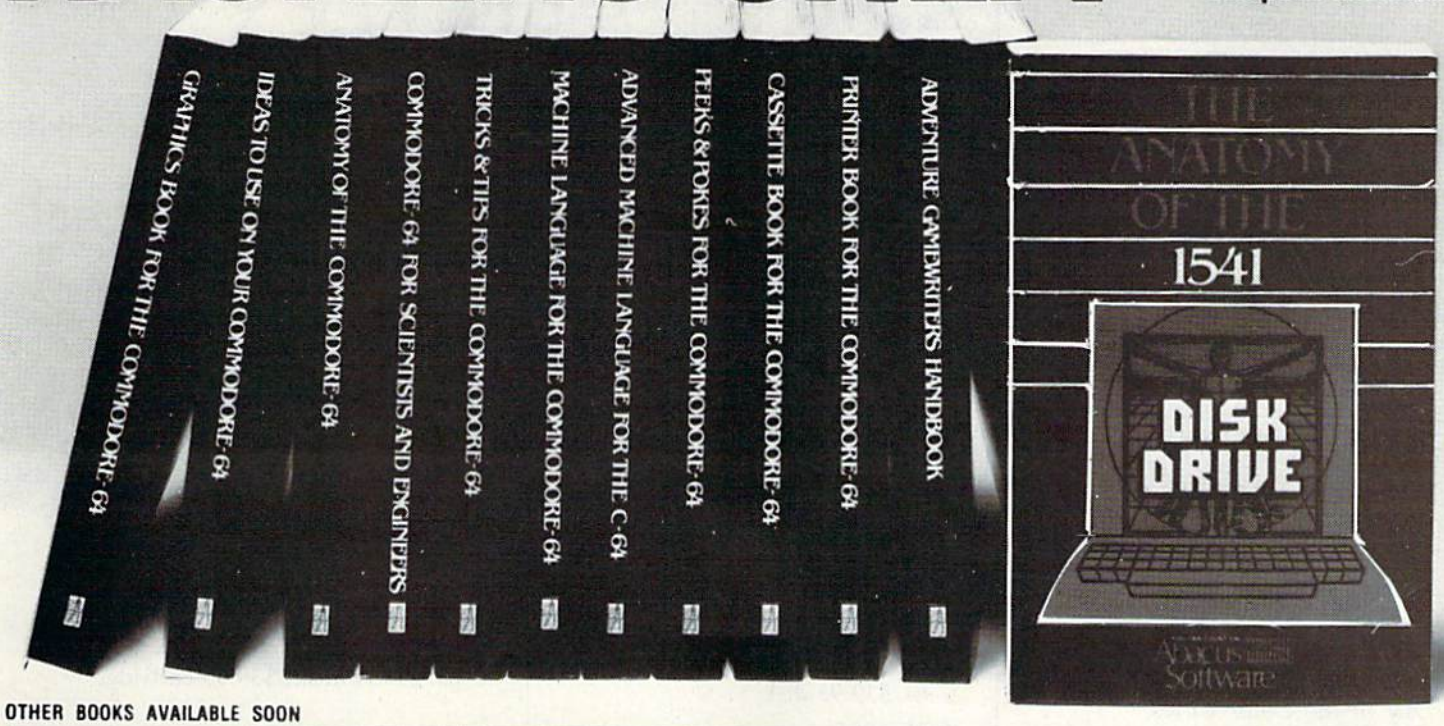

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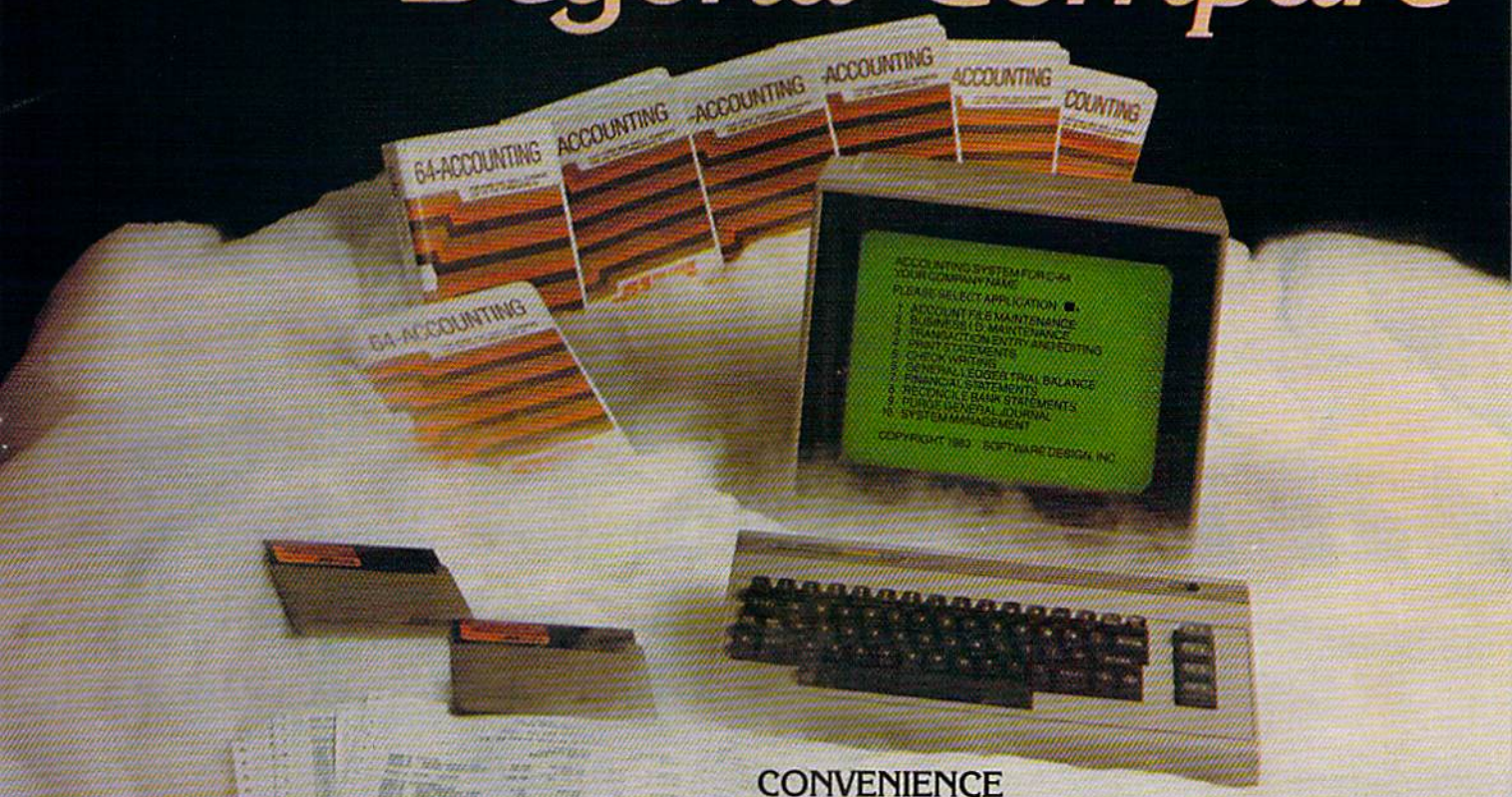

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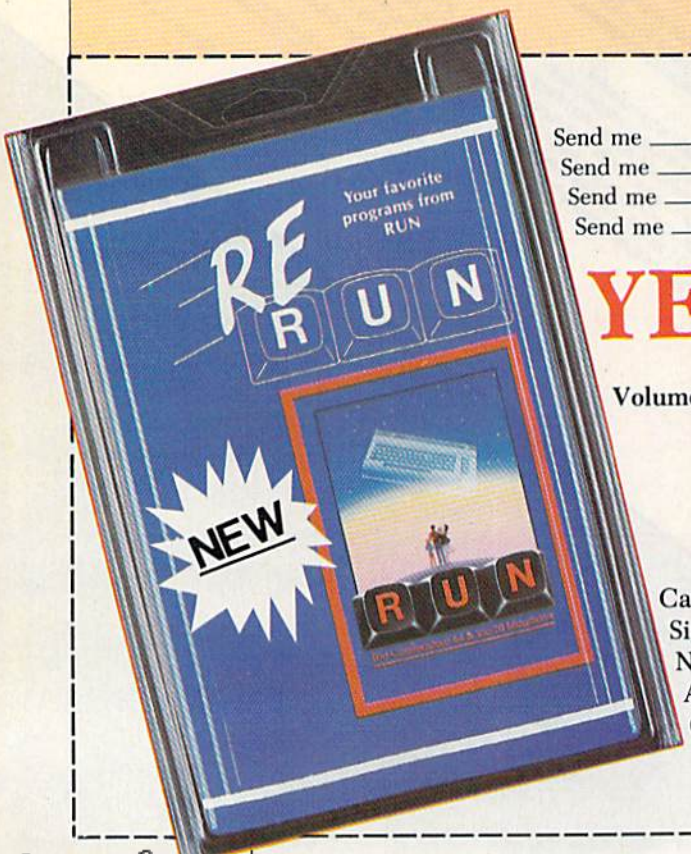

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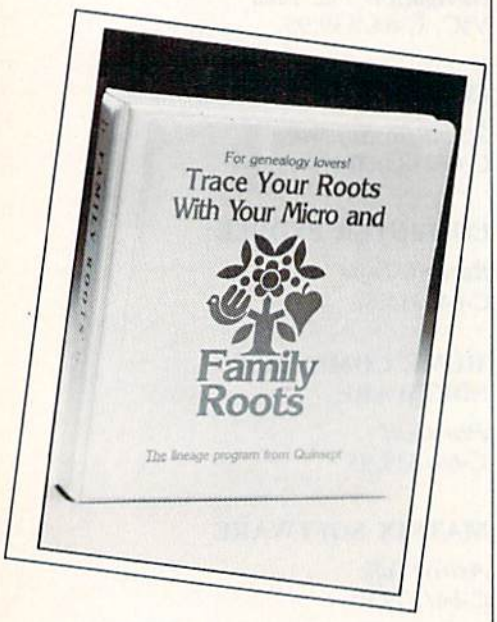

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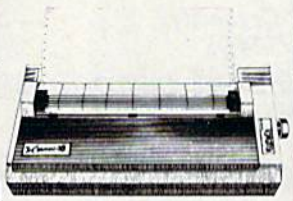

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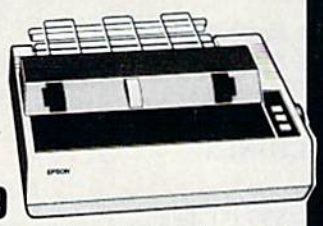

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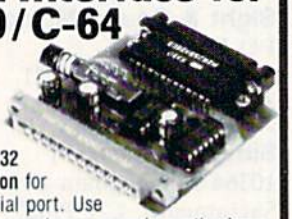

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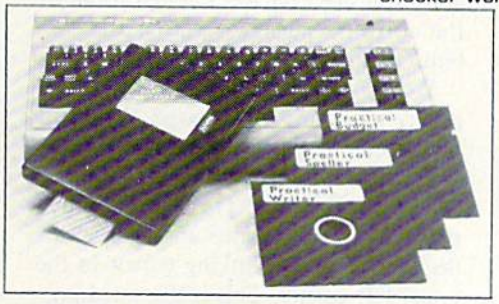

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PLUS/4's WORD PROCESSOR

BY MARGARET MORABITO

Commodore's new Plus/4 contains four built-in software programs, including the word processor this article reviews. Find out what's in it for you.

Commodore's latest computer, the 64K Plus/4, comes with several built-in software programs in addition to an upgraded version of Basic and a machine language monitor. These programs are a word processor, a spreadsheet, a graphics program and a database. The Plus/4's versatility and low price tag (about $300) might be enough to immediately deem this machine an excellent buy, but it is still wise to evaluate the software packages inside the Plus/4.

This is the first in a series of reviews on the Plus/4's software. You'll encounter the word processor first when using this computer, so I'll begin by discussing its hardware requirements, its features, its strengths and limitations and how to get started.

Using the Word Processor

The peripherals required for the Plus/4 word processor are a television or monitor, a disk drive (1541 or 1551) and a printer. A Commodore printer will connect directly. If you have a non-Commodore printer, it will need special interfacing, different from that used for the C-64 and VIC-20. A manual accompanying the Plus/4 includes tutorials and extensive exercises tailored to all of the software packages within the system. This is required reading.

When you first turn on your computer, it is simple to access the word processor. At the Ready prompt, press the f1 key; then, at the blinking cursor, press the return key. The screen will display a copyright notice and then clear, displaying a non-blinking cursor in the upper-left corner. This is the word processor, ready for typing.

At the bottom of the screen will be a horizontal dotted line, beneath which are the row and column numbers of your cursor's screen position. What you *can't* see on your screen is probably the most important feature of the word processor. An entire set of screen and disk commands, as well as formatting instructions, are available, allowing you to control your screen, disk drive and printer.

The Plus/4 word processor provides you with a maximum of 99 lines, with 77 characters per line for a single document. A screen window of 22 lines and 37 characters per line is controlled through the use of four cursor keys and six other key combinations. Full-screen editing lets you type, insert or delete words anywhere on the 99-line document space. Just move the cursor to the desired location and type.

As your sentence surpasses 37 characters, you will notice that your words start scrolling right to left. For a newcomer to word processing, this scrolling seems awkward because you can't see your entire line at once. Some of the better-selling home word processors, however, have this feature.

Automatic word wrap prevents words from haphazardly being split at the end of a line. Your screen won't show this, but your hard copy will.

To delete text, you have two options.

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... Sonar reports the "whine" of torpedoes running toward you. You kick the destroyer's rudder full-right and order flank speed.

As you watch, two torpedoes cross your bow. Sonar returns quicken and you close on the submarine below. Suddenly, bearing to target shifts 180 degrees and the sonar return is instantaneous. THE SUB IS DIRECTLY BELOW! You stab the fire button and watch as 6 depth charges arch into your wake. Several long seconds pass before they explode, sending six domes of white water to the surface. The message "SUBMARINE SUNK" flashes on the screen. But congratulations are brief. Four more subs are lurking out there somewhere, trying to escape into the open ocean...

SONAR SEARCH is a "fast-action" strategy game based on anti-submarine warfare. You are the commander of a group of three destroyers sent to intercept a pack of 5 enemy submarines. Equipped with sonar gear and depth charges, and aided by submarine sightings from other ships and aircraft, you must get directly over a sub to score a hit with your depth charges.

SONAR SEARCH makes full use of the high-resolution graphics, multicolor and audio capabilities of the Commodore 64. Programmed in machine language to provide immediate response to your commands, SONAR SEARCH is realistic, educational and entertaining. Comes complete with Instruction Manual and keyboard template.

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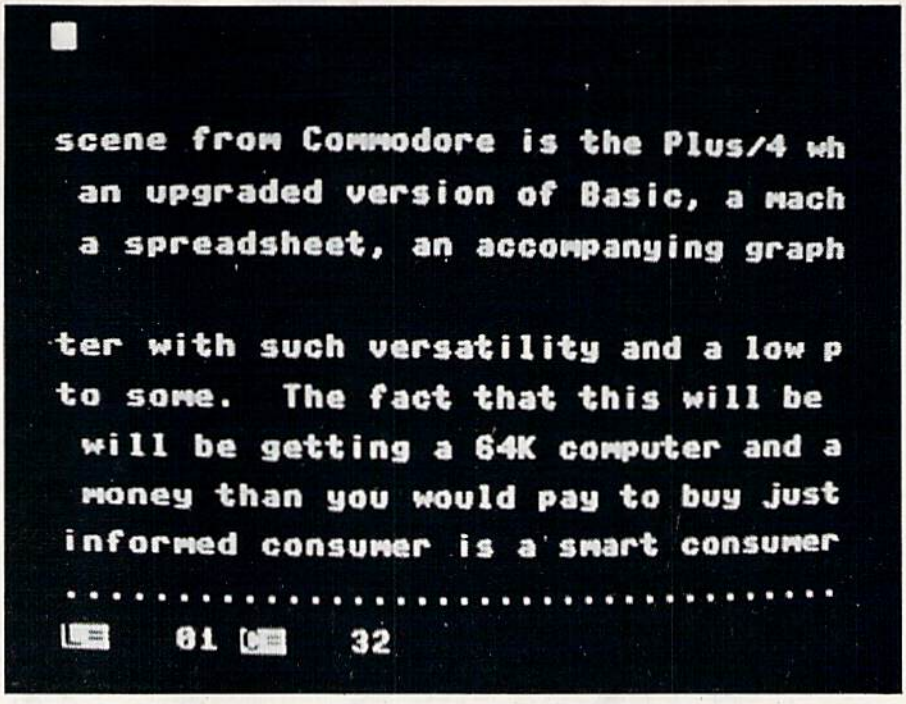

You may use the delete key, which will erase as many characters as you wish, one at a time. This is quite convenient for short deletions. If you want to erase an entire line, you may do so and save time by entering the Delete command. (The Command mode of operation will be discussed shortly.) Don't, however, try to use this command to erase only part of a line, because your entire line will disappear.

To insert text into an existing document, you again have two options. You may insert spaces, one at a time, by using the insert key, then typing in your desired letters. Or you can use the Insert command, which will insert a full blank line upon which you may then type your new text. (This command can't be used to insert a partial line.)

Setting tabs is quite easy. Place your cursor at your desired tab column number and press the CTRL key with the equals-sign key. An asterisk for each tab will be displayed just above the command line. You can easily activate the tabs by pressing the shift key with the equals-sign key.

Commands and Formatting Instructions

The Plus/4 word processor is driven by commands, not by menus. This is a powerful and fast feature, as there is no time lost in the translation of a menu selection. Let's look more closely at the Command mode, which offers eighteen different commands beyond Delete and Insert.

To send any command, press the Commodore (CMD) key with the C key. When you do this, the dotted line at the bottom of the screen will be replaced by a W>. You will type your command here and press the return key to activate it.

The Plus/4's commands fall into two categories: memory and disk. Memory commands affect what is in memory and on your screen. The standard ones, which you should expect to see on top-quality word processors, are commands to insert a line, delete a line, erase a document from memory, set pointers, create a block of text, insert and delete blocks, search and replace words and print a document. Standard disk commands allow you to save, load and delete a file, catalog and initialize. Less common are commands that allow you to merge files and to print files from disk.

The Merge command is quite helpful if you have paragraphs that you often will be using in other documents. It lets you take a repeatedly used paragraph, which has been saved to disk, and append it to a document currently in memory. Instead of repeatedly typing the same text, you just command the computer to append it, after which you can continue typing the remainder of your text. This is an excellent feature for small-business use, where you might be doing mailings to customers.

The Print Document command makes

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the computer automatically load and print several files from disk. This is helpful for printing documents longer than 99 lines.

Separate from the Command mode are the formatting instructions, which control your printout and are typed inside your document, not on the command line. You won't see these in action on your screen, but you will on your hard copy.

Commodore has done a good job of including features beyond those of many home word processors. Instructions available include margin settings, centering text, right justification, printer pauses, page numbering, page length, paper size, page forcing, linking files and sending ASCII codes for reasons such as underlining, enhanced text and line spacing.

If you choose not to insert any formatting instructions, the following default values will automatically take over: left margin, 0; right margin, 77; page length, 60 lines; paper size, 66 lines; no justification; word wrap active.

Pros and Cons

While the Plus/4 contains an all-around good word processor for small business, educational and home users, some of its features are awkward, such as the lack of easy double-spacing. Commodore does let you format double-spacing with an ASCII instruction, but this is cumbersome.

Another common feature that the Plus/4 lacks is on-screen justification. What you see on your screen is not what you see on paper. Also, the 99-line limit per document might seem too limiting for people who often need to type long papers. Commodore has tried to offset this with its linkfile feature.

The Plus/4 does have its limitations, but it is better than many word processors that have sold well for other home computers. If you need a word processor for correspondence, short reports or financial uses, this system should be sufficient.

You will quickly discover that it has capabilities far beyond those of a stand-alone word processor. This is due to its three companion programs: spreadsheet, graphics and database, all of which can interact with the word processor. Each of these built-in programs will receive its own review in *RUN* during the next few months. R

Address all author correspondence to Margaret Morabito, RUN editorial, 80 Pine St., Peterborough, NH 03458.

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Play Me A Color

BY JOSEPH T. WOYTON

Explore the mysteries of machine language programming with this tutorial, which describes how to make your VIC into a color organ.

Basic programs often require the use of lookup tables to compare a series of data for coincidence, equality or tests of validity. This is usually done with For...Next loops, and the computer may take several seconds to execute a lengthy comparison list in Basic. This can certainly slow down your program's action.

Using a machine language program, as illustrated here, instead of the For...Next loop, results in much faster computer processing. A machine language program, with its blazing speed and efficiency, will run hundreds of times faster than its Basic counterpart. When you press a key, you want action!

About Machine Language

For the machine language novice who has no assembler or monitor programs, the following description will show that it is fairly easy to implement simple machine language programs by using only VIC Basic.

Machine language uses only numbers for machine instructions. All information must be in the form of integer decimal values from 0 to 255 for entry via Basic. Memory addresses are identified by page (high address byte), with 256 locations (low address byte) per page, to format the two-byte machine language address the computer requires.

The machine operation codes are also specified in decimal values. These code numbers control the computer functions as the computer sequentially steps through the machine language program. (See Table 1 for procedures to calculate memory addresses and operation codes for machine language programs.)

As in assembly language, using mnemonics for reference purposes helps us bridge the gap between our English language and the numbers-only world of machine language. Mnemonics are programmers' English abbreviations for the operations specified by the numeric operation codes. (See Table 2 for a complete explanation of all operation codes used in this program.)

The machine language program is placed into a safe and convenient memory location (it won't interfere with the Basic program) using Read, Poke and Data statements in Basic. The cassette buffer memory area, addresses 828–1019, is an excellent storage place. The Color Organ program uses addresses 828 to 948.

The *VIC-20 Programmer's Reference Guide* contains more on machine language programming. You should read this or other reference material to become more familiar with the VIC's 6502 microprocessor functions.

The VIC memory addresses are specified as quantities from 0 to 65,535. Convert these numbers to the two-byte format by following these examples.

ADDRESS 197, the VIC keyboard:

PAGE = INTEGER (ADDRESS/256)	LOCATION = ADDRESS – PAGE*256
PAGE = INTEGER (197/256)	LOCATION = 197 – 0*256
PAGE = 0 (high address byte)	LOCATION = 197 (low address byte)

ADDRESS 828, the start of the cassette buffer:

PAGE = INTEGER (828/256)	LOCATION = 828 – 3*256
PAGE = 3	LOCATION = 60

ADDRESS 36879, the VIC color register:

PAGE = INTEGER (36879/256)	LOCATION = 36879 – 144*256
PAGE = 144	LOCATION = 15

The VIC operation codes are usually specified as hexadecimal (HEX) quantities. Convert these to decimal values by following these examples.

HEX 0 to 9 = DECIMAL 0 to 9
HEX A, B, C, D, E, F = DECIMAL 10, 11, 12, 13, 14, 15
Load the accumulator = OP CODE HEX A9
HEX A9 = 10*16 + 9 = 169 DECIMAL
Store the accumulator = OP CODE HEX 8D
HEX 8D = 8*16 + 13 = 141 DECIMAL
Branch if result zero = OP CODE HEX F0
HEX F0 = 15*16 + 0 = 240 DECIMAL

Table 1. *Memory address and operation code conversion.*

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The Machine Language Program

In going through this description, you'll note many references to accumulator operations. The accumulator is the main processing register of the microprocessor. It is used to transfer data, make comparisons and perform arithmetic operations.

Compare the program flowchart and machine language listing as we discuss the major steps in the lookup-table routine. The listing has liberal comments to help explain the machine language program activities.

Starting at address 828 (p. 3, location 60) the machine language program sequentially executes each operation code. The keyboard entry obtained from address 197 is loaded (LDA) into the accumulator. This value is stored (STA) into the VIC color register to create a screen and border color. If you press any key, the program goes to JSR, the Read Keys subroutine.

The subroutine compares (CMP(X)) the accumulator to each of the values in the Key Data table. This uses an index address technique, where the microprocessor's X-index register is used as a pointer that steps down (DEX) the data table.

When a match is found (BEQ), the accumulator loads (LDA(X)) the proper value from the Tone Data table by using the X-index pointer value as a reference. The tone value is then stored (STA) into the VIC sound register to produce an organ tone.

If no key match is found, the X index will be decremented (DEX) below zero. The program branches on this negative (BMI) to return (RTS) from the Read Keys subroutine. It then goes to look

Op Code	Mnemonic	Operation
169	LDA#	Load the accumulator with the number in the next byte.
141	STA	Store the accumulator contents in the memory address given by the next two bytes.
173	LDA	Load the accumulator with the contents of the memory address given by the next two bytes.
201	CMP#	Compare the contents of the accumulator with the number given in the next byte.
240	BEQ	Branch forward or backward by the number of steps given in the next byte, *if* the result of the previous operation was zero (equality). Backward = 256 – steps.
32	JSR	Jump to the subroutine at the address given by the next two bytes. Save the current return address.
76	JMP	Jump to the address given in the next two bytes.
162	LDX#	Load the X-index register with the number given in the next byte.
221	CMP(X)	Compare the contents of the accumulator with the number at the address given by the next two bytes plus the value in the X-index register.
202	DEX	Decrement the value in the X-index register by one.
48	BMI	Branch by the number of steps given in the next byte, *if* the result of the previous operation was negative.
96	RTS	Return from this subroutine.
189	LDA(X)	Load the accumulator with the number at the address given by the next two bytes plus the value in the X-index register.

Table 2. *Operation codes, mnemonics and operations.*

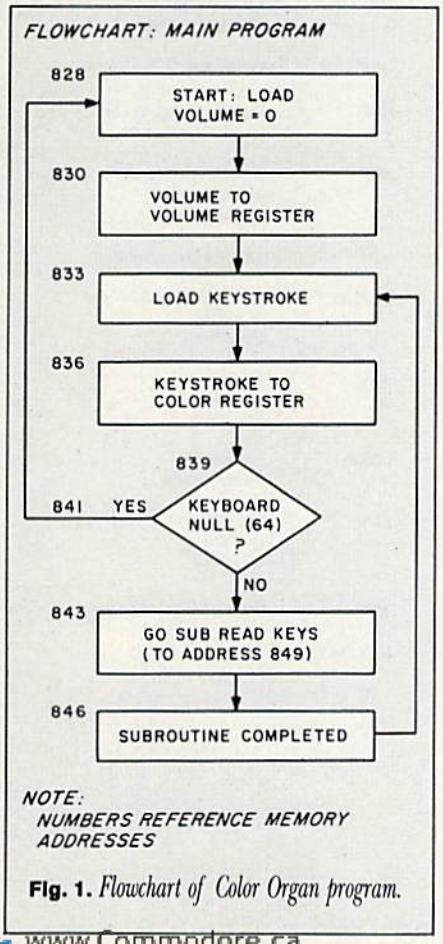

Fig. 1. *Flowchart of Color Organ program.*

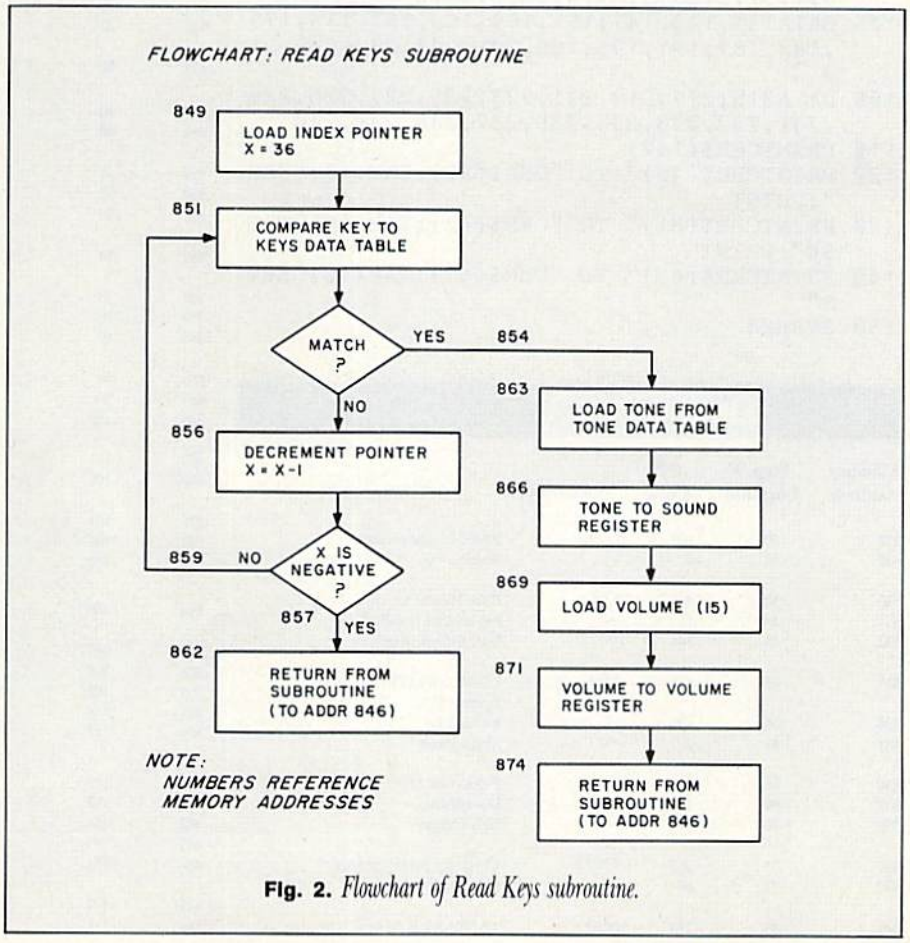

Fig. 2. *Flowchart of Read Keys subroutine.*

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(JMP) for another key press at the top of the ML program.

The Key Data and Tone Data are thus used in pairs, starting at the end of the tables (X index = 36) and working backwards (DEX) to the beginning (X index =0). For example, the keyboard £ (code 6) in address 911 is used with the musical tone C4 (code 240) in address 948.

This offset relationship holds, stepping through both data tables. You can easily change the keyboard tone assignments by rearranging the data in either data table. You can make the key pattern more like the standard piano layout (white and black) if you wish. You may also substitute your own data to construct any other kind of lookup table.

Note that the data in address 850 identifies the number of values in each of the tables. This program uses 37 entries, 0–36. Insert the proper value (up to 255) for your own data list. Changes to the machine language program are made by modifying the values in the Basic program's Data statements.

The Basic Program

In the Basic program's operation, the machine language routine is Read and Poked into memory (line 100), starting at address 828. The machine language program is entirely contained within the Data statements (lines 101–106). The screen is cleared and prompt messages are displayed (lines 110–140).

The machine language program is then called from Basic as a subroutine by SYS 828 (line 150) to play the VIC Color Organ.

The program is loaded into the VIC using the Basic listing. When typing it in, do not add any extra spaces in the Data statements, or all the numbers may not fit. Be sure to save the program before running it. A data entry error in the machine language section could cause the computer to crash and lose your program.

Good luck and have fun. If this is your first attempt at machine language programming, you are about to enter a new dimension in computer power and speed. R

Address all author correspondence to Joseph T. Woyton, 106 Braddock Drive, Mauldin, SC 29662.

Listing 1. *Basic listing for Color Organ program.*

```
10 REM VIC COLOR ORGAN
20 REM J. WOYTON
100 FORA=828TO948:READD:POKEA,D:NEXT
101 DATA169,0,141,11,144,173,197,0,141,15,1
    44,201,64,240,241,32,81,3,76,65
102 DATA3,162,36,221,107,3,240,7,202,48,3,7
    6,83,3,96,189,144,3,141,11
103 DATA144,169,15,141,14,144,96,17,41,18,4
    2,19,43,20,44,21,45,22,46,48
104 DATA9,49,10,50,11,51,12,52,13,53,14,0,5
    6,1,57,2,58,3,59,4,60,5,61,6
105 DATA135,143,147,151,159,163,167,175,179
    ,183,187,191,195,199,201,203,207,209,21
    2
106 DATA215,217,219,221,223,225,227,228,229
    ,231,232,233,235,236,237,238,239,240
110 PRINTCHR$(147)
120 PRINTCHR$(49)" TO "CHR$(92);TAB(10)"USE
    ":PRINT
130 PRINTCHR$(81)" TO "CHR$(42);TAB(10)"THE
    SE":PRINT
140 PRINTCHR$(65)" TO "CHR$(61);TAB(10)"KEY
    S"
150 SYS828
```

Listing 2. *Machine language listing.*

Memory Address	Page 3 Location	OP Code	Mnemonic	Comments
828	60	169	LDA#	START: load volume
829	61	0	—	Volume = 0
830	62	141	STA	Poke volume to
831	63	11	—	low address (location)
832	64	144	—	high address (page)
833	65	173	LDA	LOAD KEYSTROKE from keyboard
834	66	197	—	low address
835	67	0	—	high address
836	68	141	STA	Poke color to
837	69	15	—	low address
838	70	144	—	high address
839	71	201	CMP#	Check for no key pressed
840	72	64	—	64 is keyboard null
841	73	240	BEQ	To START if no key,
842	74	241	—	branch back 15 steps
843	75	32	JSR	To READ KEYS subroutine
844	76	81	—	low address
845	77	3	—	high address
846	78	76	JMP	To LOAD KEYSTROKE
847	79	65	—	low address
848	80	3	—	high address
849	81	162	LDX#	READ KEYS
850	82	36	—	37 data points
851	83	221	CMP(X)	COMPARE to KEY DATA table
852	84	107	—	low address
853	85	3	—	high address
854	86	240	BEQ	To PLAY if match,
855	87	7	—	branch forward 7 steps
856	88	202	DEX	Next key data
857	89	48	BMI	If end of key data, branch
858	90	3	—	forward 3 steps to RTS
859	91	76	JMP	To COMPARE, repeat
860	92	83	—	low address
861	93	3	—	high address
862	94	96	RTS	RETURN from subroutine
863	95	189	LDA(X)	PLAY: load tone data from
864	96	144	—	low address
865	97	3	—	high address
866	98	141	STA	Poke tone to
867	99	11	—	low address
868	100	144	—	high address
869	101	169	LDA#	Load volume
870	102	15	—	15 is max volume
871	103	141	STA	Poke volume to
872	104	14	—	low address
873	105	144	—	high address
874	106	96	RTS	RETURN from subroutine
875	107	17	KEY DATA	A
876	108	41		S
877	109	18		D
878	110	42		F
879	111	19		G
880	112	43		H
881	113	20		J
882	114	44		K
883	115	21		L
884	116	45		:
885	117	22		;
886	118	46		=

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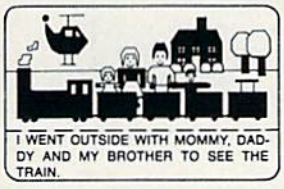

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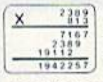

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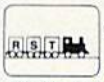

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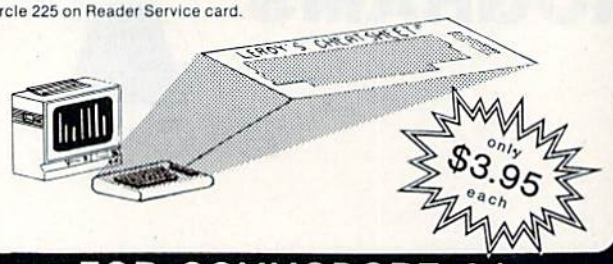

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887	119	48		Q
888	120	9		W
889	121	49		E
890	122	10		R
891	123	50		T
892	124	11		Y
893	125	51		U
894	126	12		I
895	127	52		O
896	128	13		P
897	129	53		@
898	130	14		*
899	131	0		↑
900	132	56		2
901	133	1		3
902	134	57		4
903	135	2		5
904	136	58		6
905	137	3		7
906	138	59		8
907	139	4		9
908	140	60		0
909	141	5		+
910	142	61		–
911	143	6		£
912	144	135	TONE DATA	C(1)
913	145	143		C#
914	146	147		D
915	147	151		D#
916	148	159		E
917	149	163		F
918	150	167		F#
919	151	175		G
920	152	179		G#
921	153	183		A
922	154	187		A#
923	155	191		B
924	156	195		C(2)
925	157	199		C#
926	158	201		D
927	159	203		D#
928	160	207		E
929	161	209		F
930	162	212		F#
931	163	215		G
932	164	217		G#
933	165	219		A
934	166	221		A#
935	167	223		B
936	168	225		C(3)
937	169	227		C#
938	170	228		D
939	171	229		D#
940	172	231		E
941	173	232		F
942	174	233		F#
943	175	235		G
944	176	236		G#
945	177	237		A
946	178	238		A#
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948	180	240		C(4)

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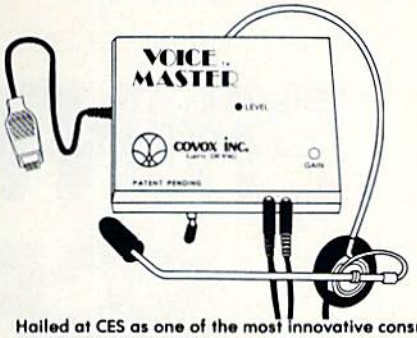

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PRINT YOUR SCREEN

BY ROBIN FRANZEL

How often have you been working at your computer and wanted a printout of the screen? This article presents a program, written in machine language for the Commodore 64, that will print your screen whenever you press the f1 function key or call the print routine from Basic.

The program is interrupt-driven, which means the keyboard is scanned every ⅙₀ of a second to see if the f1 key is being pressed. If it is, the screen is then printed. The IRQ vector technique enables this utility to work even while executing a Basic or machine language program. It can also be used while the disk wedge program is in the computer, as long as you load and run the wedge first.

The screen dump utility is also a wedge, and when it does not find the f1 key pressed, it transfers control to the DOS wedge program, so that both utilities can function properly together.

Both the loader programs ask if you want uppercase or lowercase letters to be printed. It's easy to switch back and forth, even after the program is loaded, just by changing the command sent to the printer. This is done with a Poke, from either your program or Command mode. To change to lowercase letters, enter POKE 49203,7; to change to uppercase, enter POKE 49203,255.

If you're running a program that uses the f1 key, it's very easy to change the print key. Simply type POKE 49184, with the key code for location $C5 (197 decimal). For example, to make the f7 key print the screen, enter from Command mode: POKE 49184,3.

Pressing the run/stop and restore keys will disable the utility. SYS 49152 will reenable the screen print key.

The VIC-20 Screen Dump Utility

The VIC-20 version of the screen dump program is completely relocatable, and "hides" itself below the current top of Basic memory. It is, therefore, able to function with the VIC wedge program in memory. It also determines where screen memory is located, making this screen dump program compatible with all memory configurations.

To use this program, load and run either the Basic loader or the machine language loader. Then, whenever a print is desired, simply press the f1 key.

When the Basic or machine language loader programs are run, you are asked whether upper- or lowercase print is desired, and the appropriate command is sent to the printer. The start address is provided, so that you may change the printer command. For example, to change from uppercase to lowercase, enter:

```
POKE (start address) + 54,7
```

If the print routine is to be used from within a user program, the program should use the following line of code:

```
100 POKE SA + 245,96:SYS SA + 44:POKE SA + 245,76
```

SA indicates the start address of the program. Of course, it is your responsibility to load the screen dump program and to determine the start address.

The following locations are useful to note:

- SA = start address of utility. If run/stop and restore keys are pressed, the f1 key is disabled. To reenable it, do a SYS SA.
- SA + 33 = key code being checked. Normally, this is a 39 for the f1 key, but this location may be Poked with another code (see the *Programmer's Reference Guide*, p. 179) for use with programs that utilize the f1 key.
- SA + 44 = the print routine. This is the entry point from user programs.
- SA + 54 = Printer command. Poke to 7 for lowercase, 255 for uppercase.

I hope you will agree that the VIC-20 version of the Commodore screen dump utility is a valuable addition to VIC-20 users' libraries.

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Now, what *can't* you do when this utility is in place (if you still want it to work)? First, you cannot use locations $C000 to $C0F9 (that's 49152 to 49401 to you decimal folks). Four bytes are used by the program at $02A7 to $02AA (679 to 682), and zero page bytes $FB to $FE (251 to 254) are also used. That's it!

If you don't have a machine language monitor or an assembler, then you should type in the Basic Loader program (Listing 1 for the C-64). This program computes a checksum for each line of data; if you've made an error in typing, it will display a message on the screen indicating the line in error. When you're done typing, save the program and then run it. To print the screen, just press the f1 key.

For those of you with an assembler or monitor program, I have included the assembled code for this program. After you have typed in the program and created your machine code, you can use the machine language loader (Listing 2 for the C-64), with your program named "PRSCRN"; or you can load the program yourself (LOAD"program-name", 8,1) and enter SYS49152 to start it.

The program is well commented, but let's briefly look at the main routines. SETVEC, the initialization routine, saves the IRQ vector (even if it has been changed by the DOS wedge) in IRQSAV, and establishes the new IRQ vector as NEWVEC in the program.

NEWVEC looks for the f1 key, and if it's not being pressed, it then jumps to the IRQ address saved in IRQSAV.

Line 76, the LDY #$FF instruction, is setting up the command to send to the printer. It is this #$FF we change to a #$07 with the POKE 49203,7 statement.

CONV, CONV1, CONV2 and CKCHAR do the work for printing a character. In CONV, the program checks for the first character in a line, and "tabs" over 20 spaces if it's there. CONV2 takes care of the reverse-video handling. CKCHAR converts the character from the screen-display code (Appendix B in the Reference Guide) to the ASCII code for printing (see Appendix C).

I hope that you find this program useful and interesting. Have fun with it! R

Address all author correspondence to Robin Franzel, 5521 Harvey Lane, Alexandria, VA 22312.

Listing 1. *Basic Loader program for the C-64.*

```
10 DATA 1136,1059,1515,1764,1699,1690,1762
20 DATA 1823,1612,1993,1902,1747,1366,1640
30 DATA 1945,1578,1724,1493,1472,1865,1213
40 DATA 120,173,20,3,141,169,2,173,21,3,141
   ,170
50 DATA 2,169,29,141,20,3,169,192,141,21,3,
   169
60 DATA 0,133,254,88,96,165,197,201,4,208,4
   ,165
70 DATA 254,240,3,108,169,2,169,255,133,254
   ,169,8
80 DATA 162,4,160,255,32,186,255,169,0,32,1
   89,255
90 DATA 32,192,255,162,8,32,201,255,169,0,1
   33,251
100 DATA 133,253,169,4,133,252,162,25,32,23
    0,192,177
110 DATA 251,32,139,192,200,204,168,2,208,2
    45,169,13
120 DATA 32,210,255,169,40,24,101,251,133,2
    51,144,2
130 DATA 230,252,32,230,192,202,208,223,169
    ,13,32,210
140 DATA 255,32,210,255,32,204,255,169,8,32
    ,195,255
150 DATA 169,0,133,254,76,188,254,142,167,2
    ,170,192
160 DATA 0,208,15,169,16,32,210,255,169,50,
    32,210
170 DATA 255,169,48,32,210,255,138,201,128,
    144,19,41
180 DATA 127,170,165,253,208,25,169,255,133
    ,253,169,18
190 DATA 32,210,255,56,176,13,165,253,240,9
    ,169,0
200 DATA 133,253,169,146,32,210,255,138,201
    ,32,144,11
210 DATA 201,64,176,11,32,210,255,174,167,2
    ,96,105
220 DATA 64,144,245,201,96,176,4,105,32,144
    ,237,24
230 DATA 144,241,160,39,177,251,136,240,4,2
    01,32,240
240 DATA 247,200,200,140,168,2,160,0,96
250 DIMCS(21):SA=49152:EA=49400:L=1
260 FORI=1TO21:READCS(I):NEXT
270 FORI=SA TO EA STEP 12:CS=0:FORJ=0TO11
280 READK:POKEI+J,K:CS=CS+K
290 IFI+J=EATHENJ=11:I=EA
300 NEXTJ
310 IFCS<>CS(L)THEN600
320 L=L+1:NEXTI
330 PRINT"{CRSR DN}UPPER OR LOWER CASE";:IN
    PUT"{3 SPACEs}U{3 CRSR LFs}";A$:IFA$="L
    "THENPOKE49203,7
340 SYS49152:NEW
600 PRINT"ERROR IN DATA STATEMENT #";40+(L-
    1)*10
```

Listing 2. *Machine Language Loader program for the C-64.*

```
10 IFA=0THENA=1:LOAD"PRSCRN",8,1
20 PRINT"{SHFT CLR}UPPER OR LOWER CASE";:IN
   PUT"{3 SPACEs}U{3 CRSR LFs}";A$:IFA$="L"
   THENPOKE49203,7
30 SYS49152:NEW
```

Listing 3. *Basic Loader program for the VIC-20.*

```
1 F$="VICSCRN"
10 DATA 907,869,1199,1261,1403,1782,1699,19
   49
20 DATA 1343,1366,1652,1948,1757,1715,1366,
   1219
30 DATA 1593,1531,1895,1902,704
40 DATA 120,173,20,3,141,54,3,173,21,3,141,
   55
50 DATA 3,169,30,141,20,3,169,0,141,21,3,16
   9
60 DATA 0,141,56,3,88,96,165,197,201,39,208
   ,5
70 DATA 173,56,3,240,3,108,54,3,169,255,141
   ,56
80 DATA 3,169,8,162,4,160,255,32,186,255,16
   9,0
90 DATA 32,189,255,32,192,255,162,8,32,201,
   255,169
100 DATA 0,133,251,133,253,169,30,133,252,1
    62,23,160
110 DATA 21,177,251,136,240,4,201,32,240,24
    7,200,200
120 DATA 140,53,3,160,0,177,251,142,52,3,17
    0,192
```


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Listing 3 continued.

```
130 DATA 0,208,15,169,16,32,210,255,169,50,
    32,210
140 DATA 255,169,57,32,210,255,138,201,128,
    144,22,41
150 DATA 127,170,165,253,208,28,169,255,133
    ,253,169,18
160 DATA 32,210,255,56,176,16,24,144,186,16
    5,253,240
170 DATA 9,169,0,133,253,169,146,32,210,255
    ,138,201
180 DATA 32,144,13,201,64,176,13,32,210,255
    ,174,52
190 DATA 3,24,144,15,105,64,144,243,201,96,
    176,4
200 DATA 105,32,144,235,24,144,241,200,204,
    53,3,208
210 DATA 152,169,13,32,210,255,169,22,24,10
    1,251,133
220 DATA 251,144,2,230,252,202,208,182,169,
    13,32,210
230 DATA 255,32,210,255,32,204,255,169,8,32
    ,195,255
240 DATA 169,0,141,56,3,76,24,235
1000 DIMCS(21):POKE56,PEEK(56)-1:X=PEEK(55)
    :Y=PEEK(56)
1010 FORI=1TO21:READCS(I):NEXT:SA=X+256*Y:E
    A=SA+247:L=1
1020 FORI=SATOEASTEP12:CS=0:FORJ=0TO11
1030 READK:POKEI+J,K:CS=CS+K
1040 IFI+J=EATHENJ=11:I=EA
1050 NEXTJ
1060 IFCS<>CS(L)THEN1120
1070 L=L+1:NEXTI
1080 PRINT"{CRSR DN}UPPER OR LOWERCASE";:IN
    PUT"{3 SPACEs}U{3 CRSR LFs}";A$:IFA$="
    L"THENPOKESA+54,7
1090 PRINT"START ADDRESS ="SA
1100 POKESA+78,PEEK(648):VEC=SA+30:Y=INT(VE
    C/256):X=VEC-Y*256
1110 POKESA+14,X:POKESA+19,Y:SYSSA:NEW
1120 PRINT"ERROR IN DATA STATEMENT #";40+(L
    -1)*10
```

Listing 4. *Machine Language Loader program for the VIC-20.*

```
10 F$="VICSCRN":POKE56,PEEK(56)-1:X=PEEK(55
   ):Y=PEEK(56):SA=X+256*Y
20 NA=PEEK(43)+256*PEEK(44)+8:POKE782,NA/25
   6:POKE781,NA-PEEK(782)*256
30 POKE780,7:SYS65469:REM SETNAM
40 POKE780,1:POKE781,8:POKE782,0:SYS65466:R
   EM SETLFS
50 POKE780,0:POKE781,X:POKE782,Y:SYS65493:R
   EM LOAD
60 PRINT"{CRSR DN}UPPER OR LOWERCASE";:INPU
   T"{3 SPACEs}U{3 CRSR LFs}";A$:IFA$="L"TH
   ENPOKESA+54,7
70 PRINT"{CRSR DN}START ADDRESS = "SA
80 POKESA+78,PEEK(648):VEC=SA+30
90 Y=INT(VEC/256):X=VEC-Y*256
100 POKESA+14,X:POKESA+19,Y:SYSSA
```

Listing 5. *Assembled source code for the C-64.*

```
00001  0000            ; ************************************
00002  0000            ; **        SCREEN DUMP UTILITY     **
00003  0000            ; **              BY                **
00004  0000            ; **          ROBIN FRANZEL         **
00005  0000            ; **                                **
00006  0000            ; **                                **
00007  0000            ; **                                **
00008  0000            ; ** THIS UTILITY CAN BE USED FROM **
00009  0000            ; **    A PROGRAM BY DOING A SYS    **
00010  0000            ; **    TO PRINTR (SYS49178), OR    **
00011  0000            ; **    CAN BE USED AT ANY TIME     **
00012  0000            ; **    BY USING THE F1 KEY AFTER   **
00013  0000            ; **    INITIALIZING BY DOING A     **
00014  0000            ; **    SYS TO SETVEC (SYS49152)    **
00015  0000            ; ************************************
00016  0000            ;
00017  0000            ; CONSTANTS
00018  0000            ;
00019  0000            SETLFS=$FFBA            ;SET 1ST & 2ND COMMANDS
00020  0000            SETNAM=$FFBD            ;SET FILE NAME
00021  0000            OPEN=$FFC0              ;OPEN FILE
00022  0000            CHKOUT=$FFC9            ;OPEN CHANNEL FOR OUTPUT
00023  0000            CHROUT=$FFD2            ;OUTPUT CHARACTER
00024  0000            CLRCHN=$FFCC            ;CLOSE I/O CHANNELS
00025  0000            CLOSE=$FFC3             ;CLOSE A FILE
00026  0000            PRFLAG=$FE              ;PRINT IN PROGRESS FLAG
00027  0000            RVFLAG=$D9              ;REVERSE INDICATOR
00028  0000            SCRPTR=$F5              ;
00029  0000            SAVEX=$02A7             ;HOLD FOR X REGISTER
00030  0000            LINEL=$02A8             ;LINE LENGTH
00031  0000            IRQSAV=$02A9            ;SAVE IRQ VECTOR
00032  0000            IROVEC=$0314            ;IRQ VECTOR RTN ADDR .
00033  0000            ;
00034  0000            ; INIT ROUTINE: SET UP INTERRUPT VECTOR
00035  0000            ;
00036  0000                    *=$C000
00037  C000  78       SETVEC SEI              ;SET INTERRUPT DISABLE
00038  C001  AD 14 03         LDA IROVEC      ;LOW BYTE IRQ VECTOR
00039  C004  8D A9 02         STA IRQSAV      ;  INTO SAVE
00040  C007  AD 15 03         LDA IROVEC+1    ;HIGH BYTE
00041  C00A  8D AA 02         STA IRQSAV+1
00042  C00D  A9 1D            LDA #<NEWVEC    ;LOW BYTE
00043  C00F  8D 14 03         STA IROVEC
00044  C012  A9 C0            LDA #>NEWVEC    ;HIGH BYTE
00045  C014  8D 15 03         STA IROVEC+1
00046  C017  A9 00            LDA #$00        ;CLEAR PRINT FLAG
00047  C019  85 FE            STA PRFLAG
00048  C01B  58               CLI             ;CLEAR INTERRUPT DISABLE
00049  C01C  60               RTS
00050  C01D                   ;
00051  C01D                   ; NEW VECTOR ROUTINE
00052  C01D                   ;    CHECK FOR F1 KEY PRESSED
00053  C01D                   ;    IF NOT THEN RETURN TO NORMAL
00054  C01D                   ;    INTERRUPT--IF PRESSED AND WE
00055  C01D                   ;    ARE NOT ALREADY PRINTING, THEN
00056  C01D                   ;    START PRINTING
00057  C01D                   ;
00058  C01D  A5 C5            NEWVEC LDA $C5          ;GET CURRENT KEY
00059  C01F  C9 04                   CMP #$04        ;IS IT F1?
00060  C021  D0 04                   BNE RETURN      ;IF NOT, RETURN
00061  C023  A5 FE                   LDA PRFLAG      ;PRINT FLAG SET?
00062  C025  F0 03                   BEQ PRINTR      ;IF NOT THEN PRINT
00063  C027  6C A9 02         RETURN JMP (IRQSAV)    ;NORMAL IRQ
00064  C02A                   ;
00065  C02A                   ; ************************
00066  C02A                   ; **   PRINT ROUTINE    **
00067  C02A                   ; ************************
00068  C02A                   ;
00069  C02A  A9 FF            PRINTR LDA #$FF         ;SET PRINT FLAG
00070  C02C  85 FE                   STA PRFLAG
00071  C02E                   ;
00072  C02E                   ;  OPEN PRINTER
00073  C02E                   ;
00074  C02E  A9 08                   LDA #$08        ;FILE #
00075  C030  A2 04                   LDX #$04        ;DEVICE #
00076  C032  A0 FF                   LDY #$FF        ;NO COMMAND
```


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Listing 5 continued.

```
00077  C034  20 BA FF          JSR SETLFS      ;SETLFS
00078  C037  A9 00             LDA #$00        ;NO NAME
00079  C039  20 BD FF          JSR SETNAM      ;SETNAM
00080  C03C  20 C0 FF          JSR OPEN        ;OPEN FILE
00081  C03F  A2 08             LDX #$08
00082  C041  20 C9 FF          JSR CHKOUT      ;OPEN CHANNEL FOR FILE
00083  C044                    ;
00084  C044                    ;  SET UP SCREEN POINTER
00085  C044                    ;
00086  C044  A9 00             LDA #$00        ;LOW BYTE SCREEN
00087  C046  85 FB             STA SCRPTR      ;SAVE IN SCREEN POINTER
00088  C048  85 FD             STA RVFLAG      ; INIT REVERSE FLAG
00089  C04A  A9 04             LDA #$04        ;HIGH BYTE SCREEN
00090  C04C  85 FC             STA SCRPTR+1
00091  C04E                    ;
00092  C04E                    ; ************************
00093  C04E                    ; **   PRINT A LINE     **
00094  C04E                    ; ************************
00095  C04E                    ;
00096  C04E  A2 19             LDX #$19        ; DO ONLY 25 LINES
00097  C050  20 E6 C0          JSR GETLL       ;INIT Y FOR INDEX
00098  C053  B1 FB       LOOP  LDA (SCRPTR),Y  ;GET SCREEN CHAR
00099  C055  20 8B C0          JSR CONV        ; PUT CHAR
00100  C058  C8                INY             ;NEXT CHAR
00101  C059  CC A8 02          CPY LINEL       ; EOL
00102  C05C  D0 F5             BNE LOOP
00103  C05E  A9 0D             LDA #$0D        ;C/R AT EOL
00104  C060  20 D2 FF          JSR CHROUT
00105  C063  A9 28             LDA #$28        ; UPDATE PTR
00106  C065  18                CLC             ; TO NEXT LINE
00107  C066  65 FB             ADC SCRPTR      ;UPDATE LOW BYTE
00108  C068  85 FB             STA SCRPTR      ;SAVE IT BACK
00109  C06A  90 02             BCC NEXTL       ;IF CARRY SET, HIGH BYTE
00110  C06C  E6 FC             INC SCRPTR+1    ;  MUST BE UPDATED
00111  C06E  20 E6 C0    NEXTL JSR GETLL       ;GET LINE LENGTH
00112  C071  CA                DEX             ;DO NEXT LINE
00113  C072  D0 DF             BNE LOOP
00114  C074                    ;
00115  C074                    ; ************************
00116  C074                    ; **     END OF PRINT    **
00117  C074                    ; ************************
00118  C074                    ;
00119  C074  A9 0D             LDA #$0D        ;C/R AT END OF PAGE
00120  C076  20 D2 FF          JSR CHROUT
00121  C079  20 D2 FF          JSR CHROUT
00122  C07C  20 CC FF          JSR CLRCHN      ; CLOSE CHANNEL
00123  C07F  A9 08             LDA #$08
00124  C081  20 C3 FF          JSR CLOSE       ; CLOSE FILE
00125  C084  A9 00             LDA #$00
00126  C086  85 FE             STA PRFLAG
00127  C088  4C BC FE          JMP $FEBC       ;INTERRUPT EXIT
00128  C08B                    ;
00129  C08B                    ; ************************
00130  C08B                    ; ** OUTPUT A CHARACTER  **
00131  C08B                    ; ************************
00132  C08B                    ;
00133  C08B                    ; IF AT FIRST CHAR ON LINE THEN
00134  C08B                    ;   TAB OVER 20 CHARS
00135  C08B                    ;
00136  C08B  8E A7 02    CONV  STX SAVEX
00137  C08E  AA                TAX             ;SAVE CHAR IN X
00138  C08F  C0 00             CPY #$00        ;1ST CHAR ON LINE?
00139  C091  D0 0F             BNE CONV1       ;IF SO TAB 20 SPC
00140  C093  A9 10             LDA #$10        ;PRINTCHR$(16)
00141  C095  20 D2 FF          JSR CHROUT
00142  C098  A9 32             LDA #$32        ;TAB 20 CHARS
00143  C09A  20 D2 FF          JSR CHROUT
00144  C09D  A9 30             LDA #$30
00145  C09F  20 D2 FF          JSR CHROUT
00146  C0A2                    ;
00147  C0A2                    ; CHECK FOR INVERSE VIDEO
00148  C0A2                    ;   IF REVERSE THEN SET FLAG AND
00149  C0A2                    ;   SET PRINTER TO REVERSE
00150  C0A2                    ;
00151  C0A2  8A          CONV1 TXA             ;RESTORE CHAR TO A
00152  C0A3  C9 80             CMP #$80        ;REVERSE CHAR?
00153  C0A5  90 13             BCC CONV2       ;IF NO, CONTINUE
00154  C0A7  29 7F             AND #$7F        ;MAKE NORMAL
00155  C0A9  AA                TAX             ;UPDATE NEW CHAR
00156  C0AA  A5 FD             LDA RVFLAG
00157  C0AC  D0 19             BNE CKCHAR      ;IF ALREADY SET
00158  C0AE  A9 FF             LDA #$FF
00159  C0B0  85 FD             STA RVFLAG      ;SET FLAG
00160  C0B2  A9 12             LDA #$12        ;REVERSE ON
00161  C0B4  20 D2 FF          JSR CHROUT
00162  C0B7  38                SEC
00163  C0B8  B0 0B             BCS CKCHAR
00164  C0BA                    ;
00165  C0BA                    ; COME HERE ON NOT REVERSED
00166  C0BA                    ;   IF REVERSE FLAG IS SET, THEN
00167  C0BA                    ;   UN-SET IT, AND TURN REVERSE OFF
00168  C0BA                    ;   AT PRINTER
00169  C0BA                    ;
00170  C0BA  A5 FD       CONV2 LDA RVFLAG      ;IF REVERSE THEN
00171  C0BC  F0 09             BEQ CKCHAR      ;   TURN OFF
00172  C0BE  A9 00             LDA #$00
00173  C0C0  85 FD             STA RVFLAG
00174  C0C2  A9 92             LDA #$92        ;REVERSE OFF
00175  C0C4  20 D2 FF          JSR CHROUT
00176  C0C7                    ;
00177  C0C7                    ; CONVERT TO ASCII AND PRINT
00178  C0C7                    ;
00179  C0C7  8A          CKCHAR TXA            ;CHAR IN A
00180  C0C8  C9 20             CMP #$20        ; ALPHA CHAR?
00181  C0CA  90 08             BCC ALPHA
00182  C0CC  C9 40             CMP #$40        ;IS IT SPEC CHAR?
00183  C0CE  B0 0B             BCS GRAFIC      ;NO, SO GRAPHICS
00184  C0D0  20 D2 FF    PRINT JSR CHROUT
00185  C0D3  AE A7 02          LDX SAVEX
00186  C0D6  60                RTS
00187  C0D7                    ;
00188  C0D7                    ;
00189  C0D7  69 40       ALPHA ADC #$40        ;ADD 64 AND PRINT
00190  C0D9  90 F5             BCC PRINT
00191  C0DB                    ;
00192  C0DB  C9 60       GRAFIC CMP #$60       ;40-CASE?
00193  C0DD  B0 04             BCS HIGH        ; NO EVEN HIGHER
00194  C0DF  69 20             ADC #$20        ;ADD 32
00195  C0E1  90 ED             BCC PRINT
00196  C0E3                    ;
00197  C0E3  18          HIGH  CLC             ;IF 256 THEN ADD 64
00198  C0E4  90 F1             BCC ALPHA
00199  C0E6                    ;
```


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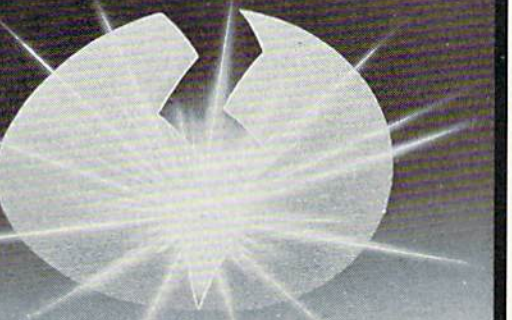

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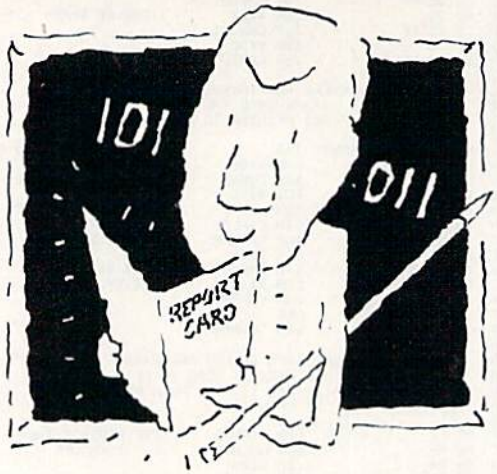

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Listing 5 continued.

```
00200  C0E6              ; GET LINE LENGTH AND STORE IN
00201  C0E6              ;    LINEL-THEN RETURN
00202  C0E6              ;
00203  C0E6  A0 27       GETLL  LDY #$27        ; START AT EOL
00204  C0E8  B1 FB       GETLP  LDA (SCRPTR),Y  ;LOOK FOR LAST
00205  C0EA              DEY                    ; NON BLANK FOR LINE
00206  C0EB  F0 04       BEQ GETRET
00207  C0ED  C9 20       CMP #$20               ; LENGTH
00208  C0EF  F0 F7       BEQ GETLP
00209  C0F1  C8          GETRET INY
00210  C0F2  C8          INY
00211  C0F3  8C A8 02     STY LINEL              ;LENGTH OF LINE
00212  C0F6  A0 00       LDY #$00               ;RE-INIT Y
00213  C0F8  60          RTS
00214  C0F9              .END

ERRORS = 00000
```

Listing 6. *Assembled source code for the VIC-20.*

```
00001  0000              ; ***********************************
00002  0000              ; **       SCREEN DUMP UTILITY     **
00003  0000              ; **         (VIC 20 VERSION)      **
00004  0000              ; **              BY               **
00005  0000              ; **           ROBIN FRANZEL       **
00006  0000              ; **                               **
00007  0000              ; **                               **
00008  0000              ; **                               **
00009  0000              ; ** TO PRINT YOUR SCREEN, PRESS   **
00010  0000              ; **    THE F1 KEY.  TO CHANGE THE **
00011  0000              ; **    KEY, POKE THE KEY CODE     **
00012  0000              ; **    (PROG REF GUIDE-P 179) IN  **
00013  0000              ; **    START+33).  TO PRINT LOWER-**
00014  0000              ; **    CASE POKE 7 IN START+54.   **
00015  0000              ; ***********************************
00016  0000              ;
00017  0000              ; CONSTANTS
00018  0000              ;
00019  0000              SETLFS=$FFBA           ;SET 1ST & 2ND COMMANDS
00020  0000              SETNAM=$FFBD           ;SET FILE NAME
00021  0000              OPEN=$FFC0             ;OPEN FILE
00022  0000              CHKOUT=$FFC9           ;OPEN CHANNEL FOR OUTPUT
00023  0000              CHROUT=$FFD2           ;OUTPUT CHARACTER
00024  0000              CLRCHN=$FFCC           ;CLOSE I/O CHANNELS
00025  0000              CLOSE=$FFC7            ;CLOSE A FILE
00026  0000              EXINT=$EB15            ;IRQ INTERRUPT EXIT
00027  0000              RVFLAG=$FD             ;REVERSE INDICATOR
00028  0000              SCRPTR=$FB
00029  0000              SAVEX=$0334            ;HOLD FOR X REGISTER
00030  0000              LINEL=$0335            ;LINE LENGTH
00031  0000              IRQSAV=$0336           ;SAVE IRQ VECTOR
00032  0000              PRFLAG=$033B           ;PRINT IN PROGRESS FLAG
00033  0000              IRQVEC=$0314           ;IRQ VECTOR RTN ADDR
00034  0000              ;
00035  0000              ; INIT ROUTINE: SET UP INTERRUPT VECTOR
00036  0000              ;
00037  0000                   *=$0000
00038  0000  78          SETVEC SEI                    ;SET INTERRUPT DISABLE
00039  0001  AD 14 03          LDA IRQVEC              ;LOW BYTE IRQ VECTOR
00040  0004  8D 36 03          STA IRQSAV              ;  INTO SAVE
00041  0007  AD 15 03          LDA IRQVEC+1            ;HIGH BYTE
00042  000A  8D 37 03          STA IRQSAV+1
00043  000D  A9 1E             LDA #<NEWVEC            ;LOW BYTE
00044  000F  8D 14 03          STA IRQVEC
00045  0012  A9 00             LDA #>NEWVEC            ;HIGH BYTE
00046  0014  8D 15 03          STA IRQVEC+1
00047  0017  A9 00             LDA #$00                ;CLEAR PRINT FLAG
00048  0019  8D 3B 03          STA PRFLAG
00049  001C  58                CLI                     ;CLEAR INTERRUPT DISABLE
00050  001D  60                RTS
00051  001E              ;
00052  001E              ; NEW VECTOR ROUTINE
00053  001E              ;    CHECK FOR F1 KEY PRESSED
00054  001E              ;    IF NOT THEN RETURN TO NORMAL
00055  001E              ;    INTERRUPT--IF PRESSED AND WE
00056  001E              ;    ARE NOT ALREADY PRINTING, THEN
00057  001E              ;    START PRINTING
00058  001E              ;
00059  001E  A5 C5       NEWVEC LDA $C5          ;GET CURRENT KEY
00060  0020  C9 27              CMP #$27         ;IS IT F1?
00061  0022  D0 05              BNE RETURN       ;IF NOT, RETURN
00062  0024  AD 3B 03           LDA PRFLAG       ;PRINT FLAG SET?
00063  0027  F0 03              BEQ PRINTR       ;IF NOT THEN PRINT
00064  0029  6C 36 03    RETURN JMP (IRQSAV)     ;NORMAL IRQ
00065  002C              ;
00066  002C              ; *************************
00067  002C              ; **    PRINT ROUTINE    **
00068  002C              ; *************************
00069  002C              ;
00070  002C  A9 FF       PRINTR LDA #$FF         ;SET PRINT FLAG
00071  002E  8D 3B 03           STA PRFLAG
00072  0031              ;
00073  0031              ;  OPEN PRINTER
00074  0031              ;
00075  0031  A9 08              LDA #$08         ;FILE #
00076  0033  A2 04              LDX #$04         ;DEVICE #
00077  0035  A0 FF              LDY #$FF         ;NO COMMAND
00078  0037  20 BA FF           JSR SETLFS       ;SETLFS
00079  003A  A9 00              LDA #$00         ;NO NAME
00080  003C  20 BD FF           JSR SETNAM       ;SETNAM
00081  003F  20 C0 FF           JSR OPEN         ;OPEN FILE
00082  0042  A2 08              LDX #$08
```


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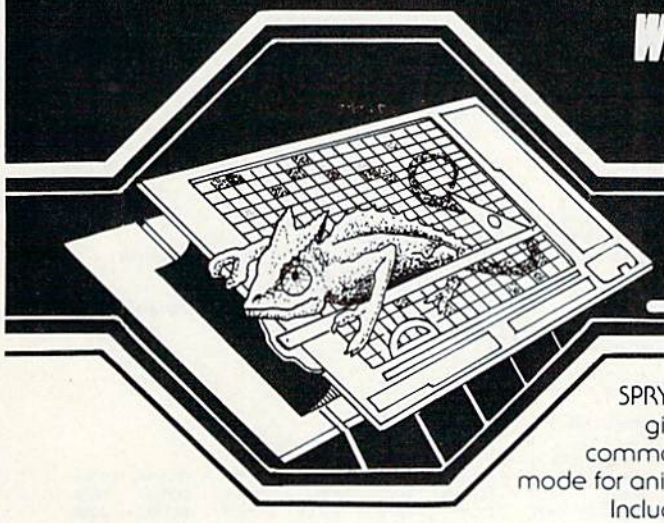

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Listing 6 continued.

```
0083  0044  20 C9 FF        JSR CHKOUT      ;OPEN CHANNEL FOR FILE
0084  0047                  ;
0085  0047                  ;  SET UP SCREEN POINTER
0086  0047                  ;
0087  0047  A9 00           LDA #$00        ;LOW BYTE SCREEN
0088  0049  85 FB           STA SCRPTR      ;SAVE IN SCREEN POINTER
0089  004B  85 FD           STA RVFLAG      ; INIT REVERSE FLAG
0090  004D  A9 1E        SCRPGE LDA #$1E    ;HIGH BYTE SCREEN
0091  004F  85 FC           STA SCRPTR+1
0092  0051                  ;
0093  0051                  ; **************************
0094  0051                  ; **   PRINT A LINE       **
0095  0051                  ; **************************
0096  0051                  ;
0097  0051  A2 17           LDX #$17        ; DO ONLY 23 LINES
0098  0053                  ;
0099  0053                  ; GET LINE LENGTH AND STORE IN LINEL
0100  0053                  ;
0101  0053  A0 15        LNELP  LDY #$15    ; START AT EOL
0102  0055  B1 FB        GETLP  LDA (SCRPTR),Y ;LOOK FOR LAST
0103  0057  88              DEY             ; NON BLANK FOR LINE
0104  0058  F0 04           BEQ GETRET
0105  005A  C9 20           CMP #$20        ; LENGTH
0106  005C  F0 F7           BEQ GETLP
0107  005E  C8           GETRET INY
0108  005F  C8              INY
0109  0060  8C 35 03        STY LINEL       ;LENGTH OF LINE
0110  0063  A0 00           LDY #$00        ;RE-INIT Y
0111  0065                  ;
0112  0065  B1 FB        LOOP   LDA (SCRPTR),Y ;GET SCREEN CHAR
0113  0067                  ;
0114  0067                  ; **************************
0115  0067                  ; **  OUTPUT A CHARACTER  **
0116  0067                  ; **************************
0117  0067                  ;
0118  0067                  ; IF AT FIRST CHAR ON LINE THEN
0119  0067                  ;   TAB OVER 29 CHARS
0120  0067                  ;
0121  0067  8E 34 03        CONV   STX SAVEX
0122  006A  AA              TAX             ;SAVE CHAR IN X
0123  006B  C0 00           CPY #$00        ;1ST CHAR ON LINE?
0124  006D  D0 0F           BNE CONV1       ;IF SO TAB 29 SPC
0125  006F  A9 10           LDA #$10        ;PRINTCHR$(16)
0126  0071  20 D2 FF        JSR CHROUT
0127  0074  A9 32           LDA #$32        ;TAB 29 CHARS
0128  0076  20 D2 FF        JSR CHROUT
0129  0079  A9 39           LDA #$39
0130  007B  20 D2 FF        JSR CHROUT
0131  007E                  ;
0132  007E                  ; CHECK FOR INVERSE VIDEO
0133  007E                  ;   IF REVERSE THEN SET FLAG AND
0134  007E                  ;   SET PRINTER TO REVERSE
0135  007E                  ;
0136  007E  8A           CONV1  TXA             ;RESTORE CHAR TO A
0137  007F  C9 80           CMP #$80        ;REVERSE CHAR?
0138  0081  90 16           BCC CONV2       ;IF NO, CONTINUE
0139  0083  29 7F           AND #$7F        ;MAKE NORMAL
0140  0085  AA              TAX             ;UPDATE NEW CHAR
0141  0086  A5 FD           LDA RVFLAG
0142  0088  D0 1C           BNE CKCHAR      ;IF ALREADY SET
0143  008A  A9 FF           LDA #$FF
0144  008C  85 FD           STA RVFLAG      ;SET FLAG
0145  008E  A9 12           LDA #$12        ;REVERSE ON
0146  0090  20 D2 FF        JSR CHROUT
0147  0093  38              SEC
0148  0094  B0 10           BCS CKCHAR
0149  0096                  ;
0150  0096  18           INTJMP CLC             ;INTERMEDIATE JUMP
0151  0097  90 BA           BCC LNELP
0152  0099                  ;
0153  0099                  ;
0154  0099                  ; COME HERE ON NOT REVERSED
0155  0099                  ;    IF REVERSE FLAG IS SET, THEN
0156  0099                  ;    UN-SET IT, AND TURN REVERSE OFF
0157  0099                  ;    AT PRINTER
0158  0099                  ;
0159  0099  A5 FD        CONV2  LDA RVFLAG      ;IF REVERSE THEN
0160  009B  F0 09           BEQ CKCHAR      ;   TURN OFF
0161  009D  A9 00           LDA #$00
0162  009F  85 FD           STA RVFLAG
0163  00A1  A9 92           LDA #$92        ;REVERSE OFF
0164  00A3  20 D2 FF        JSR CHROUT
0165  00A6                  ;
0166  00A6                  ; CONVERT TO ASCII AND PRINT
0167  00A6                  ;
0168  00A6  8A           CKCHAR TXA             ;CHAR IN A
0169  00A7  C9 20           CMP #$20        ; ALPHA CHAR?
0170  00A9  90 0D           BCC ALPHA
0171  00AB  C9 40           CMP #$40        ;IS IT SPEC CHAR?
0172  00AD  B0 0D           BCS GRAFIC      ;NO, SO GRAPHICS
0173  00AF  20 D2 FF     PRINT  JSR CHROUT
0174  00B2  AE 34 03        LDX SAVEX
0175  00B5  18              CLC
0176  00B6  90 0F           BCC NXTCHR
0177  00B8                  ;
0178  00B8                  ;
0179  00B8  69 40        ALPHA  ADC #$40        ;ADD 64 AND PRINT
0180  00BA  90 F3           BCC PRINT
0181  00BC                  ;
0182  00BC  C9 60        GRAFIC CMP #$60        ;40<A<60?
0183  00BE  B0 04           BCS HIGH        ; NO EVEN HIGHER
0184  00C0  69 20           ADC #$20        ;ADD 32
0185  00C2  90 EB           BCC PRINT
0186  00C4                  ;
0187  00C4  18           HIGH   CLC             ;IF >96 THEN ADD 64
0188  00C5  90 F1           BCC ALPHA
0189  00C7                  ;
0190  00C7                  ; DONE WITH CHARACTER
0191  00C7                  ;
0192  00C7  C8           NXTCHR INY             ;NEXT CHAR
0193  00C8  CC 35 03        CPY LINEL       ; EOL
0194  00CB  D0 98           BNE LOOP
0195  00CD  A9 0D           LDA #$0D        ;C/R AT EOL
0196  00CF  20 D2 FF        JSR CHROUT
0197  00D2  A9 16           LDA #$16        ; UPDATE PTR
0198  00D4  18              CLC             ; TO NEXT LINE
0199  00D5  65 FB           ADC SCRPTR      ;UPDATE LOW BYTE
0200  00D7  85 FB           STA SCRPTR      ;SAVE IT BACK
0201  00D9  90 02           BCC NEXTL       ;IF CARRY SET, HIGH BYTE
0202  00DB  E6 FC           INC SCRPTR+1    ;  MUST BE UPDATED
0203  00DD  CA           NEXTL  DEX             ;DO NEXT LINE
0204  00DE  D0 B6           BNE INTJMP
0205  00E0                  ;
0206  00E0                  ; **************************
0207  00E0                  ; **     END OF PRINT     **
0208  00E0                  ; **************************
0209  00E0                  ;
0210  00E0  A9 0D           LDA #$0D        ;C/R AT END OF PAGE
0211  00E2  20 D2 FF        JSR CHROUT
0212  00E5  20 D2 FF        JSR CHROUT
0213  00E8  20 CC FF        JSR CLRCHN      ; CLOSE CHANNEL
0214  00EB  A9 08           LDA #$08
0215  00ED  20 C3 FF        JSR CLOSE       ; CLOSE FILE
0216  00F0  A9 00           LDA #$00
0217  00F2  8D 38 03        STA PRFLAG
0218  00F5  4C 18 EB        JMP EXINT       ;INTERRUPT EXIT
0219  00F8                  ;
0220  00F8                     .END

ERRORS = 00000

SYMBOL TABLE

SYMBOL VALUE
 ALPHA   00B8   CHKOUT  FFC9   CHROUT  FFD2   CKCHAR  00A6
 CLOSE   FFC3   CLRCHN  FFCC   CONV    0067   CONV1   007E
 CONV2   0099   EXINT   EB18   GETLP   0055   GETRET  005E
 GRAFIC  00BC   HIGH    00C4   INTJMP  0096   IRQSAV  0336
 IRQVEC  0314   LINEL   0335   LNELP   0053   LOOP    0065
 NEWVEC  001E   NEXTL   00DD   NXTCHR  00C7   OPEN    FFC0
 PRFLAG  0338   PRINT   00AF   PRINTR  002C   RETURN  0029
 RVFLAG  00FD   SAVEX   0334   SCRPGE  004D   SCRPTR  00FB
 SETLFS  FFBA   SETNAM  FFBD   SETVEC  0000

END OF ASSEMBLY
```


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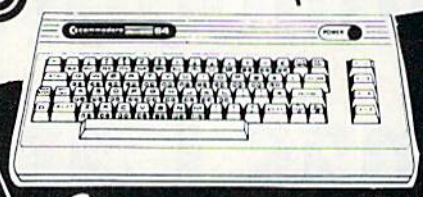

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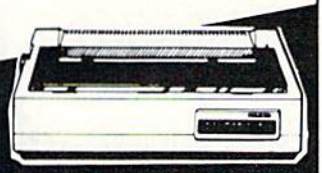

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A Commodore Christmas Carol

BY WILLIAM E. FORRESTER

Before you go Christmas caroling, get in tune with your VIC. This article teaches you several musical programming techniques and gives you Christmas songs that you can enjoy.

The four accompanying Christmas songs make full use of the VIC-20's musical capabilities. The VIC has three independent tone generators, so that musical arrangers can include three-part harmony and counterpoint in their programs. A method for writing music using Data statements and Pokes to the three speakers is described in the *Programmer's Reference Guide*.

The four programs presented here build upon that method of programming, with some modifications designed to simplify programming, improve musical quality or overcome problems not dealt with by the aforementioned methods.

The general method can be seen in Listing 1, which is an arrangement of "We Wish You a Merry Christmas." The critical lines in Listing 1 are 10, 20, 40, 60, 70, 80 and the Data statements. In fact, you don't need anything else to play a straightforward rendition of the song.

Line 10 simply turns the volume up to 6 and labels the alto, tenor and bass voices as S1, S2 and S3, respectively.

Line 20 sets the tempo of the music with the value assigned to TE. Changing that value will speed up or slow down the entire song, without affecting the relative durations of the individual notes. The latter are determined by the variable D, which is defined by the first value in each successive block of four Data points read when line 40 is executed.

In line 60, the value of D is multiplied by TE to produce a third variable (K). The length of time that a given note will be held is then defined by the loop found at line 70.

Line 80 simply says to keep reading the Data and playing the song unless the value of D is equal to −9.

The features described above can be found in each of the four programs, so I won't mention them again. Instead, I'll look at other parts of each program, trying to point out ways to overcome problems that might arise when you program music, and ways to incorporate your individual musical style into your programs.

One...Two...Three...Four...

Listing 1. The For...Next loop, starting at line 30, sets the number of choruses to four. At the end of each loop (line 90), the value of TE is decreased so that the next chorus will be a bit faster than the previous one. The music itself is exactly the same each time through, so the same data can be used following a Restore statement.

During the fourth chorus, there is a point near the end of the song where I wanted a note to be held longer than normal. This is accomplished at line 50, which causes control to pass to a subroutine at line 1000 when the data indicates that D = −1. If you want to really jazz things up a bit, replace the REM statement at line 65 with:

```
FOR V = 15 TO 0 STEP -1: POKE 36878,V: NEXT
```

Listing 2. This program is a rendition of "Silent Night." There are three choruses, defined by the For...Next loop between lines 40 and 106. Instead of the tempo changing for each chorus (as was done in Listing 1), the volume changes each time. Since the second measure of "Silent Night" is identical to the first, it was possible to use the same data for each. This is accomplished with the Restore command at line 60. In addition, measures 7 and 8 are a repetition of measures 5 and 6. Those measures are handled by the subroutine beginning at line 199. The jump to this subroutine occurs at line 70. Note that this subroutine makes use of other subroutines (lines 700–900) that control the note durations.

Listing 3. "The Twelve Days of Christmas" has a unique structure. There are only two musical phrases that are repeated in each of the twelve choruses. The first phrase ("On the____

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VIC-20 (any memory)

day of Christmas, my true love gave to me") is represented by the data through line 300. The second phrase ("a partridge in a pear tree"), which occurs in each chorus, is contained in the data on lines 340 and 380. After the first chorus, different subroutines are called by lines 60–80 and inserted between the two main phrases of the song.

Listing 4. "Dona Nobis Pacem" is a sacred canon that is often associated with Christmas. It is included here to illustrate one way of writing a program for songs of this type. A canon is like a round (e.g., "Row, Row, Row Your Boat") in that a musical phrase is initiated by one voice and duplicated by other voices, which begin after various time delays. Writing a program for this type of musical composition is simplified a bit because the melody is exactly the same for each voice. You only need some way to indicate when each voice should join in. The method employed in Listing 4 is patterned after Jim Butterfield's Brother John program in the Spring 1982 issue of *Power/Play* magazine.

So, now that your VIC-20 is playing music, open your Christmas songbook and sing along. 'Tis the season to be jolly.... R

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Listing 1. *"We Wish You a Merry Christmas" program.*

```
5 PRINT"{SHFT CLR}{5 CRSR DNs}{5 CRSR RTs}W
  E WISH YOU"
6 PRINT:PRINTTAB(10)"A":PRINT
7 PRINT"{3 CRSR RTs}MERRY CHRISTMAS"
10 POKE36878,6 :S1=36876:S2=36875:S3=36874
20 TE=150
30 FORJ=1TO4
40 READD,N1,N2,N3
50 IFD=-1ANDJ=4THENGOSUB1000
60 K=TE*D:POKES1,N1:POKES2,N2:POKES3,N3
65 REM
70 FORT=1TOK:NEXT
80 IFD<>-9THEN40
90 TE=TE-25:RESTORE:NEXT
100 POKE36878,0:END
200 DATA2,201,0,0,1,215,223,215,1,215,223,2
    28,0,0,223,228
240 DATA1,215,223,235,1,219,223,235,1,215,2
    23,235,1,212,223,235
280 DATA1,207,225,225,1,207,225,235,0,0,225
    ,235,2,207,225,240
320 DATA0,0,225,240,2,207,225,240,1,219,227
    ,219,1,219,227,231
360 DATA0,0,227,231,1,219,227,237,1,223,227
    ,235,1,219,227,233
400 DATA1,215,227,231,2,212,228,228,1,201,2
    28,228,1,201,228,240
440 DATA0,0,0,240,1,201,228,239,1,201,228,2
    37,2,223,228,235
480 DATA0,0,228,235,1,223,228,215,1,225,228
    ,215,1,223,225,219
520 DATA1,219,225,219,2,215,228,223,2,225,2
    31,219,-1,225,231,219
560 DATA1,223,228,223,0,0,228,223,1,223,228
    ,223,2,219,231,225
600 DATA2,225,231,225,2,212,225,228,1,215,2
    23,215,1,215,223,228
640 DATA2,215,223,235,-9,0,0,0
1000 FORT=1TO1000:NEXT:TE=200:RETURN
```

Listing 2. *"Silent Night" program.*

```
5 PRINT"{SHFT CLR}{5 CRSR DNs}{4 CRSR RTs}S
  ILENT NIGHT"
10 V=36878:S1=36876:S2=36875:S3=36874
20 TE=400:A=7:B=1
40 FORJ=1TO3:POKEV,A
50 READD,N1,N2,N3
60 IFD=-1ANDB=1THENRESTORE:B=2
70 IFD=-9THENGOSUB199
90 K=TE*D:POKES1,N1:POKES2,N2:POKES3,N3
100 FORT=1TOK:NEXT
101 IFD=-2ANDJ<3THENB=1:GOTO106
102 IFD<>-2THEN50
105 POKEV,0:END
106 RESTORE:A=A-2:NEXT
199 FORI=1TO2
200 POKES1,219:POKES2,225:POKES3,232:GOSUB7
    00:POKES1,0:POKES3,0
210 POKES1,219:POKES3,232:GOSUB800:POKES1,2
    25:POKES3,237:GOSUB750
220 POKES1,223:POKES3,235:GOSUB850:POKES1,2
    19:POKES3,232:GOSUB800POKES2,0
230 POKES1,215:POKES2,225:POKES3,231:GOSUB7
    50
240 POKES1,219:POKES3,232:GOSUB850:POKES1,2
    15:POKES3,231:GOSUB800
250 POKES1,207:POKES2,215:POKES3,225:GOSUB7
    50:POKES2,219:GOSUB850
260 POKES2,215:GOSUB800
270 NEXT:RETURN
500 DATA3,215,231,225,1,219,232,225,0,219,2
    32,0,2,215,231,225
510 DATA3,207,225,235,1,207,225,237,2,207,2
    25,235,-1,207,225,235
520 DATA4,228,223,235,0,0,0,0,2,228,223,235
    ,0,228,0,0
530 DATA3,223,232,235,1,223,232,237,2,223,2
    32,235
540 DATA4,225,231,225,0,0,0,0,2,225,231,225
    ,0,225,0,225
550 DATA2,215,231,240,2,215,231,239,2,215,2
    31,238,-9,0,0,0
560 DATA4,228,232,239,0,0,232,0,2,228,232,2
    39
570 DATA3,232,232,228,1,228,232,239,2,223,2
    32,235

580 DATA6,225,231,240,6,231,235,240,0,231,2
    35,0
590 DATA3,225,231,240,1,215,231,240,2,207,2
    31,240
600 DATA3,215,223,235,1,209,223,235,2,201,2
    23,232
610 DATA{2 SPACEs}4 ,195,215,231,2,195,219,
    232,4,195,215,231,2,0,0,0,-2,0,0,0
700 FORT=1TOTE:NEXT
750 FORT=1TOTE:NEXT
800 FORT=1TOTE:NEXT
850 FORT=1TOTE:NEXT
900 RETURN
```

Listing 3. *"Twelve Days of Christmas" program.*

```
10 POKE36878,5 :S1=36876:S2=36875:S3=36874
20 J=1
```

→

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Listing continued.

```
22 C=36879
25 PRINT"{SHFT CLR}":CO=J+153:IFJ>6THENCO=J
   +211
26 ONJGOSUB611,61Ø,6Ø9,6Ø8,6Ø7,6Ø6,6Ø5,6Ø4,
   6Ø3,6Ø2,6Ø1,6ØØ
28 POKEC,CO
3Ø READD,N1,N2,N3
35 IFD=-9ANDJ=12THEN9999
4Ø IFD=-9THEN5ØØ
6Ø IFD=-1ANDJ>5THEN1ØØØ
7Ø IFD=-1ANDJ=5THEN2ØØØ
8Ø IFD=-1ANDJ>1THENGOSUB8ØØ
9Ø TE=2ØØ:K=TE*D:X=TE/1Ø
95 POKES1,N1:POKES2,N2:POKES3,N3:FORT=1TOK:
   NEXT:GOTO3Ø
1ØØ DATA1,195,Ø,Ø,Ø,Ø,Ø,Ø,Ø,1,195,Ø,Ø,Ø,Ø,Ø,Ø,Ø
14Ø DATA1,195,219,232,1,195,221,235,1,2Ø9,2
    25,237,Ø,Ø,225,237
18Ø DATA1,2Ø9,Ø,Ø,Ø,Ø,Ø,Ø,Ø,1,2Ø9,225,237,1,2
    Ø9,228,238
22Ø DATA1,2Ø7,225,Ø,1,2Ø9,Ø,Ø,1,215,231,24Ø
    ,1,219,231,Ø
26Ø DATAØ,219,Ø,Ø,1,221,231,225,1,215,231,Ø
    ,1,219,232,232
3ØØ DATA1,215,232,231,1,219,232,232,1,221,2
    32,235
32Ø DATA-1,Ø,Ø,Ø
34Ø DATA2,225,232,237,Ø,225,Ø,237,1,228,232
    ,238,1,221,232,238
38Ø DATA1,219,232,24Ø,1,2Ø9,232,24Ø,2,215,2
    31,225,6,2Ø9,219,232
42Ø DATA-9,Ø,Ø,Ø
5ØØ RESTORE:J=J+1:GOTO25
6ØØ PRINT"12 DRUMMERS DRUMMING"
6Ø1 PRINT"{2 CRSR RTs}11 PIPERS PIPING"
6Ø2 PRINT"{CRSR RT}1Ø LORDS A-LEAPING"
6Ø3 PRINT"{3 CRSR RTs}9 LADIES DANCING"
6Ø4 PRINT"{2 CRSR RTs}8 MAIDS A-MILKING"
6Ø5 PRINT"{2 CRSR RTs}7 SWANS A-SWIMMING"
6Ø6 PRINT"{3 CRSR RTs}6 GEESE A-LAYING"
6Ø7 PRINT"{4 CRSR RTs}5 GOLDEN RINGS"
6Ø8 PRINT"{3 CRSR RTs}4 CALLING BIRDS"
6Ø9 PRINT"{4 CRSR RTs}3 FRENCH HENS"
61Ø PRINT"{4 CRSR RTs}2 TURTLE DOVES"
611 PRINT"PARTRIDGE IN PEAR TREE":RETURN
8ØØ FORI=1TOJ-1
81Ø POKES1,225:POKES2,232:POKES3,237:GOSUB4
    ØØØ
82Ø POKES3,238:GOSUB4ØØØ
83Ø POKES1,215:POKES2,231:POKES3,24Ø:GOSUB4
    ØØØ
84Ø POKES1,219:GOSUB4ØØØ
85Ø POKES1,221:POKES3,225:GOSUB35ØØ:NEXT
86Ø POKES1,219:POKES2,232:POKES3,Ø:GOSUB4ØØ
    Ø
87Ø POKES1,221:GOSUB4ØØØ
88Ø RETURN
1ØØØ FORI=1TOJ-5
1Ø1Ø POKES1,225:POKES2,232:POKES3,237:GOSUB
    4ØØØ
1Ø2Ø POKES3,238:GOSUB4ØØØ
1Ø3Ø POKES1,215:POKES2,231:POKES3,24Ø:GOSUB
    4ØØØ
1Ø4Ø POKES1,219:GOSUB4ØØØ
1Ø5Ø POKES1,221:POKES3,225:GOSUB4ØØØ
1Ø6Ø POKES1,215:GOSUB4ØØØ:NEXT
2ØØØ POKES1,225:POKES2,232:POKES3,237:GOSUB
    3ØØØ
2Ø1Ø POKES1,228:POKES2,232:POKES3,236:FORT=
    1TOTE/2+X:NEXT
2Ø2Ø POKES1,223:FORT=1TO3.5*TE+X:NEXT
2Ø3Ø POKES1,225:POKES2,232:POKES3,235:GOSUB
    3ØØØ
2Ø4Ø POKES2,231:POKES3,225:GOSUB3ØØØ
2Ø5Ø POKES1,225:POKES2,237:POKES3,2Ø9:GOSUB
    4ØØØ
2Ø6Ø POKES1,221:POKES2,235:GOSUB4ØØØ
2Ø7Ø POKES1,219:POKES2,232:GOSUB4ØØØ
2Ø8Ø POKES1,215:POKES2,225:GOSUB4ØØØ
2Ø9Ø POKES1,2Ø9:POKES2,219:GOSUB35ØØ
21ØØ POKES1,221:POKES2,221:POKES3,235:GOSUB
    4ØØØ
211Ø POKES2,225:POKES3,237:GOSUB4ØØØ
212Ø POKES1,2Ø1:POKES2,221:GOSUB4ØØØ
213Ø POKES2,225:GOSUB4ØØØ
214Ø POKES1,2Ø9:POKES2,221:POKES3,235:GOSUB
    35ØØ
215Ø POKES1,215:POKES2,231:POKES3,225:GOSUB
    4ØØØ
216Ø POKES1,2Ø9:POKES2,228:GOSUB4ØØØ
217Ø POKES1,2Ø7:POKES2,225:GOSUB4ØØØ
218Ø POKES1,2Ø1:POKES2,215:GOSUB4ØØØ
219Ø POKES1,195:POKES2,2Ø7:GOSUB35ØØ
22ØØ POKES1,219:POKES3,232:POKES2,225:GOSUB
    4ØØØ
221Ø POKES1,221:GOSUB4ØØØ
222Ø GOTO3Ø
3ØØØ FORT=1TO2*TE+X:NEXT
35ØØ FORT=1TOTE+X:NEXT
4ØØØ FORT=1TOTE+X:NEXT:RETURN
9999 POKES3,225:GOSUB35ØØ:POKES3,2Ø9:GOSUB3
    ØØØ:POKE36878,Ø:END
```

Listing 4. *"Dona Nobis Pacem" program.*

```
5 PRINT"{SHFT CLR}{6 CRSR DNs}{3 CRSR RTs}D
  ONA NOBIS PACEM"
2Ø POKE36878,5 :S1=36876:S2=36875:S3=36874
25 FORJ=1TO2
3Ø FORA=5TO3STEP-1
4Ø READD,A(A+Ø),A(A+1),A(A+2)
45 IFJ=2THENS3=36876:S1=36874
5Ø TE=4ØØ:K=TE*D
6Ø POKES1,A(3):POKES2,A(4):POKES3,A(5)
7Ø FORT=1TOK:NEXT
8Ø IFD<>-1THEN4Ø
9Ø RESTORE:NEXT
95 NEXT
1ØØ POKE36878,Ø:END
11Ø DATA1,2Ø9,225,2Ø9,1,195,225,2Ø9,4,219,2
    25,2Ø9,Ø,219,Ø,2Ø9
15Ø DATA1,215,225,2Ø7,1,195,225,2Ø7,4,221,2
    25,2Ø7,Ø,221,Ø,2Ø7
19Ø DATA2,219,225,2Ø9,1,215,221,2Ø9,1,215,2
    21,215,1,2Ø9,219,219
23Ø DATA1,2Ø9,219,221,Ø,Ø,Ø,221,2,2Ø9,219,2
    25,4,2Ø7,215,195
27Ø DATA2,228,228,221,Ø,228,Ø,Ø,1,225,228,2
    21,1,221,228,221
31Ø DATA1,219,228,221,1,215,228,221,2,225,2
    25,219,Ø,225,Ø,Ø
35Ø DATA1,225,225,219,1,221,225,219,2,219,2
    25,219,Ø,Ø,Ø,219
39Ø DATA1,219,225,2Ø7,1,215,221,215,2,2Ø9,2
    19,225,2,2Ø7,215,195
43Ø DATA6,2Ø9,2Ø9,2Ø9,-1,Ø,Ø,Ø
```


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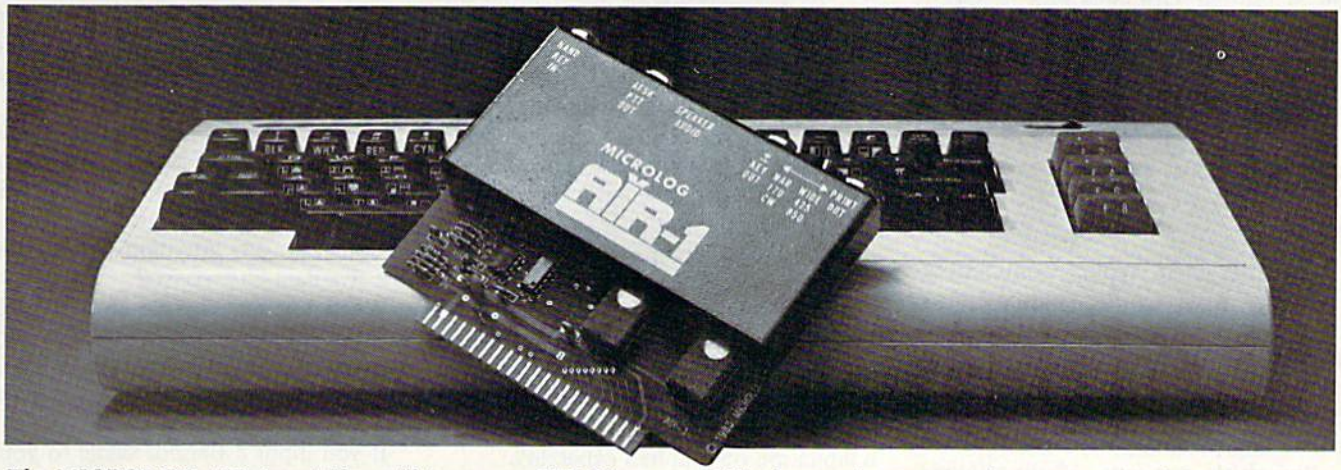

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GATEWAY TO THE WORLD

BY JIM GRUBBS

After a brief hiatus, Gateway author Jim Grubbs returns with a modem program you can use for telecommunications.

In the last article in this series (June 1984), we took a look at how to properly open an RS-232 channel. In this installment you will learn how to make your Commodore computer communicate at nonstandard baud rates and how to make it speak new languages, in addition to its native ASCII. Then, you can put it all to work in a specialized modem program for the Baudot code commonly used for radio Teletype communications.

Baud Rates

Off the shelf, your Commodore computer is all set for common data transmission speeds, such as 300 and 1200 baud. In the example in this article, you will use the so-called 60-words-per-minute Teletype standard, which equals approximately 45.45 baud.

But that's not one of the choices Commodore gives us. So, we'll have to refer to two register locations that will let us implement virtually any desired baud rate. These registers are at decimal addresses 665 and 666.

You can use the following formula to calculate the values to Poke into these registers:

X = INT(1.023E6/B + .5), Q = INT(X/256),
R = 256*(X/256 – Q)

where B is the baud rate, Q is the value to Poke into address 666, and R is the value to Poke into address 665. In the case of 45.45 baud, the values are 236 for R and 87 for Q.

Now you have complete control over the speed at which you will communicate. If you are curious, calculate the values for 300 and 1200 baud. Then, using the register "peeker" utility program from the last installment (June 1984), open an RS-232 channel and look at these two registers. You should come up with the same numbers you calculated using the formulas for Q and R.

Virtually all computers speak in a language called ASCII. ASCII code usually is either a seven- or eight-bit code, though there are a few machines that use even fewer bits. The fewer the number of bits, the fewer distinct characters can be sent. Usually this results in a limitation on graphics capability.

Five-Bit Code

ASCII is by no means the only machine-type code for exchanging data. Gray code, Baudot code and typewriter code are just a few of the others used.

We will be using Baudot code to let the computer speak a new language using the Open statement and a few lines of Basic programming.

Briefly, Baudot code is a five-level code; that is, each character contains five bits. Table 1 shows a binary representation of what the alphabet and numbers look like in Baudot code.

Table 2 is a partial binary representation of ASCII code. Each combination of ones and zeros in the Baudot table has a corresponding combination in the ASCII table, if you ignore the three high-order bits.

From the last installment, you know that you can set the length of the data words. In this case, you should set this value to five bits, which will instruct the computer to pay attention to only the first five data bits received.

When opening the RS-232 channel, you can set the standard speed at any rate you choose. Then, by Poking the Q and R values, you can change the baud rate to 45.45.

If you input a Baudot signal to your computer through the user port, you get what appears to be nice steady garbage on the screen! A closer look, though, will reveal a distinct pattern.

Look at the E in the Baudot table. Those same five bits in the ASCII table translate as an A. If you check with the Baudot transmitting station, you would find that every time an E is transmitted, your computer will print an A.

By carefully examining the Baudot and ASCII tables, you can create a one-

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E	00001	3
*	00010	undefined
A	00011	- (dash)
*	00100	(null)
S	00101	'
I	00110	8
U	00111	7
*	01000	carriage return
D	01001	$
R	01010	4
J	01011	bell
N	01100	,
F	01101	!
C	01110	:
K	01111	(
T	10000	5
Z	10001	"
L	10010	)
W	10011	2
H	10100	#
Y	10101	6
P	10110	0
Q	10111	1
O	11000	9
B	11001	?
G	11010	&
*	11011	* (asterisk)
M	11100	.
X	11101	/
V	11110	;
*	11111	undefined

*line feed, space, carriage return, figures, letters (in that order)

Table 1. *Binary representation of Baudot code. The first column shows the alphabetic character represented by the five-bit binary code that follows. When your receive station is in the "figures" or shifted mode, the character in the last column is printed.*

A	00000001
B	00000010
C	00000011
D	00000100
E	00000101
F	00000110
G	00000111
H	00001000
I	00001001
J	00001010
K	00001011
L	00001100
M	00001101
N	00001110
O	00001111
P	00010000
Q	00010001
R	00010010
S	00010011
T	00010100
U	00010101
V	00010110
W	00010111
X	00011000
Y	00011001
Z	00011010

Table 2. *Alphabetic portion of the ASCII code.*

to-one translation chart. The computer will forever speak ASCII, but you can "force" it to print whatever you want. Plain text will print on your screen from the Baudot transmitting station.

A similar process is used to convert your outgoing ASCII into Baudot, but you must reverse the positions of the two charts, going from ASCII to Baudot. The principle is identical.

Terminal Program

Listing 1 shows a simple Baudot terminal program utilizing the techniques you have learned. After a little screen color changing for the C-64 in line 5, the program opens the RS-232 port for five-bit words with one stop bit at a speed of 50 baud. Line 20 then sets the baud rate to 45.45, which you calculated earlier.

WITH THIS SIMPLE MODEM PROGRAM, YOU AND A FRIEND CAN EXPERIMENT WITH BAUDOT CODE.

You actually have two translators—one for receive (lines 40 and 50) and one for transmit (lines 60 and 70).

In conjunction with the program statements in lines 120, 130, 230 and 250, the translation task is implemented using the translation tables.

Notice the Get# statement in 100. Just like the Get statement, this retrieves a single character of information. By using GET#2, you instruct the computer to get the data from channel 2, which was opened earlier using the RS-232 port.

The corresponding transmit command, Print#, appears in lines 230 and 260. While the Print statement normally sends data to the screen, a Print#2 statement sends the data to channel 2, which is our RS-232 channel.

Two other commands available for our use might, under some circumstances, be used. You could use the CMD instruction to direct all output to the RS-232 port by placing a CMD 2 statement early in the program and then using regular Print statements rather than PRINT#.

It's just like sending a listing to your printer through device number 4. You tell the computer to change the normal output from the screen to the channel you specify.

Finally, you could use the Input# command to retrieve strings of data from an RS-232 channel. The danger is that the system can get hung up in a waiting condition until it receives a non-zero character and a carriage return. In most communications applications, this is not a desirable way of programming.

Numerous Possibilities

With this program, you and a friend can experiment using Baudot code. Remember that one of you must set your modem to the originate mode, while the other is in the answer mode.

This program operates just like any other modem program except that you will find it much slower and find the number of characters available severely limited—no lowercase or graphics, for example. This is because with only five bits there is a maximum of only 32 distinct code combinations.

Baudot code designates one of the 32 combinations as a "shift" signal, almost doubling the number of codes available. This is not readily apparent, since the computer is doing the conversion for you.

If you are familiar with older model Teletype machines, though, such as the model 15, it becomes more clear. Why would anyone want to deliberately "give away" improvements by using such a system?

Thousands of amateur radio operators worldwide still use Baudot code, many military and government services still fill the shortwave bands with Baudot, and the deaf community uses a specialized version of this system in the telecommunications for the deaf system. If you are interested in learning more about any or all of these systems, let me know.

Our software method of code conversion is not necessarily the best way for all applications. It is cheap (how much do a few lines of Basic cost?) and teaches you how the conversions are actually done.

The more electronically inclined among you should be able to make your computer print to that old Teletype machine you have in the garage. The amateurs and shortwave listeners now have

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a simple program for receiving Baudot code using an appropriate receiver fed through a special modem called a terminal unit. You can even adapt the VIC modem for noncritical reception of strong Baudot signals.

Are you interested in code encryption? You can create your own code and translation table for two-way communications. The possibilities are numerous.

In the months ahead, Gateway will include some basic interfacing techniques to connect safely the outside world to your computer. We'll take an in-depth look at using the joystick ports for doing a lot more than playing games. And we'll also discuss some specific control applications for your VIC or C-64. R

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

Listing 1. *Baudot Terminal program.*

```
5 POKE 5328Ø,1:POKE 53281,1:PRINT"{CTRL 1}"
  :REM 64 ONLY
1Ø OPEN 2,2,Ø,CHR$(96+1)+CHR$(Ø)
2Ø POKE 665,236:POKE 666,87
3Ø LF$=CHR$(1Ø):CR$=CHR$(13)
4Ø L$="E"+LF$+"A SIU"+CR$+"DRJNFCKTZLWHYPQO
   BG*MXV*"
5Ø F$="3"+LF$+"- '87"+CR$+"$4',!:(5')2#6Ø19
   ?&*./;*"
6Ø L1$="CYNIAMZTFKOR{LB.}LXVWJEPG{UP ARROW}
   S]UQ"
7Ø F1$="MDTIDZQORDDLC{LB.}]VWSAJPUGFXN{UP A
   RROW}DDDYD"
8Ø PRINT"{SHFT CLR}GATEWAY TTY 6Ø WPM"
9Ø LS=-1
1ØØ GET#2,C$:IF C$=""THEN 15Ø
11Ø C=ASC(C$):IF C<1 OR C>31 THEN 1ØØ
12Ø IF LS THEN C$=MID$(L$,C,1)
13Ø IF NOT LS THEN C$=MID$(F$,C,1)
14Ø IF C$<>"*" THEN PRINT C$;:GOTO 1ØØ
145 LS=(C=31):GOTO 1ØØ
15Ø GET X$:IF X$=""THEN 1ØØ
16Ø IF X$=CHR$(34)THEN X$=CHR$(39)
17Ø PRINT X$;
18Ø IF X$=CHR$(13) THEN PRINT#2,"H";:GOTO 1
   5Ø
19Ø IF X$=CHR$(1Ø) THEN PRINT#2,"B";:GOTO 1
   5Ø
2ØØ IF X$=CHR$(32) THEN PRINT#2,"D";:GOTO 1
   5Ø
21Ø X=ASC(X$)
22Ø IF X<33 THEN GOTO 15Ø
23Ø IF X<65 THEN X=X-32:X$=CHR$(91)+MID$(F1
   $,X,1):PRINT#2,X$+CHR$(95);:GOTO 15Ø
24Ø IF X>95 THEN GOTO 15Ø
25Ø X=X-64:X$=MID$(L1$,X,1)
26Ø PRINT#2,X$;
27Ø GOTO 15Ø
3ØØ REM *************
3Ø1 REM *
3Ø2 REM * GATEWAY TTY
3Ø3 REM *
3Ø4 REM * JIM GRUBBS
3Ø5 REM * PO BOX 3Ø42
3Ø6 REM * SPRINGFIELD
3Ø7 REM * IL 627Ø8
3Ø8 REM *
3Ø9 REM *************
```

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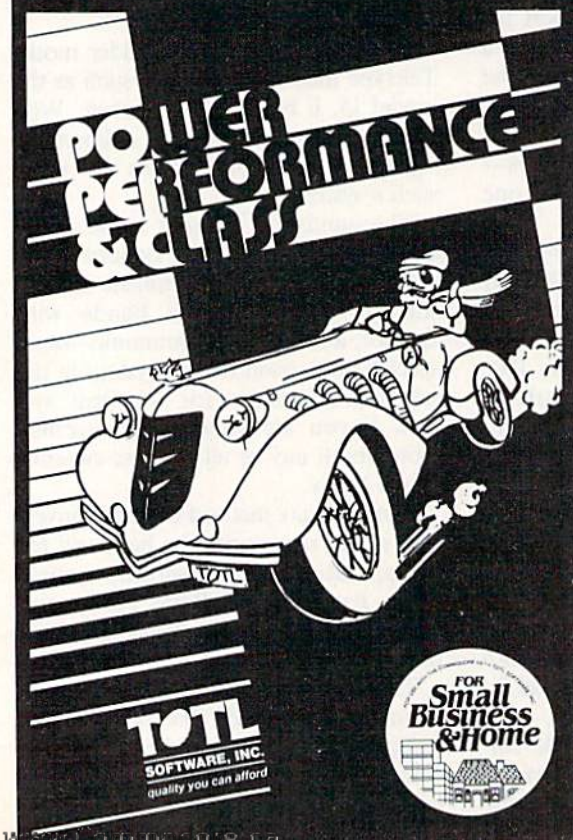

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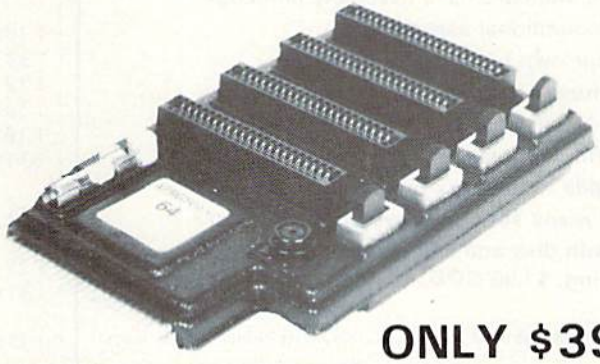

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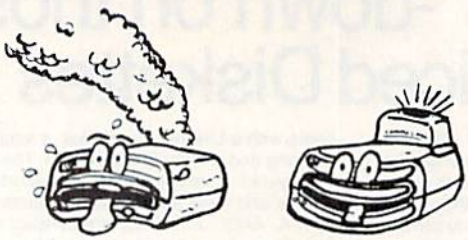

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(from p. 92)

```
1226 INPUT#5,RW
1228 FORI=1TORW:FORN=1TO3
123Ø INPUT#5,ML$(I,N):GOSUB1316
1232 NEXTN
1234 NEXTI
1236 S=ST:IFS<>ØTHEN124Ø
1238 INPUT#5,E$
124Ø CLOSE5:CLOSE15
1242 GOTO117Ø
1244 REM-----PRINT SAMPLE LABELS
1246 PRINT"{SHFT CLR}INSERT SINGLE ROW TRAC
     TOR FEED LABELS"
1248 PRINT"{CRSR DN}RUN TEST LABELS TO HELP
      POSITION LABELS
125Ø PRINT"{2 CRSR DNs}PRESS {CTRL 9}T{CTRL
     Ø}EST LABEL
1252 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}C{CTR
     L Ø}HOOSE RECORDS
1254 GETA$:IFA$=""THEN1254
1256 IFA$="C"THEN1Ø4Ø
1258 IFA$<>"T"THEN1254
126Ø FORI=1TORW:FORJ=1TOLW:PRINT#4,"*";:NEX
     TJ:PRINT#4,B1$;:NEXTI
1262 FORI=1TOT%-RW:PRINT#4,B1$;:NEXTI
1264 GOTO1246
1266 REM----PRINT LABELS
1268 FORJ=1TORW:F1=VAL(ML$(J,1)):F2=VAL(ML$
     (J,2)):F3=VAL(ML$(J,3))
127Ø PRINT#4,LEFT$(REC$(K%(I),F1)+B$+REC$(K
     %(I),F2)+B$+REC$(K%(I),F3),LW)
1272 NEXTJ
1274 FORS=1TOT%-RW:PRINT#4,B1$;:NEXTS
1276 RETURN
1278 REM----CHOOSE LABEL SIZE
128Ø PRINT"{SHFT CLR} {CTRL 9}{12 SPACEs}LA
     BEL SIZE{15 SPACEs}{CTRL Ø}"
1282 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}S{CTR
     L Ø}TANDARD - 5 ROWS PER LABEL"
1284 PRINT"{6 SPACEs}15/16 INCH BY 3 1/2 IN
     CHES"
1286 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}L{CTR
     L Ø}ARGE{4 SPACEs}- 8 ROWS PER LABEL"
1288 PRINT"{6 SPACEs}1 7/16 INCH BY 3 1/2 I
     NCHES"
129Ø PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}O{CTR
     L Ø}THER{4 SPACEs}- CUSTOM LABEL SIZE
     OR"
1292 PRINT"{6 SPACEs}NUMBER OF CHARACTERS P
     ER ROW"
1294 PRINT"{2 CRSR DNs} NOTE: LABELS ARE SE
     PARATED BY ONE ROW"
1296 PRINT" 32 CHARACTERS PER ROW IS STANDA
     RD"
1298 PRINT"{CRSR DN} {CTRL 9}{6 SPACEs}PRES
     S THE APPROPRIATE KEY{7 SPACEs}"
13ØØ GETC$:IFC$=""THEN13ØØ
13Ø2 IFC$="S"THENT%=6:RETURN
13Ø4 IFC$="L"THENT%=9:RETURN
13Ø6 IFC$="O"THEN131Ø
13Ø8 GOTO13ØØ
131Ø INPUT"{CRSR DN} ENTER NUMBER OF ROWS O
     N LABEL";T%:RW=T%:T%=T%+1
1312 INPUT" ENTER # OF CHARACTERS PER ROW";
     LW:RETURN
1314 REM----DISK ERROR CHECK
1316 INPUT#15,EN,EM$,ET,ES:IFEN<2ØTHENRETUR
     N
1318 PRINT"{CRSR DN} {CTRL 9}DISK ERROR{CTR
     L Ø}"EN"{CRSR LF}, "EM$","ET"{CRSR LF}
     ,"ES
132Ø PRINT"{CRSR DN} PRESS {CTRL 9}ANY KEY{
     CTRL Ø} TO RETURN TO MENU"
1322 GETA$:IFA$=""THEN1322
1324 CLOSE5:CLOSE15:GOTO11Ø2
```


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Listing 2. *DFReport program.*

```
5ØØ REM-DATAFILE 2.6 SUBPROGRAM DFREPORT BY
    MIKE KONSHAK
5Ø2 REM-FOR 1525, MPS8Ø1, GEMINI1ØX, OKIDAT
    A92A EPSONRX8Ø AND OTHERS
5Ø4 OPEN4,4:CR$=CHR$(13):B$=CHR$(32):B1$=CH
    R$(1Ø):IFPW=ØTHENPW=8Ø
5Ø6 GOTO614
5Ø8 REM----LOAD SUBPROGRAMS
51Ø PRINT"{SHFT CLR}{2 CRSR DNs}{7 SPACEs}L
    OADING MAIN PROGRAM"
512 LOAD"DATAFILE",8
514 PRINT"{SHFT CLR}{2 CRSR DNs}{2 SPACEs}L
    OADING MAILING LABEL SUBPROGRAM"
516 LOAD"DFMAIL",8
518 REM----QUIT ROUTINE
52Ø PRINT"{SHFT CLR}{2 CRSR DNs}QUITTING NO
    W WILL ERASE CURRENT DATA"
522 PRINT"{CRSR DN}ARE YOU SURE YOU WANT TO
     QUIT?":PRINT"{2 CRSR DNs} {CTRL 9}Y{CT
    RL Ø} OR {CTRL 9}N{CTRL Ø} ?
524 GETA$:IFA$="" THEN524
526 IFA$="N"THEN614
528 IFA$="Y"THEN532
53Ø GOTO524
532 PRINT"{SHFT CLR}{2 CRSR DNs}SUBPROGRAM
    TERMINATED"
534 PRINT"{CRSR DN}{CTRL 9}DATAFILE{CTRL Ø}
     BY MIKE KONSHAK (C)1983":END
536 REM----SEARCH ROUTINES MENU
538 PRINT"{SHFT CLR} {CTRL 9}{11 SPACEs}PRI
    NT OPTIONS MENU{8 SPACEs}"
54Ø PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}A{CTRL
    Ø}LL RECORDS IN FILE
542 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}S{CTRL
    Ø}ELECT INDIVIDUAL RECORD
544 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}F{CTRL
    Ø}IND RECORDS WITH COMMON FIELDS
546 PRINT"{CRSR DN}{4 SPACEs}{CTRL 9}E{CTRL
    Ø}XIT TO MAIN MENU
548 PRINT"{CRSR DN}POSITION PAPER IN PRINTE
    R AT TOP OF PAGE"
55Ø PRINT"PRINTER MAY STOP DURING PRINTING
    IF THE"
552 PRINT"COMPUTER NEEDS TO REALLOCATE MEMO
    RY."
554 PRINT"{CRSR DN} {CTRL 9}{6 SPACEs}PRESS
     THE APPROPRIATE KEY{7 SPACEs}"
556 GETC$:IFC$="" THEN556
558 IFC$="A"THEN6Ø6
56Ø IFC$="S"THEN57Ø
562 IFC$="F"THEN58Ø
564 IFC$="E"THEN614
566 GOTO556
568 REM----SELECT ONE RECORD
57Ø INPUT"{SHFT CLR}{CRSR DN}PRINT WHICH RE
    CORD";I$:I=VAL(I$)
572 IFI>XTHENPRINT"NO SUCH RECORD EXISTS, T
    RY AGAIN{3 CRSR UPs}":GOTO57Ø
574 IFK=2THENGOSUB81Ø:GOSUB824:GOSUB842:PRI
    NT#4,B1$;:GOTO538
576 GOSUB798:PRINT#4,B1$;:GOTO538
578 REM----FIND RECORD (SEARCH)
58Ø PRINT"{SHFT CLR}{CRSR DN} {CTRL 9}{4 SP
    ACEs}FIND RECORDS WITH COMMON ITEMS{4 S
    PACEs}{CRSR DN}"
582 FOR N=1TOF:PRINT" {CTRL 9}";N;"{CTRL Ø}
     ";F$(N):NEXTN
584 INPUT"{CRSR DN}WHICH FIELD IS TO BE SEA
    RCHED";SF
586 IFSF<ØORSF>FTHENPRINT"{3 CRSR UPs}":GOT
    O584
588 PRINT"ENTER {CTRL 9}COMMON ITEM{CTRL Ø}
     ":PRINT"(THE ENTIRE STRING IS NOT REQU
    IRED)"
59Ø PRINT"{CTRL 9}";F$(SF);"{CTRL Ø} ";:INP
    UTT$
592 IFK=2THENGOSUB81Ø:GOSUB824
594 FORI=1TOX
596 PRINT"{CRSR DN}SEARCHING RECORD";I;"{2
    CRSR UPs}"
598 IFT$=LEFT$(REC$(K%(I),SF),LEN(T$))THENO
    NKGOSUB798,842
6ØØ NEXTI
6Ø2 PRINT#4,B1$;:GOTO538
6Ø4 REM----PRINT ALL RECORDS
6Ø6 PRINT"{SHFT CLR}{CRSR DN} PRINTING HEAD
    ING":IFK=2THENGOSUB81Ø:GOSUB824
6Ø8 FORI=1TOX:PRINT"{CRSR UP} PRINTING RECO
    RD #";I:ONKGOSUB798,842:NEXTI
61Ø PRINT#4,B1$;:GOTO538
612 REM----PRINT RECORDS MENU
614 PRINT"{SHFT CLR} {CTRL 9}{8 SPACEs}REPO
    RT PRINTOUT MENU{1Ø SPACEs}"
616 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}L{CTRL
    Ø}IST RECORDS UNFORMATTED"
618 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}P{CTRL
    Ø}RE-DEFINED FORMAT OR"
62Ø PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}D{CTRL
    Ø}EFINE NEW FORMAT"
622 PRINT"{2 CRSR DNs}{6 SPACEs}{CTRL 9}E{C
    TRL Ø}XIT TO MAIN PROGRAM OR"
624 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}M{CTRL
    Ø}AILING LABEL PROGRAM"
626 PRINT"{CRSR DN}{6 SPACEs}{CTRL 9}Q{CTRL
    Ø}UIT PROGRAM"
628 PRINT"{2 CRSR DNs} {CTRL 9}{6 SPACEs}PR
    ESS THE APPROPRIATE KEY{7 SPACEs}"
63Ø GETC$:IFC$="" THEN63Ø
632 IFC$="L"THENK=1:GOTO538
634 IFC$="P"THENK=2:GOTO766
636 IFC$="E"THENPRINT#4:CLOSE4:GOTO51Ø
638 IFC$="M"THENPRINT#4:CLOSE4:GOTO514
64Ø IFC$="D"THENK=2:GOTO646
642 IFC$="Q"THENPRINT#4:CLOSE4:GOTO52Ø
644 GOTO63Ø
646 PRINT"{SHFT CLR}{CRSR DN}{CTRL 9}REPORT
     SIZE{CTRL Ø} UP TO 136 CHARACTER WIDE.
    "
648 PRINT"{CRSR DN}PRINTER MUST BE INITIALI
    ZED FOR WIDTHS"
65Ø PRINT"GREATER THAN 8Ø CHARACTERS. CHECK
     YOUR"
652 PRINT"PRINTER MANUAL TO HOW TO PRINT 13
    6 CHRS"
654 PRINT"{CRSR DN}NUMBER OF CHARACTERS?":P
    RINT"?{3 SPACEs}{3 CRSR LFs}";PW:INPUT"
    {CRSR UP}";PW
656 IFPW>136THEN654
658 PRINT"{SHFT CLR}{CRSR DN}{CTRL 9}TITLE
    FORMAT{CTRL Ø} UP TO 4 TITLE LINES OF"
66Ø PRINT"INFORMATION AT THE TOP OF THE FOR
    M."
662 PRINT"{CRSR DN}NUMBER OF LINES?":PRINT"
    ?{3 SPACEs}{3 CRSR LFs}";NL:INPUT"{CRSR
     UP}";NL:IFNL>4THEN662
664 FORJ=1TONL:PRINT"TITLE #";J:PRINT"? >{2
     SPACEs}{3 CRSR LFs}";TT$(J)
666 IFLEN(TT$(J))>37THENPRINT"{CRSR UP}";
668 INPUT"{CRSR UP}";TT$(J):IFTT$(J)=""THEN
    TT$(J)=">"
67Ø NEXTJ
672 PRINT"{SHFT CLR}{CTRL 9}COLUMN FORMAT{C
    TRL Ø} UP TO 8 COLUMNS WITH 2"
673 PRINT"SPACES BETWEEN COLUMNS"
674 PRINT"{CRSR DN}NUMBER OF COLUMNS?":PRIN
    T"?{3 SPACEs}{3 CRSR LFs}";NC:INPUT"{CR
    SR UP}";NC:IFNC>8THEN674
676 FORJ=1TONC:PRINT"POSITION OF COLUMN #";
```

→

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Listing 2 continued.

```
    J:PRINT"?{3 SPACEs}{3 CRSR LFs}";PC(J)
678 INPUT"{CRSR UP}";PC(J):NEXTJ
68Ø PRINT"{SHFT CLR}{CTRL 9}HEADING FORMAT{
    CTRL Ø} COLUMN HEADINGS CANNOT"
682 PRINT"EXCEED WIDTH OF COLUMNS:{CRSR DN}
    "
684 FORJ=1TONC:PRINT"COLUMN";J;" HEADING";
686 IFJ=NCTHENPRINT8Ø-PC(J);:GOTO69Ø
688 PRINTPC(J+1)-2-PC(J);
69Ø PRINT" CHARACTERS WIDE"
692 PRINT"? >{2 SPACEs}{3 CRSR LFs}";HC$(J)
    :INPUT"{CRSR UP}";HC$(J):IFHC$(J)=""THE
    NHC$(J)=">"
694 NEXTJ
696 PRINT"{SHFT CLR}CHOOSE WHICH FIELDS GO
    UNDER THE COLUMNS"
698 PRINT"ENTER {CTRL 9}Ø{CTRL Ø} IF ADDITI
    ONAL FIELDS ARE":PRINT"NOT DESIRED."
7ØØ FORN=1TOF:PRINT"{CTRL 9}";N;"{CTRL Ø} "
    ;F$(N):NEXTN
7Ø2 FORJ=1TONC:PRINT"{HOME}{4 CRSR DNs}";TA
    B(25)"COLUMN";J;"{2 CRSR DNs}"
7Ø4 FORL=1TO3:PRINTTAB(25)"{CRSR UP}FIELD";
    L;" Ø {2 CRSR LFs}";ML$(J,L)
7Ø6 PRINTTAB(32);"{CRSR UP}";:INPUTML$(J,L)
7Ø8 NEXTL
71Ø NEXTJ
712 PRINT"{SHFT CLR}{2 CRSR DNs}DO YOU WISH
     TO REVIEW YOUR FORMAT AND/OR"
714 PRINT"MAKE CORRECTIONS?{2 SPACEs}PRESS
    {CTRL 9}Y{CTRL Ø} OR {CTRL 9}N{CTRL Ø}"
716 GETA$:IFA$=""THEN716
718 IFA$="Y"THEN646
72Ø IFA$="N"THEN726
722 GOTO716
724 REM----SAVE REPORT FORMAT
726 PRINT"{CRSR DN} {CTRL 9}SAVE FORMAT{CTR
    L Ø}?{12 SPACEs}{CTRL 9}Y{CTRL Ø} OR {C
    TRL 9}N{CTRL Ø}"
728 GETA$:IFA$=""THEN728
73Ø IFA$="N"THEN538
732 IFA$="Y"THEN736
734 GOTO728
736 PRINT"{CRSR DN}SAVE UNDER WHAT FILE NAM
    E?"
738 PRINT"{CRSR DN}{2 SPACEs}";NF$:INPUT"{C
    RSR UP}";NF$:IFNF$=""THEN614
74Ø OPEN15,8,15:PRINT#15,"SØ:RP] "+NF$:GOSU
    B876
742 OPEN5,8,5,"Ø:RP] "+NF$+",S,W":GOSUB876
744 PRINT#5,PW;CR$;NL;CR$;NC:GOSUB876
746 FORJ=1TONL
748 PRINT#5,TT$(J):GOSUB876
75Ø NEXTJ
752 FORI=1TONC
754 PRINT#5,PC(I);CR$;HC$(I):GOSUB876
756 FORN=1TO3
758 PRINT#5,ML$(I,N):GOSUB876
76Ø NEXTN:NEXTI
762 PRINT#5,E$:GOSUB876:CLOSE5:CLOSE15:GOTO
    538
764 REM----LOAD REPORT FORMAT
766 PRINT"{2 CRSR DNs}LOAD FORMAT FROM WHAT
     FILE?"
768 PRINT"{CRSR DN}{2 SPACEs}";NF$:INPUT"{C
    RSR UP}";NF$:IFNF$=""THEN614
77Ø OPEN15,8,15:OPEN5,8,5,"Ø:RP] "+NF$+",S,
    R":GOSUB876
772 INPUT#5,PW,NL,NC:GOSUB876
774 FORJ=1TONL
776 INPUT#5,TT$(J):GOSUB876
778 NEXTJ
78Ø FORI=1TONC
782 INPUT#5,PC(I),HC$(I):GOSUB876
```


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Listing 2 continued.

```
784 FORN=1TO3
786 INPUT#5,ML$(I,N):GOSUB876
788 NEXTN:NEXTI
790 S=ST:IFS<>0THEN794
792 INPUT#5,E$
794 CLOSE5:CLOSE15:GOTO712
796 REM----PRINT NONFORMATTED LISTING
798 PRINT#4,"[ RECORD #";I;"{3 SPACEs}]";:F
    ORJ=1TO62:PRINT#4,"-";:NEXTJ:PRINT#4,B1
    $;
800 FORN=1TOF
802 PRINT#4,F$(N);:FORJ=1TO20-LEN(F$(N)):PR
    INT#4,".";:NEXTJ
804 PRINT#4,REC$(K%(I),N)
806 NEXTN:PRINT#4,B1$;:RETURN
808 REM----PRINT REPORT
810 PG=0:S$="":FORJ=1TOPW:S$=S$+B$:NEXTJ
812 FORJ=1TONL:IFTT$(J)<>">"THENGOSUB818
814 NEXTJ:RETURN
816 REM----CENTER TITLE
818 B=INT((PW-LEN(TT$(J)))/2)
820 PRINT#4,LEFT$(S$,B)+TT$(J);B1$;:PG=PG+1
    :RETURN
822 REM----POSITION HEADINGS
824 GOSUB838:PC(NC+1)=PW+3:CW=PC(2)-2-PC(1)
    :IFPC(1)>1THEN828
826 PRINT#4,LEFT$(HC$(1),CW);:GOTO830
828 PRINT#4,LEFT$(S$,PC(1)-1)+LEFT$(HC$(1),
    CW);
830 FORJ=2TONC:M=PC(J)-LEN(LEFT$(HC$(J-1),P
    C(J)-2-PC(J-1)))-PC(J-1)
832 PRINT#4,LEFT$(S$,M)+LEFT$(HC$(J),PC(J+1
    )-2-PC(J));
834 NEXTJ:PRINT#4,B1$;:GOSUB838:PG=PG+3:RET
    URN
836 REM----PRINT DASHED LINE
838 FORJ=1TOPW:PRINT#4,"-";:NEXTJ:PRINT#4,B
    1$;:RETURN
840 REM----PRINT FILE DATA
842 F1=VAL(ML$(1,1)):F2=VAL(ML$(1,2)):F3=VA
    L(ML$(1,3)):CW=PC(2)-2-PC(1)
844 IFPC(1)>1THEN850
846 PRINT#4,LEFT$(REC$(K%(I),F1)+B$+REC$(K%
    (I),F2)+B$+REC$(K%(I),F3),CW);
848 GOTO854
850 PRINT#4,LEFT$(S$,PC(1)-1);
852 PRINT#4,LEFT$(REC$(K%(I),F1)+B$+REC$(K%
    (I),F2)+B$+REC$(K%(I),F3),CW);
854 FORJ=2TONC:CW=PC(J)-2-PC(J-1)
856 F1=VAL(ML$(J-1,1)):F2=VAL(ML$(J-1,2)):F
    3=VAL(ML$(J-1,3))
858 M=LEN(LEFT$(REC$(K%(I),F1)+B$+REC$(K%(I
    ),F2)+B$+REC$(K%(I),F3),CW))
860 M=PC(J)-M-PC(J-1):CW=PC(J+1)-2-PC(J)
862 PRINT#4,LEFT$(S$,M);
864 F1=VAL(ML$(J,1)):F2=VAL(ML$(J,2)):F3=VA
    L(ML$(J,3))
866 PRINT#4,LEFT$(REC$(K%(I),F1)+B$+REC$(K%
    (I),F2)+B$+REC$(K%(I),F3),CW);
868 NEXTJ:PRINT#4,B1$;:PG=PG+1
870 IFPG=60THENFORJ=1TO6:PRINT#4,B1$;:NEXTJ
    :PG=0:GOSUB824
872 RETURN
874 REM----DISK ERROR CHECK
876 INPUT#15,EN,EM$,ET,ES:IFEN<20THENRETURN
878 PRINT"{CRSR DN} {CTRL 9}DISK ERROR{CTRL
    0}"EN"{CRSR LF}, "EM$","ET"{CRSR LF},"
    ES
880 PRINT"{CRSR DN} PRESS {CTRL 9}ANY KEY{C
    TRL 0} TO RETURN TO MENU"
882 GETA$:IFA$=""THEN882
884 CLOSE5:CLOSE15:GOTO614
```


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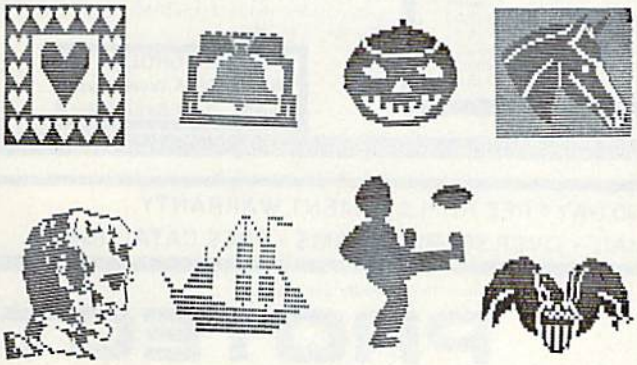

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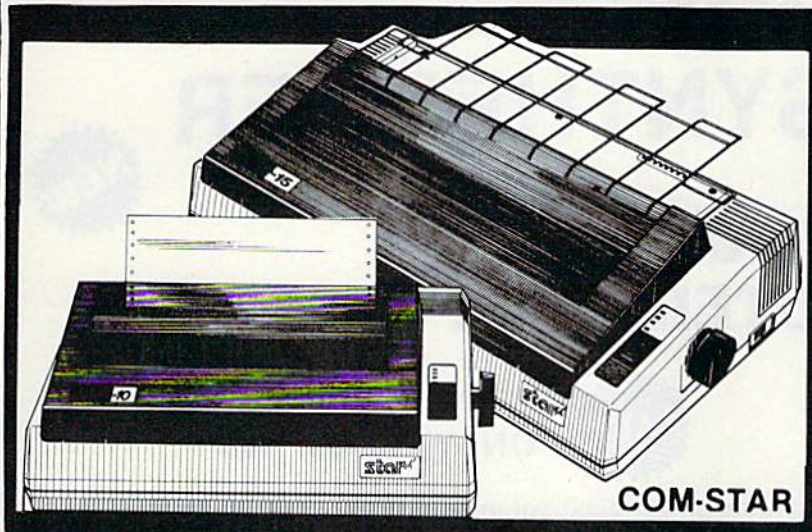

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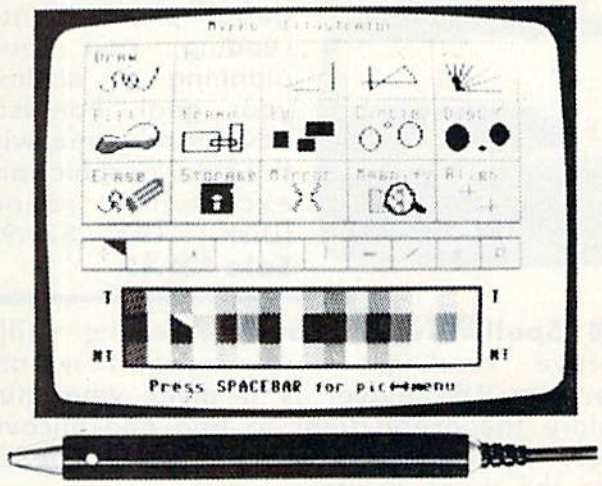

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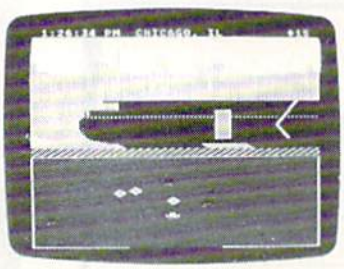
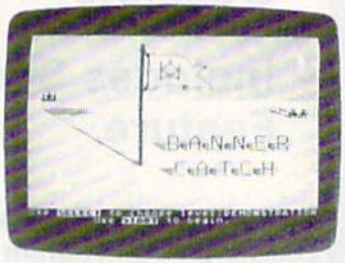
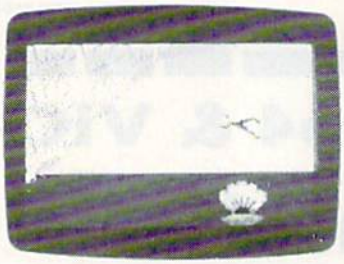


0804 Banner Catch. This one even teaches Binary numbers. Players must work together as a team in this capture the flag game where you must get Max's flag before his robot raiders get yours. Fantastic play action and teamwork and cooperation skills make this a must for everyone. (Disk.) List $34.95. **Sale $24.95.**



0808 Spell Diver. Sharpen spelling skills, improve reading, word recognition and retention. The player is a diver who must explore the ocean floor to find and uncover letters. The more quickly a player can guess a word the more points are scored. Sea creatures and other dangerous surprises plus a time limit make it more exciting. Fantastic graphics and sound. (Disk.) List $34.95. **Sale $24.95.**



0812 Double Feature Adventure. Two full color graphic adventures that allow the player to choose among danger, humor, excitement and chance. Plus these programs make the players stars of the adventure. Explore the microzone or the Northwoods while improving reading skills and building vocabulary. (Disk.) List $29.95. **Sale $17.95.**

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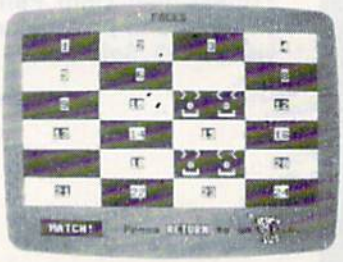

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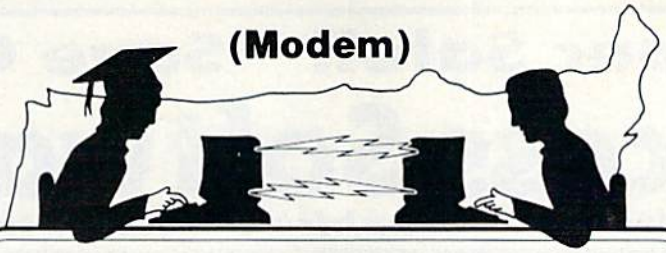

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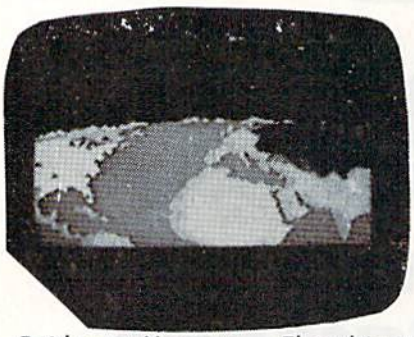
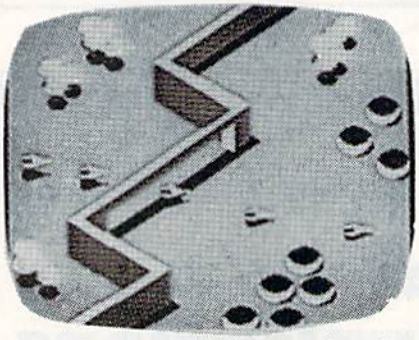
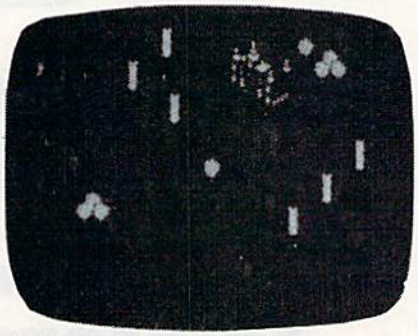

Raid over Moscow — The ultimate in multi screen computer graphics has arrived. (over six screens) The Soviets have launched an attack. First you must locate and destroy the ICBM missiles from your Stealth Bomber, then you must lead your squadron through the Soviet terrain to the Kremlin itself. Destroy the defenses, then destroy the defense center and finally the attack operations themselves. Fly planes, launch grenades, shoot bazookas. Super Fantastic Graphics, Sound, Animation. **(The best multi-level game we've seen!!!)** List $39.95. **Sale $29.95.** (Disk.) *Coupon $26.95.*

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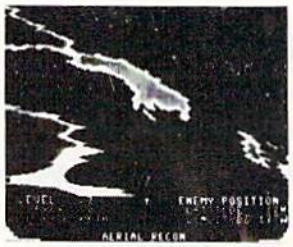

Actual Screens

Actual Screens

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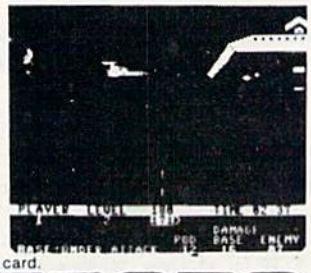

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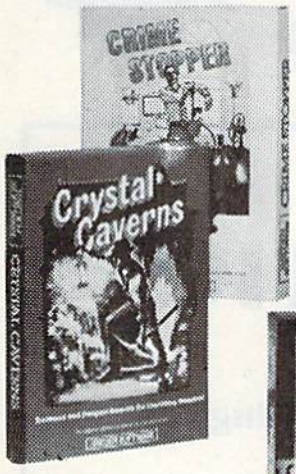

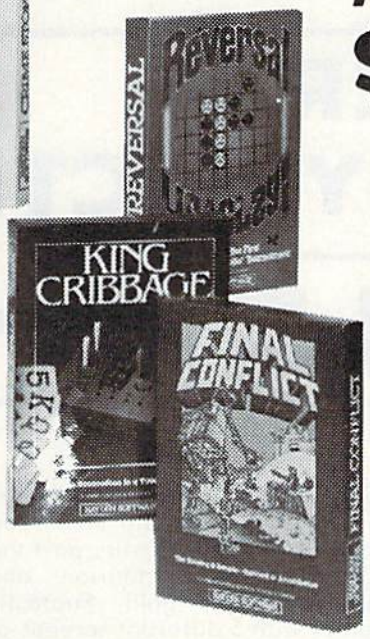

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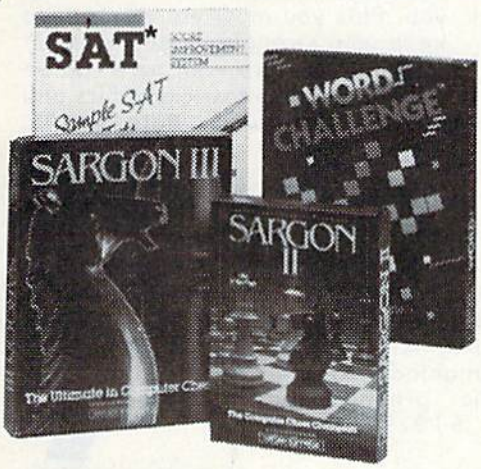

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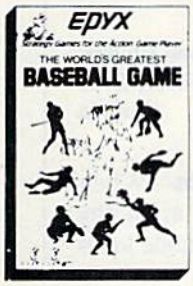

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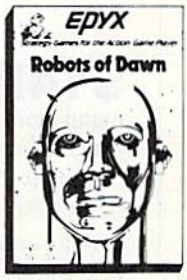

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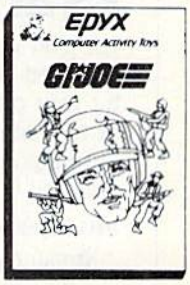

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Magic

From p. 12

Clever programmers can print up to *ten* Direct mode lines, with proper spacing between them, then put CHR$(13)'s into the buffer, causing all those lines to be executed. The key to success is careful placement of the screen commands and careful positioning of the cursor at the moment the program ends.

Several of this month's tricks incorporate the dynamic keyboard technique. Now that we've explained it, try to figure out how they work.

Fobert E. Peary
Cresson, PA

$14B List Magic—If you execute the List command from within a program, the listing will take place, but program execution will stop. You can use the following routine to Poke the word RUN into the keyboard buffer, and to execute the run as soon as the list is finished.

```
10 FOR I=631 TO 634 : READ A : POKE I,A : NEXT : POKE 198,4
20 DATA 82, 85, 78, 13
30 LIST
```

Craig Lewis
Address unknown

$14C Good listing from bad lines—Did you ever get a Syntax error without finding an error in the indicated line? Not all keyboard entries show up when you list your program, and the secret to debugging success may be to reenter the suspected line. For example, enter the following program, purposely misspelling PRINT by inserting a shifted Q between the I and the N:

```
100 PRI[shift Q]NT "DOUG HENNING"
```

When you try to run the program, you'll get a Syntax error. List the program to find the error, and you won't be able to see it. Surprised? The shifted Q didn't show up at all! To fix this problem, retype your line. To fix it with less effort, move your cursor up to the listed line, then press the return key.

L.A. Gerig
Monroeville, IN

$14D C-64 slow lister—You can slow the listing on a C-64 by entering:

```
POKE 56324,28 : POKE 56325,0
```

When you ask for a listing, the computer may seem to stall for a moment, but give it time and it'll start a very slow list. To make things even slower, press the CTRL key or Poke a lower number into 56324. To return the computer to its normal mode, press the stop and restore keys simultaneously.

Thomas J. Tennant
Louisville, KY

$14E Loading from within a program—It's often desirable to split programs into two parts, usually to save space in memory. You can load program #2 by executing the Load command from within program #1, but you must take some precautions. When one program loads another, the second program *must* be shorter than the first. (You can use the FRE function to compare the programs' lengths.) Some side effects of this process are that the second program is executed automatically after it's loaded, and any variables used in program #1 retain their values when program #2 is executed.

If you're loading from tape, you can get around the program length restriction and avoid both side effects, by putting the following line at the start of program #2.

```
0 POKE 45,PEEK(174) : POKE 46,PEEK(175) : CLR
```

If you modify a program to which this line has been added, you *must* remove the line before executing the modified program. Failing to do that will cause an unrecoverable disaster.

Anne Phillips
New Denver, B.C.
Canada

$14F Dynamic keyboard loads—When loading one program from another, you can avoid the length restrictions and side effects of Program mode loads by using this:

```
5000 PRINT "LOADING [3 CRSR DNs]"
5010 PRINT "LOAD"CHR$(34)"programname"CHR$(34)",8[3
     CRSR UPs]"
5020 POKE 631,13 : POKE 632,82 : POKE 633,85 : POKE 634,78 :
     POKE 635,13 : POKE 198,5 : END
```

When executed, this will act as if you typed the Load command on the keyboard and then typed RUN when it was complete. If you use tape rather than disk, replace the 8 in line 5010 with a 1.

P.R.D.
Hales Corners, Wisconsin

$150 Easiest Program mode load—If you are using a Datassette, the easiest way to load and run one program from another is this:

```
100 POKE 631,131 : POKE 198,1
```

It has the same effect as pressing the shifted run/stop key.

Craig Lewis
Address Unknown

$151 Easy load and save—If you're copying a program from one disk to another, you first load it by entering LOAD"programname",8. When the time comes to save it again, just type SAVE over the former LOAD, then hit the return key. It saves your having to retype the program name and drive number. To save even more, use L [shift O] as an abbreviation for the Load command, and S [shift A] as an abbreviation for the Save command.

Walter Dickerson
Brick, NJ

$152 Multiple saves—You can make multiple copies of a program by putting the Save command in a For...Next loop, such as

```
FOR I=1 TO 3 : SAVE "HARRY ALBACKER" : NEXT
```


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You can even number each copy:

```
FOR I=1 TO 4 : SAVE "THE GREAT CARSONI"+STR$(I) : NEXT
```

David C. O'Sada
Jacksonville, FL

$153 Multiple verify—The Verify command works nicely in a For...Next loop, too. If the verification fails, the loop will abort with an error message.

James M. Byrne
York Harbor, ME

$154 Keyword abbreviation tip—Proofreading Basic lines that contain keyword abbreviations is easier if the computer is in Upper- Lowercase mode. In this mode, abbreviations don't contain graphics characters and are much easier to read. Poke is pO, Next is nE and so on. You can put your machine into this mode by simultaneously pressing the shift and Commodore keys.

Maurice A. Gage
Westchester, CA

$155 Input hint—Quotation marks can help you input strings you didn't think were possible to input. By typing quotes before and after your input, you can add leading and trailing blanks that would normally be truncated. You can also input commas (no more Extra Ignored!), colons, cursor controls and so on. To input a delete character any time after your initial quote, just type "[CRSR LF][insert][delete]." The best part is that the quote marks will not be included in the string, (for example, "MAGIC" has five characters in the string, not seven).

Richard Shine
Carrollton, TX

$156 More on Input statements with quotes—You can use the dynamic keyboard technique to put leading quotation marks on your response to the Input statement. For example:

```
100 PRINT "WHAT MAGIC CHARMS";
110 POKE 631,34 : POKE 198,1
120 INPUT C$
```

34 is ASCII for the quotation mark, and the Pokes make the computer think you've typed it. Now the computer will accept any key except the return and delete keys.

Errol Lisonbee
Salt Lake City, UT

$157 Input prompts—When using the Input statement, don't use prompts longer than 38 characters (on the C-64) or 20 characters (on the VIC). Due to a bug in the ROM (Read Only Memory), longer prompts will result in bad reads or an error message. Reports say the bug has been fixed in the SX-64 portable computer.

Michael L. Bumbaugh
Lima, OH

$158 Interesting Input prompt—To get an unusual flashing prompt, try this:

```
10 INPUT"[2 spaces][COMD B][3 CRSR LF]";A$
```

For variety, try substituting different graphics for the COMD B. To ensure you don't get the graphics symbol itself, as A$, you can add this to the end of line 10:

```
:ON (A$="[COMD B]")+2 GOTO 10,20
```

Then put your program continuation at line 20.

Brooks Hunt
Alexandria, VA

$159 Another queryless Input—There's another method of eliminating the question mark when getting input from the keyboard. The secret is the little-known fact that the keyboard has a device number of 0, and that any piece of hardware with a device number can have an input channel opened to it. To see what this means, try the short program below.

```
10 OPEN 1,0
20 PRINT "TYPE SOMETHING ";
30 INPUT#1,A$
40 PRINT
50 CLOSE 1
60 PRINT "YOU TYPED: "A$
```

Line 10 opens an input channel to the keyboard. Line 30 gets the user's input. Line 40 is necessary to move the cursor to the next line and line 50 closes the channel. You get no question mark with this method, but you must carefully control the cursor position.

Michael Scharland
Steger, IL

$15A Slick Get trick—Here's a way to use the character received with a Get statement as the first character for an Input statement. The technique follows the THEN in line 110 below. In the example, if you continually press the space bar, a sequence of numbers is printed. If you input a number in place of the space, that number is printed instead. The example is useless, but the technique has lots of possibilities.

```
100 GET A$ : IF A$ = "" THEN 100
110 IF A$<>"[space]" THEN POKE 631,ASC(A$) : POKE 198,1 :
    INPUT B
120 PRINT B : B=B+1 : GOTO 100
```

Ron Ahern
San Diego, CA

$15B Multiple-choice Get—The following short routine lets you detect keypresses, from a specified group of keys, and directs the program according to the detected keypress.

```
10 GET A$ : J=1 : FOR I=1 TO 4 : IF A$=MID$ ("ABCD",I,1)
   THEN J=I+1
20 NEXT : ON J GOTO 10,aaa,bbb,ccc,ddd
```

In the example, aaa, bbb, ccc, ddd are the statement numbers you want the program to go to if A, B, C or D are pressed. The string in the MID$ expression can be as long as you'd like, and can even include function key codes. Try it!

Jason Dorn
Saratoga Springs, NY

$15C Using Get instead of Input—Here's a way to get rid of the question mark while getting input from the keyboard.

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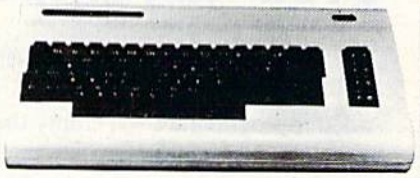

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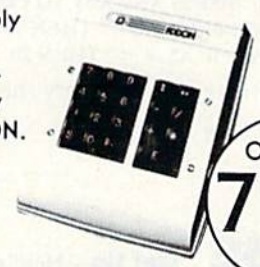

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```
5 B$=""
10 POKE 207,0 : POKE 204,0 : GET A$ : IF A$="" THEN 10
20 IF A$=CHR$(13) THEN PRINT CHR$(32) : GOTO 40
30 PRINT A$; : B$=B$+A$ : GOTO 10
40 REM THE INPUT IS STORED AS B$
```

It's necessary to print CHR$(32), which is a space, to obliterate the cursor in case it is on when you press the return key.

N.S. Hanspal
King of Prussia, PA

$15D Using the Get statement

—A good programmer will write this:

```
10 PRINT "PRESS ANY KEY TO CONTINUE"
20 GET A$ : IF A$="" THEN 20
```

A better programmer will empty the keyboard buffer first, so that any previous keystrokes are ignored:

```
10 PRINT "PRESS ANY KEY TO CONTINUE"
15 GET A$ : IF A$ <>"" THEN 15
20 GET A$ : IF A$ = "" THEN 20
```

An alternate way to empty the buffer is:

```
15 POKE 198,0
```

John R. Olsen, Jr.
Newberg, OR

$15E Get tip

—Here's a Get routine that avoids a possible Type Mismatch crash when using numerical values:

```
10 PRINT "CHOOSE A NUMBER 1-5";
20 GET A$ : IF A$="" THEN 20
30 A=VAL(A$) : IF A<1 OR A>5 THEN 20
40 PRINT A
```

Line 20 inputs the data as a string value to avoid the Type Mismatch crash if an alphabetic key is pressed. Line 30 converts the data to numeric form and checks whether it's in the right range (1 to 5 in the example). The routine won't crash, accepts only the numbers you specify, and it does not require you to press the return key.

John Blanford
Ventura, CA

$15F Cursor for Get

—A disadvantage of the Get statement is that it provides no flashing cursor to prompt the user for input. Here's a way to provide a cursor:

```
10 POKE 204,0
20 GET A$ : POKE 207,0 : IF A$="" THEN 20
30 POKE 204,1 : PRINT A$
```

The Poke statements in lines 10 and 20 tell the computer to turn on the cursor while it is waiting for a key to be pressed. Line 30 turns off the cursor and prints the value of A$. Be sure to print something at this step, even if it's just a space, or an image of the cursor might be left on the screen.

David Palmer
Address Unknown

$160 Data error finder

—If you get an Illegal Quantity error while reading Data statements, the following Direct mode entry will show you the line number of the offending data item.

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

Don Criss
Fairmont, WV

$161 Data statement debugger

—I use this on those occasions when I suspect my Read statements are out of step with their intended Data statements:

```
50 READ A : PRINT A, PEEK(63) + 256*PEEK(64)
```

It prints both the data item and the number of the line it was read from. Just insert the Print statement after the appropriate Read statement in your program, and delete it after debugging is complete. Of course, you must make the variable in the Print statement the same as that in your Read statement.

Ben Cherry
Elmira, MI

$162 Handling long Data items

—If your data items are long strings, sometimes some of them won't fit on a single program line. For instance, long questions in a quiz program may need three or four lines. To overcome this, find how many lines the longest item will take, and break it into that number of substatements. Then read and print it as several concatenated string variables. Be sure to insert null strings when necessary for shorter Data statements that don't use the extra lines.

Carolyne J. Butler
Address Unknown

$163 Finding program length

—The FRE function tells how much free memory is in your computer at any moment. If there's a Basic program in your VIC's memory, you can tell its length in bytes by entering:

```
PRINT xxx-FRE(0)
```

where xxx is the Bytes Free value your computer displays when first turned on.

A bug in the C-64 makes FRE return a negative value if there's less than 32K of free memory. The following statement allows for the bug and gives the true length of the Basic program in C-64 memory.

```
PRINT 38911-(FRE(0)-(FRE(0)<0)*65536)
```

In both cases, the 0 after the FRE can be changed to any number or letter; its value doesn't affect the result at all.

Ken Lundy
Corona, CA

$164 ASC finder

—This short program makes it easy to find the ASC value for any keyboard character. You can then print the character using PRINT CHR$(x), where x is the ASC value determined here.

```
1 GET A$ : IF A$="" THEN 1
2 PRINT A$, ASC(A$) : GOTO 1
```

James M. Byrne
York Harbor, ME

$165 GOTO nothing

—If you're using a GOTO statement in a place where every byte counts (such as in a one-liner), start with line 0 and use GOTO without a line number. It saves a character and still returns to line 0.

Heath Fallin
Baconton, GA

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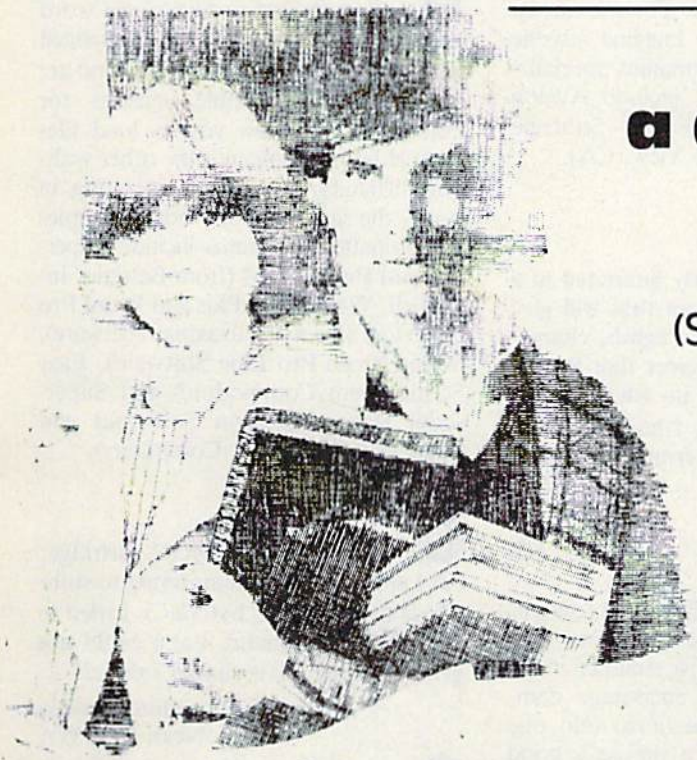

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Commodore Clinic

By Jim Strasma

Commodore Clinic is a monthly column designed to help you, the RUN *reader, through any troubles or questions you have as you use your VIC or 64 computer. Send questions to:*

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

So this column can help as many people as possible, please try to limit your questions to topics of general interest, and limit each letter to one question. Including a full-sized (#10) self-addressed stamped envelope will ensure a reply even if your letter does not appear in print. I do ask that you not call, though, because my telephone does not know how to type, and only typed questions can help others through this column.

Update: Replacement ribbons for the 801 printer are available from Radio Shack, as part number 26-1283.

George Manning
Rome, NY

A: Thanks for the tip!

Software

Q: Disk Master is an excellent program (see *RUN*, February 1984). I use it to catalog all my disks. I have one problem...certain commercial disks do not catalog on Disk Master. I receive the message DISK BAM IS INVALID. I hope you have a solution.

Danial Baney
Omaha, NE

A: I doubt if the fault is in Disk Master. Rather, some commercial programs alter the disk to keep you from reading its directory, as a copy-protection trick. If you can't read it, then neither can Disk Master. Avoid the problem by avoiding the companies that do it.

Q: Could you please tell me where I can get a disk with the same programs for my 64 as shown in the movie War Games, without having to break into a government computer?

Brian Griffith
Norman, OK

A: War Games featured several computer games and programs. It's been a while since I saw it, but I presume you aren't interested in Tic-Tac-Toe, available from most any user group.

I also presume you don't want the carrier-seeking program that dials every number in town looking for other modems. (I assume that because just having such a program may be illegal.)

That leaves Global Thermonuclear War, a game I can't imagine anyone wanting to play. Companies specializing in such "games" include Avalon Hill (Baltimore, MD) and Strategic Simulations (Mountain View, CA).

Q: I am particularly interested in a word processor program that will give me French, as well as English, characters and accents. I suspect that Paperclip and Script 64 will do what I want, but despite my letters, I have been unable to get a response from the companies. Any ideas?

Louis Emond
APO, NY

A: Low retail prices on programs for the 64 don't permit much customer service, but including a stamped reply envelope might help encourage companies to reply to questions. (No one likes to throw away a perfectly good stamp.) Both companies you mentioned have been in business for years, and they have been helpful to me.

Their programs are indeed available for French-speaking users. The same is true for other programs developed in Canada, such as Word Pro, in order to meet the needs of French-speaking Canadians.

Since you're having trouble ordering direct, why not order from a dealer? Many software companies no longer sell directly to customers, but some dealers, such as Micro-PACE Computers in Champaign, IL, offer to special-order anything and ship it anywhere.

Q: I would like to obtain a word processing program that would be compatible with both my 64 and the PETs at school. Any help would be greatly appreciated.

T.S. Bartlett
Stephenville, NFD

A: I'm not aware of a single word processing program that runs unchanged on both machines. However, several are available in compatible versions for both, and will allow you to load files from either machine into the other without difficulty, as well as operating in nearly the same way on both. Examples of compatible programs include Paperclip and Paperclip 64 (from Batteries Included), Word Pro 3 Plus and Word Pro 3 Plus/64 (from Professional Software), WP64 (from Pro Line Software), Easy Script (from Commodore) and Superscript (from Precision Software) and Pagemate (from A.B. Computers).

Q: I own the VICMON cartridge, but I am having problems trying to store a byte (listings say ".byt $2c"). I tried to use the Fill command, but I could not get it to work. How should I do it?

Randy Quillen
Neah Bay, WA

A: The syntax to make the Fill command put a byte $2c in location $1000 (for example) is:

```
.f 1000 1000 2c
```

(with the leading period already supplied by VICMON as a prompt).

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However, I would do it with the Memory command instead. Besides displaying the current contents of a part of memory, the .m command allows you to move the cursor up and over to a byte, change its value and hit the return key to enter the change in memory. For example, in your case, you might see:

```
.m 1000 1001
:1000 aa aa aa aa aa aa aa aa
```

You would then simply change the first $aa to $2c as shown:

```
:1000 2c aa aa aa aa aa aa aa
```

This method is still a bit cumbersome, but to improve on it, you'll need a full assembler, rather than the mini one in VICMON.

Q: Can you give me information on protecting and claiming rights on computer programs? How do I copyright my programs?

Cynthia Wood
APO, NY

A: Though I am not a lawyer, my understanding of current U.S. law is that any program you develop is automatically copyrighted as soon as it appears in public, provided a copyright notice appears prominently on it, and providing you haven't given out any earlier copies without such notice. You don't have to register the copyright with the federal government to make it valid, but doing so has some advantages and doesn't cost much. Unfortunately, defending a software copyright is probably more trouble than it's worth, unless your program is blatantly stolen by a company with enough assets to be worth suing.

Q: Is there anyone out there who has developed real estate-oriented software? I'm looking for a program that allows a real estate investor to evaluate potential rental property for cash flow, tax advantages (interest and depreciation), potential property appreciation, equity growth analysis and so on.

Paul Smithey
Destin, FL

A: *RUN*'s sister magazine, *Microcomputing*, once ran two articles that may be helpful to you ("Buy or Rent," May 1980, and "Boy, Did I Make a Killing," November 1979). Both could be converted to run on your system.

Hardware

Q: Can you help me make a 4-slot expansion port? Please write back.

Glen Osvold
Grafton, VA

A: Nope, sorry. It's rarely cheaper to build small boards like that than to buy them commercially, once you figure in the value of your time. Also, thanks for writing, but I get too many letters to write back unless you include a full-size envelope with your address and a stamp on it.

Q: When I hooked my 64 to the color TV, the screen was twisted and could not be read. I needed a horizontal hold control for correction, but my TV only has a vertical hold control.

For the past year I have been using a B&W TV that has a horizontal control but is missing all the pretty colors. Is there some way to control the horizontal on the 64?

Joel Berman
Haddonfield, NJ

A: Don't give up too quickly on your TV. The horizontal hold control may be hidden—accessible only through a hole or by removing the back of the set entirely. Find someone who repairs that brand of TV and have them check into it. If you have a schematic for the set, it may be listed there.

Q: I understand buffers can be purchased for printers that will take data from the computer and in turn feed the printer, leaving the computer free for other tasks.

My Quick Brown Fox word processor gives me some 38K of text storage, so it would seem that a 32K buffer would be just about right. But who makes them, where can they be bought and how much should they cost? They're not advertised in *RUN* or other magazines.

Andrew Swanson
Seekonk, MA

A: You didn't mention what printer you're using, but current buffers expect you to have either a Centronics parallel or an RS-232 interface to your printer. Unless yours is a Commodore printer, you probably do.

Given a suitable interface, the buffer simply plugs in between your computer and the printer. You should look for expandability and compressed storage of duplicated characters. Although 32K seems large enough to you now, and buffers are sold with as little as 16K of memory, you may eventually want to increase its memory to 64K. Be sure you can.

Second, the computer sends large groups of spaces and other repeated characters to the printer as it prints most documents. Normally, these are stored like any other character. However, some buffers recognize repeated characters and store them in a condensed form.

Although parallel and serial buffers are widely available, IEEE-488 and serial bus buffers are not, though both are beginning to be announced. Prices for the existing units range from $200–$400.

You're right about the shortage of ads; I could only find one product to mention by name. It's the MicroSpooler, sold by the Quill Corporation of Lincolnshire, IL. I mention it only because Quill offers a proven satisfaction-guaranteed-or-your-money-back warranty.

Q: Every time I use my disk drive, it makes a loud squeaky noise. It still works, but I can't stand the noise. How do I get rid of it?

Douglas Baggett
Stafford, VA

A: A likely cause, if yours is an early 1540 or 1541 disk, is a loose flywheel on the bottom of the unit. If so, you get rid of it by gently pounding it back on, and you can prevent recurrences by using superglue to fasten it in place. The hard part is getting to it, which involves removing the whole case.

If this isn't the problem (later 1541s hold it on firmly with a screw), listen carefully with the case off to isolate the source of the sound. Washers around the spindle on which the disk turns can go bad. Similarly, the arm along which

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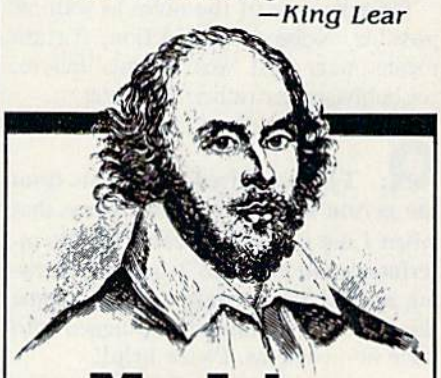
Than wish a snow in May's new fangled mirth
But like of each thing that in season grows
—King Lear



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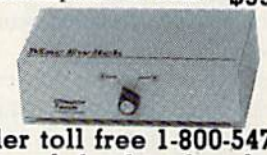

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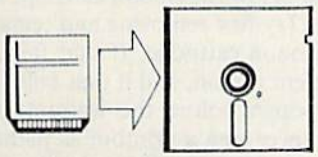

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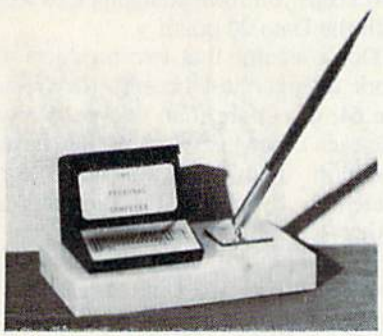

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the drive head moves has to be lubricated every once in a long while. Other pieces can also go bad, but your ear will guide you to the offender.

Do take care of the noise as soon as possible. Noise means friction, friction means wear and wear means failure, probably sooner rather than later.

Q: I have received complaints from the person living directly below me that when I use my 64, it creates terrible interference on channels 2–6. The surprising note is that people using the same line that my computer is plugged into have no problems. Please help!!

Maurice Poitras
Bridgewater, MA

A: First, pick up your 64 and turn it over. Through the cooling slots on the bottom, you should be able to see a shiny metallic sheet covering the entire bottom of the main circuit board. Its purpose is to prevent such interference, and it was left out of a few 64s in the early days.

Assuming it is in place, the next step is to isolate the source of the troublesome radiation. To do this properly, you'll need the cooperation of the offended neighbor, perhaps talking to you on the phone and telling you when things get better and worse. Start with nothing on but the 64 itself, and nothing plugged into it. Sometimes the accessories cause interference, too.

A Commodore staffer at CES this summer told me the 64's Atari-style joysticks can act like little antennas for radiation, which is why they were changed on the new Plus 4 model. Disk drives, printers and monitors are all possible offenders. By connecting and turning things on and off, one at a time, you may be able to trace the interference to a single device.

Assuming you find what is causing the trouble, the next step is to reduce the interference. One approach is to move things around. Even a foot or two can make a difference, because radiation decreases rapidly with distance and may not be equal in all directions. If you can't move the computer, try convincing the neighbor to move the TV downstairs.

Oh well, it was worth a try. If none of this has helped yet, try to isolate the TV and 64 from one another. An old favorite for this is aluminum foil, which you could tape to the bottom of the furniture used to hold your 64 system or place under a rug below the system. There are also special rugs and equipment mats made for this purpose. You could even get a filter for the wall socket from a TV shop, but I don't expect that will help much in your case.

Q: I recently bought a 64, along with a Video Pak 80 (from Data 20 Corp.) and Commodore's Easy Script word processor. I am new in computers and took for granted that, having been developed for the 64, they would both work together. Is there a way I can make the Video Pak 80 compatible with Easy Script?

German Fragoso
San German, PR

A: I'm sorry, but no. The two products were not developed with each other in mind, and they try to use the same parts of the computer in different ways. Unfortunately, the method used to keep you from copying Easy Script also keeps you from changing it to work with the Data 20 board.

Don't assume that two products will work together just because they're for the 64, any more than two people will like each other just because they have a common friend. Always make sure, preferably by testing the products together yourself.

Paperclip is a similar program that does work with the Data 20 card (ever since version c, anyway), and Data 20 also has its own word processor that works with its card.

Q: I have both a 64 and a VIC. Since the 64 has better games, I don't get much time to use it with my whole family at home. Can I type a program on my VIC, save it on tape, take the tape to my 64 and load it there?

Yosef Guttman
Scranton, PA

A: Yes. And nice to hear your computers are well used.

Q: My only complaint is that I wish I had more storage space per disk. Are you aware of any plans for a hard disk for the 64? What about a DOS for such a system?

Gay Steinberg
Lincoln Center, ME

A: Not yet, and the DOS may be the reason; the serial bus is barely fast enough for the size disk that the 64 has now. However, if you can find one, you can use the recently discontinued Commodore D9060 and D9090 hard disks with a 64 via an IEEE-488 interface, such as the Bus Card (from Batteries Included, Toronto, Ontario). Unfortunately, the D90 series is slow and expensive compared to other hard disks. It is, however, completely compatible with Commodore's DOS, and it works just like other Commodore disks, using the same commands.

Q: I recently purchased a Commodore system that included an 801 printer. After about three sheets of paper, every printout began to fade out. It was hard to believe that the inker would dry out so fast, so I ran a test to see if the ribbon-advance knob was turning properly; I marked the top of it with tape.

When the printer started up, the knob advanced ¼ turn and stopped for two lines. It started advancing again about ⅛ turn per line for three lines, then did a quick ¾ turn and stopped for four–five lines. The same behavior repeated for the remainder of the printout. A copy of the printout is enclosed for your inspection. Is the irregular advance normal?

Ali Mesghali
Millville, NJ

A: I don't have an 801, but I hardly think so. It sounds like your ribbon cartridge isn't properly seated on whatever mechanism advances the ribbon. It's also possible that the ribbon cartridge is defective or that a gear within the mechanism below the ribbon cartridge is slipping. Try first removing and reinstalling the ribbon cartridge. If that fails, try a different ribbon, and if that fails, return the printer before the warranty is up. I've never seen a printout as pathetic as the one you enclosed.

By the way, thank you for the good detective work you did before writing. It helps.

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Q: What is the purpose of a dual disk drive? Can you hook two 1541 disk drives together to use with a 64?

Sharon Ireland
Merriman, NE

A: The primary purpose of a dual disk drive is to make it easy and fast to make a backup (spare copy) of important disks. Copying an entire disk, using one or more 1541s, takes anywhere from four to 40 minutes, depending on the copying program used, and may require constant attention. A backup on a dual drive takes only about two minutes, and not only doesn't require any involvement by the operator, but even allows other work to continue on the computer, so long as that work doesn't require the disk. This speed and convenience makes a dual disk essential equipment for users with vital information on disk that must be backed up regularly.

At present, the MSD is the only dual drive that can be directly plugged into the 1541, although the MSD and any Commodore dual disk can be connected via an IEEE-488 interface, such as the Bus Card from Batteries Included. Bear in mind that a few heavily protected programs will work only with the 1541. If such programs are essential to you, it is also possible to connect several 1541s together at once, so long as they are changed to have differing device numbers on the serial bus. This is described in the disk manual and in this column, in the May issue.

Some people have had trouble using multiple 1541s, and Commodore has developed new ROM chips for the computer, to improve reliability with multiple units. Ideally, you should have ROM number 901229-05 in your 1541s and Kernal ROM 901227-03 in your computer, but I have not heard that these chips are available separately yet.

Q: I received a 64 and disk drive as Christmas presents. I sent in the warranty registration cards within ten days. Around January 20th, the sound stopped working, and the store from which I purchased it would not replace it because their return policy only extended two weeks.

Since then, I have written and called Commodore several times, and I have yet to receive a reply. By now, the warranty has expired, and I want to know whether or not Commodore will still fix my computer or if I'll have to pay. Where, in my area, can I get it repaired without having to ship it to West Chester, PA?

Robert Linaman
Chelmsford, MA

A: Recheck the fine-tuning of your TV set. Many of the reports of dead sound on the 64 turn out to be mistuned TVs. Make sure by plugging another 64 with good sound into your TV to verify that the problem is actually inside your 64.

Assuming the problem is in your 64, since you are hoping for repair under warranty, your best bet will probably be to send the 64 to Commodore along with a letter like the one you sent me. Include a copy of the sales receipt, say when you sent in the warranty card, and if possible include copies of the letters you previously sent Commodore, all to bolster your claim to extended service beyond the normal warranty.

At worst, you'll have to pay for the repair, but I have found Commodore to be quite fair in such situations.

One other thing—Commodore has traditionally required all dealers to provide service; if your dealer ignored that responsibility, find another dealer. *Micro* magazine is located in nearby West Chelmsford and should know where to find the nearest good one.

Programming

Q: I have written a program to keep track of six mutual funds. I think I should use a Dimension statement, but I can't figure out how. I want to list the name of each fund, and under this the quotation for five days. The list will include five weeks for each month.

Harry Cowles
San Diego, CA

A: It sounds like you want a three-dimensional array, with the first dimension being the fund, the second being the week of the month and the third being the day of the week. Since there are six funds, five weeks and five days per week to consider, the following line will dimension a suitable array:

```
100 DIM S(6,5,5)
```

Here is a simple routine to fill your array:

```
110 ? CHR$(147):REM CLEAR SCREEN
120 FOR I=1 TO 6
130 : FOR J=1 TO 5
140 : : FOR K=1 TO 5
150 : : : ? "ENTER PRICE FOR FUND #";I
160 : : : ? "IN DAY";K;"OF WEEK";J
170 : : : INPUT S(I,J,K)
180 : : NEXT
190 : NEXT
200 NEXT
```

Then, to print out the results, you might use:

```
210 ? CHR$(147):REM CLEAR SCREEN
220 FOR I=1 TO 6
230 : ?"RESULTS FOR FUND #";I
240 : FOR J=1 TO 5
250 : : ?"WEEK #";J;":";
260 : : FOR K=1 TO 5
270 : : : ? S(I,J,K);
280 : : NEXT
290 : : ?
300 : NEXT
310 : ?
320 NEXT
330 END
```

Naturally, this simple program could use a lot of help, but it may get you started. Skilled users will notice that we have ignored the zero elements of the array, thereby wasting some space but simplifying the program.

Q: What is a machine language monitor? Also, how do I find out where a program is stored in memory so the monitor can save it to disk?

Jim Artale
Monticello, NY

A: A machine language monitor is an aid to machine language programming. You will find it difficult to understand until you learn about machine language. On the other hand, you can use it before you understand it, just as you probably used some Basic commands before you really understood them. A nearby user group can help you write down exactly what monitor commands to use to do what you want. Then when you're ready, get a good introductory book on machine language, such as Jim Butterfield's new text from Brady.

As for finding where a machine language program is stored, either get the right numbers from the program's manual or ask a skilled friend. R

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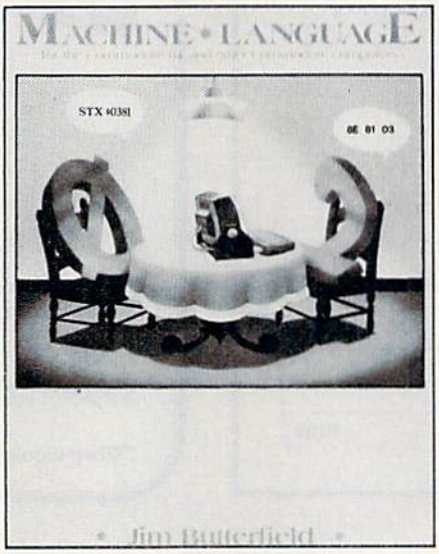
Book Gallery

Compiled by Shawn Laflamme

Machine Language for the Commodore 64 and Other Commodore Computers

Jim Butterfield
Brady Communications Co., Inc.
Bowie, MD 20715
Softcover, 224 pp., $12.95



Anyone desiring to write his own programs would not have to own a Commodore 64 for very long before the need for information about machine language programming would become apparent. For certain tasks, the built-in Basic interpreter is clearly too slow and lacking in flexibility. Since the language built into Commodore computers, as with most other home computers, is Basic, every book publisher with an eye toward making a few dollars on the computer market has been compelled to issue its own versions of beginning, intermediate and advanced Basic, while the machine language programmer has had to grope in the murkiness of the inadequate Commodore documentation.

I couldn't understand why some of the better-known authors had not published any machine language books for the best-selling C-64. I had even decided to take a crack at writing a C-64 machine language tutorial myself, when I learned of the imminent publication of *Machine Language for the Commodore 64 and Other Commodore Computers*, by Jim Butterfield. This sapped my enthusiasm for my own venture, because I was pretty sure that if Butterfield was writing it, it was going to be the definitive machine language book. Now that I've plowed through its pages, I find that my prediction has been verified. The book has some gaps, but it is certainly the most useful machine language book for the Commodore computers that is presently available.

The only negative comment I can make is that the book is written as a tutorial for machine language beginners, but the pace is too fast for the real novice, especially one who has no grounding in the 6502/6510 instruction set. The publishers are aware of this, since they are releasing another book, *Assembly Language Programming With the Commodore 64*, which is geared to the fundamentals of the instruction set. It complements Butterfield's book in many ways.

The best advice I can offer a rank beginner is to expect to do some real digging, and try to find a more experienced person to give some help.

Now, the good news. This is far and away the best Commodore 64 machine language book that has been written, and it is quite possibly the best PET and VIC-20 machine language book as well. To the best of my knowledge, it's also the only machine language book that tells much about the new Commodore Plus/4. The secret of Butterfield's success stems, I'm sure, from his extensive experience conducting training seminars and answering thousands of questions from would-be programmers.

Getting down to specifics, the first five chapters cover the 65XX instruction set, except for the stack and interrupt commands. Butterfield uses the excellent approach of introducing the use of a machine language monitor in the first chapter. The intent is to have the reader enter and run the short machine language examples that are offered in profusion throughout the book. This is better than some of the other tutorials I've seen that start off with editor/assemblers, because the use of a monitor puts a minimum of manipulation between the user and the machine code.

In Chapter 2, with only five instructions (LDA, LDX, STA, STX and BRK) having been introduced from the previous chapter, the CHROUT Kernal subroutine ($FFD2) is introduced to allow you to use ASCII code. A little knowledge of the screen memory addresses is also given, enabling you to place characters on the screen. In this chapter, the limited assembly capability of the monitor is used to show the conversion of the three-letter mnemonics to machine code.

The use of the disassembler is also discussed to show how the machine code can be disassembled into the original mnemonics. The concept of loops is introduced and used to display full words on the display screen. The mechanics of calling a machine language program from Basic and returning thereto are also described, as is the storage of machine language code in the form of Basic Data statements.

Chapter 3 begins with a brief introduction to the use of interrupts, then discusses the four testable flags: Z, C, N and V. In order to put the V flag in a reasonable context, the concept of signed numbers is introduced at this

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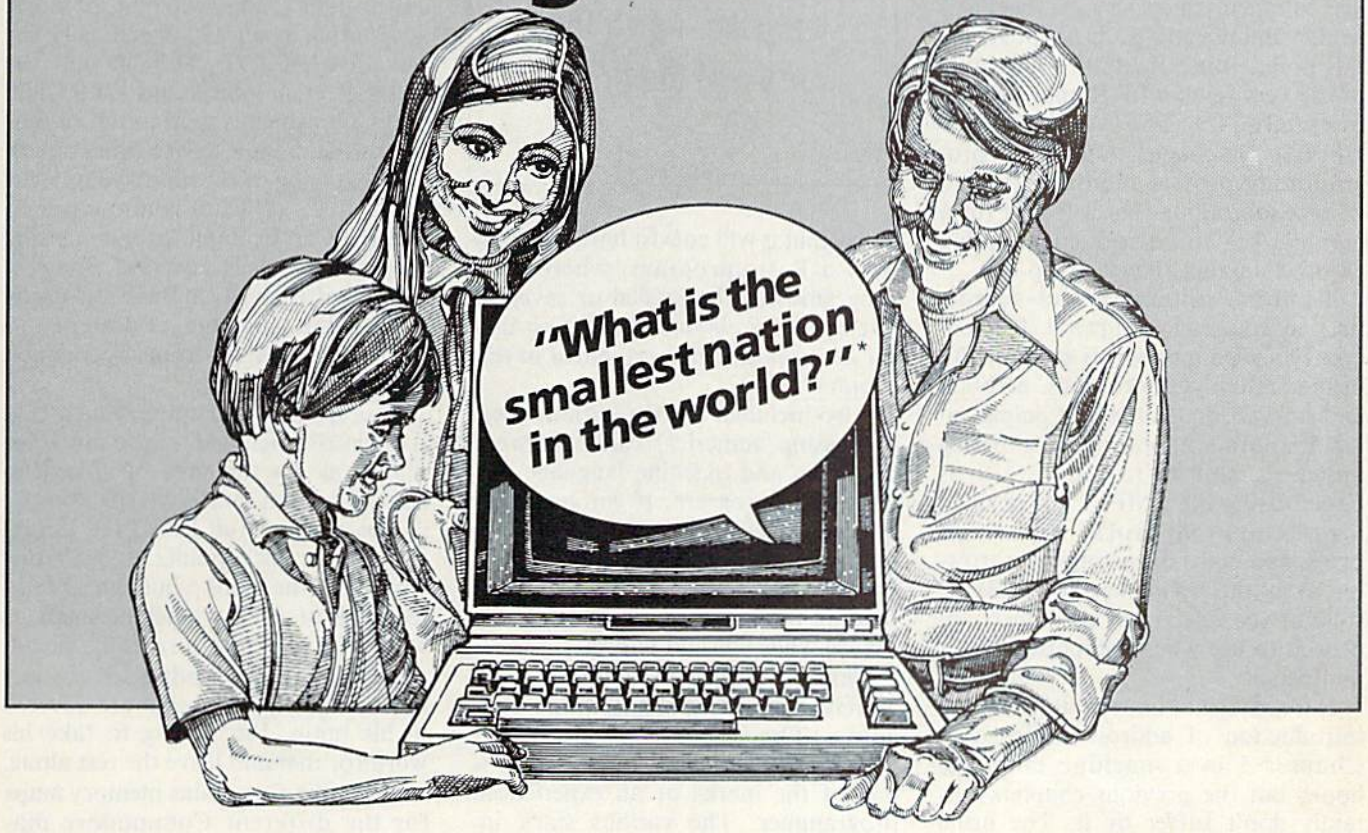

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point. Flags D, B and I, comparison operations as tests for branching and the logical operator commands AND, ORA and EOR are discussed. The explanations are complete, but they skimp on the use of numerical examples, which is one reason for my earlier comment that the rank beginner would find the going a little tough. At this point, Butterfield introduces two of the very few useful Kernal subroutines: GETIN ($FFE4) and STOP ($FFE1). The chapter closes with a programming project requiring you to write a subroutine that will wait for a numeric key to be pressed, ignoring all others except the run/stop key.

Numbers, arithmetic and subroutines are covered in Chapter 4. The concept of signed numbers is expanded to include multibyte operations, addition and subtraction. Butterfield points out that the normal approach of comparing unsigned numbers to learn which is larger (using the CMP, CPX or CPY instruction) only works with single bytes, and that subtracting and throwing away the result, keeping only the state of the Carry flag is the best approach to use when comparing larger numbers.

It is somewhat unusual to delay the introduction of address modes until Chapter 5 in a machine language book, but the previous chapters certainly don't suffer by it. The usual discussion of addressing found in most books is pretty much limited to how the program counter is affected and how the program decides which memory byte gets loaded or read. Butterfield goes beyond that to show the significance of each address mode to the computer system as a whole. Thus, when relative branching is discussed, its advantage toward improving program relocatability is mentioned.

Chapter 6, by itself, is worth the price of the book. It deals with linking Basic and machine language, and it begins with an excellent description of the layout of Basic in memory and the Basic pointers. This is followed by the best discussion I've ever read of where to put your machine language program, the hazards of trying to use that large space between the end of arrays and the bottom of strings and how the start-of-variables pointer can cause problems if it is not understood. The insertion of machine language in such a way that it will coexist harmoniously with a Basic program, where both programs may be loaded or saved as one operation, is one of the most useful accomplishments explained in this chapter.

> The chapter dealing with the linking of Basic and machine language is, in itself, worth the price of the book.

Also included are the various ways of passing numerical values between the Basic and machine language segments of a program. If you have ever had mysterious program crashes when attempting to run any combination of Basic and machine language, after reading this chapter, you'll probably realize what you did wrong.

Chapter 7 discusses a number of relatively advanced programming concepts. The use of the stack for temporary storage of information is one of the marks of an experienced programmer. The various stack instructions, and the effect of the JSR and RTS instructions on the stack are covered.

Butterfield includes a neat addressing trick sometimes used by Commodore, and which I have seen described in Raeto West's *Programming the PET/CBM*, which allows the stack to be used to point to alternative indirect jumps, as determined by a jump table and either the X or Y register. The NMI, IRQ and BRK interrupts are explained, showing how the vectors may be changed to temporarily divert the flow of the program.

There is a short, general discussion of the interface adapter chips used in the various Commodore machines. Various machines use PIAs, VIAs and CIAs, so the reader is referred to Appendix I, which contains detailed manufacturer's descriptions of each special chip. The remainder of the chapter shows how a wedge can be programmed to infiltrate Basic. Its use is illustrated in the end-of-chapter project to create a new Basic command.

Chapter 8 is the catchall for material that didn't seem to fit anywhere else. Estimating the amount of time required to execute a machine language routine is discussed. Another useful item is the switching of input and output channels, specifically the use of CHKOUT ($FFC9) and the channel clear command CLRCHN ($FFCC), which is used to return output to the default device (the screen). The switching of the input channel using CHKIN ($FFC6) is also covered, and then an example program using these commands is described. The program, written partly in Basic and partly in machine language, is designed to send a sequential file from any common device to any other.

The appendices contain much that is obviously included, not so much for utility, as for the sake of completeness. One item that is conspicuous by its absence is a full list of the Kernal subroutine entry points. It isn't discussed in the book, but when I attended Butterfield's machine language workshop in Toronto recently, he advised against attempting to use any but the half a dozen that are covered in his book. I'm willing to take his word for that and leave the rest alone.

Appendix C contains memory maps for the different Commodore machines. Actually, only the low page vectors, temporary storage and buffer addresses are given for all computers. A unique feature of these listings is a breakdown of zero-page locations that can be used without causing any monitor problems. This can be a great boon, because zero-page space is always useful, and Commodore left so little of it for the machine language programmer. In addition, the Basic and Kernal subroutine entry points for the Commodore 64 are listed in full. Appendix H is a Basic listing of a program that will generate a Supermon-type machine language monitor.

Besides more generous numerical examples, the only other addition I would have liked to see in this book is something about the optimum structure of machine language programs.

In preparing to teach a course on machine language, I was eager to find a good machine language book that would serve as a text for my students.

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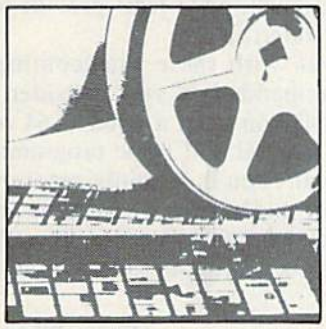

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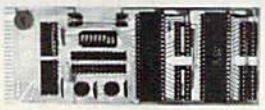

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Butterfield's book was ideal for this, and it will continue to serve as a useful reference long after the course is over. I'm also glad to acknowledge that the book will help not only my students—it will help *me* to write much better programs, too.

S. Brown Pulliam
Bedford, MA

Dr. Aron's Guide to the Care, Feeding, and Training of Your Commodore 64

Arthur and Elaine Aron
Hayden Book Co., Inc.
10 Mulholland Drive
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Softcover, 300 pp., $16.95

The goal of *Dr. Aron's Guide to the Care, Feeding, and Training of Your Commodore 64* is to quickly and thoroughly teach you how to use your Commodore 64. The territory of this teaching manual includes the fundamentals of setting up the computer equipment, keyboard use, Basic programming and control of graphics and sound.

This is a big book (300 pages), with 19 chapters organized into four parts, as well as nine appendices. No index is included, but the table of contents is quite detailed. The authors, Arthur and Elaine Aron, are university researchers and teachers. The book's content has reportedly been taught many times, and the book has been revised several times; topics found confusing were rewritten. Also, the Arons tried to avoid much of the technical jargon found in other training guides.

The Arons claim that after about 12 hours with the book, you will be able to write almost any type of C-64 program. So how well does this approach work? Will this book feed and care for your C-64, or are certain nutrients missing? Let's look at each of the book's four parts in detail.

Part I covers how to set up your computer equipment. Software is discussed, and tips on purchasing software are included. Then the Commodore 64 keyboard is reviewed, followed by an introduction to Basic programming. Basic terminology is given, and designing screen displays using Print statements is discussed. Practical applications for the material learned in Part I are also provided.

Part II presents more on Basic programming, covering topics such as subscripted and string variables and GOSUB. Things start to get fun in Part III with the tutorial on graphics and sound programming. Color variations, animation, sprites and music are some of the specific areas covered. Part IV puts the first three parts together, enabling you to write your own programs. Debugging tips are also included.

Each chapter is organized into specific topics, with each topic introduced in large, bold headings. There is an abundance of illustrations, but no photographs. The program listings, presented in dot-matrix format, are readable, but they're of a lower quality than the rest of the book. Wide margins are used, which allows room for note taking.

Overall, *Dr. Aron's Guide* is a very easy-to-read tutorial. When extra information is needed, boxes of text are provided in the left margin. This spares you from thumbing through the book to find footnotes or information buried in an appendix. There are several blank pages at the end of the book, which makes a good area for taking notes and storing important information.

While *Dr. Aron's Guide* is relatively complete, there are some areas where the cupboard is bare. One such area is printer information. Printer instructions and related programming steps are briefly covered in a reference box area. While this is useful, good examples are missing, and coverage for printing as either device #2 or #4 is confusing. This is an important omission, since programming lessons are almost useless without a means of saving what you've done.

Disk drive operation and related programming is also briefly covered in a reference box. So, don't expect this book to solve disk drive problems you might be having. For example, there is no coverage of error handling for a disk drive. Perhaps the Arons felt that these areas were beyond the scope of the book. However, I feel a book of this caliber should cover these areas in some detail, or at least provide some good referrals.

Even with these shortcomings, I recommend that you consider this book if you need a good C-64 reference manual and Basic programming tutorial. You'll certainly recover the cost of this book by gaining the ability to use your Commodore 64 and develop Basic programs to suit your own needs.

Larry Bihlmeyer
Pontiac, MI

PcDex: Magazine Resource Guide for Commodore 64, VIC-20 and PET/CBM Personal Computers

Altacom, Inc.
PO Box 19070
Alexandria, VA 22314
Softcover, 208 pp., $14.95

Shortly after the computer came into my home, computer magazines started taking over my living quarters. At first it seemed innocent enough. My office, located in a small converted bedroom, began filling up with periodicals. Next came the living room. Now the magazines are everywhere—the kitchen, the bathroom, the garage—even in the back seat of the car.

The sheer mass of magazines doesn't bother me as much as not being able to find the articles I want when I need them. Sometimes, as I begin work on a new project, I wonder if someone else has already invented that particular "wheel." Casual browsing helps, but I usually just find more articles I don't have time to read. They get added to the list of ones I'm sure to forget!

This seemingly hopeless situation was recently brought into control with the publication of *PcDex*, the magazine resource guide for Commodore personal computers. *PcDex* indexes articles of interest from many computer magazines, covering the period from January 1982 to March 1984. Only articles of interest to Commodore buffs are included.

PcDex is a specialized reference guide

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that has its roots in guides such as the *Reader's Guide to Periodical Literature*. Since it addresses only a narrow, specific field of literature, it is easy to use and timely.

There are six ways to locate an article in *PcDex*. Librarians tell me that most of us look for material by subject. *PcDex* uses over 120 categories to classify articles. Everything from amateur radio to word processing is covered.

A title index is included for those who can recall the title of the article they seek. It can also be used to quickly scan for articles dealing with a particular subject. Although *PcDex* does a good job, the cross-referencing is not 100 percent complete.

The third section deals exclusively with articles that include program listings. Reading about computers being used in astronomy is interesting, but if you are looking for a program to calculate where to point your telescope, an actual program is of more value.

Reviews are often helpful in making a decision on what software or hardware to buy. There are two sections (one devoted to each) for reviews.

Finally, a collection of the tables of contents from selected magazines is included. Although information on articles from 13 different sources are contained in *PcDex*, the tables of contents from only six Commodore publications are presented.

After using *PcDex* for a while, I've become dependent upon it to locate material. I don't always agree with the classification assigned to each piece, but then, the Yellow Pages suffer from the same problem. (*PcDex* is a lot better than the Yellow Pages!)

Did you know that there was an article written about a PET computer being used in animal behavior research? Are you interested in how to start your own computer software business with your Commodore? You'll be able to locate such articles by using *PcDex*.

So now that I'm hooked on *PcDex*, what about articles published after March 1984? The good news is that *PcDex Quarterly* appeared beginning in late September 1984. It will be published every three months. A one-year subscription costs $17.95, and it includes a yearly subject/index cumulation.

The only criticism I have of *PcDex* is that it does not include referencing to several fine publications—the *Transactor, Journal/20* (no longer in publication) and others. To the publisher's credit, other periodicals are openly invited to have their material listed in the future. I guess it was a matter of having to start somewhere.

As neatness and order returns to my home, I have a mental image of the place where *PcDex* is put together. There are magazines everywhere. People are screaming as large stacks fall over, blocking the passageways. Employees can be heard, but not seen—they're buried under an ever-growing mountain of magazines. Better them than me!

Jim Grubbs
Springfield, IL

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The Mail RUN

Seeking a Foreign Correspondent?

I need an introduction to a pen pal who owns a C-64 and maybe a modem, and who lives in the United States. I would like to correspond and set up a telecommunication link, if possible, with someone who loves his C-64 as much as I do. Thanks.

Larry Noonan
29 Georgina St.
Newtown, 2042
Sydney, N.S.W.
Australia

I have a VIC-20, plus a few extras, and am in search of a correspondent in America. I already have correspondents in England and in Australia.

I am a 30-year-old security officer at a diamond mine. I have two daughters and a wife, who shares my interest in computers.

Is it possible you either know of someone who will be willing to correspond, or that you will place my letter in your letters column? Thank you.

L. van der Merwe
PO Box 348
Kleinzee 8282
South Africa

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Jon Foley
Dixmont, ME

More on Beale's Treasure

For those who have developed an interest in the program on Beale's Treasure, printed in the July 1984 issue of *RUN*, there is an even more complete story on the search for this elusive trove printed in the April 1981 issue of *Smithsonian* magazine. Back issues of the magazine are carried by most libraries.

Jim Stephens
Nashville, TN

Grubbs is Back!

I want to express my gratitude to *RUN* magazine and Jim Grubbs for the excellent series of articles called "Gateway to the World" (May and June 1984). I have found them to be very helpful in trying to understand how to use the C-64's users port.

I have been looking for an explanation like this ever since I got my C-64, over a year ago. I found Commodore's explanations inadequate, but the explanation by Jim Grubbs is great.

Mr. Grubbs made a reference to another article, which I hope will be published soon. I would like to see more of these articles.

Allen B. Fugelseth
Capitola, CA

Allen, wait no longer. The article you've been looking for is on p. 168 of this issue. After a lengthy hiatus, Jim Grubbs is back and will continue to be a frequent contributor to the magazine in the future.

Editors

Commodore Owners Unite!

Like Albert H. Coya, whose good letter appeared in your August edition, I, too, am very happy with my Commodore 64. Others may have bought their 64s as toys or starter units, but I envision keeping mine forever. I have already had to change word processors because the first one was not compatible with my printer, and I certainly do not ever want to have to redo all those files I've created!

Yet, we've just been told that the VIC-20 will no longer be produced, and the prediction is that, with all of the terrific innovations right around the corner, the 64 will soon be obsolete.

As Mr. Coya so rightly pointed out, if Commodore really cared about us, it would bring out *improved* versions of the 64 rather than totally new models that recognize no debt to their forebears. It is despicable enough that the industry cleaves to no common standards, but much worse is that Commodore, an industry leader, cannot even adhere to the standards it, itself, has set. Is it any wonder that IBM is having such an easy time taking over? Its product isn't any better, but its managers at least know how to keep from shooting themselves in the foot.

Thus, I say to you: *Commodore 64 owners unite! You have nothing to lose but your software.* An awful lot of us, including this magazine, have most of our eggs in Commodore's basket. Maybe we should let them know how we feel about their corporate practices.

Warren W. McCurdy
Washington, D.C.

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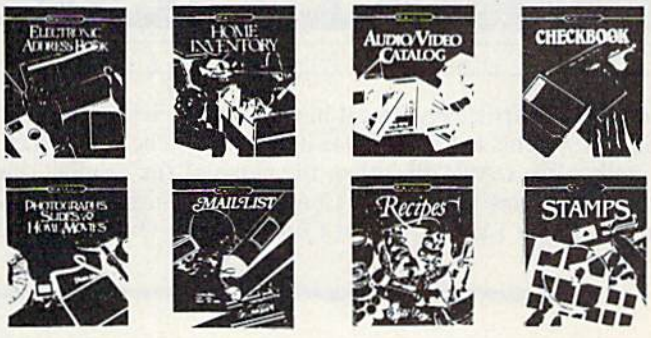

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Clubs

California

The Valley Computer Club, which has over 160 paid members, meets on the first Wednesday of the month at 7:00 PM, at the Adventist Academy (Ceres, CA).

For more information, write Valley Computer Club, PO Box 310, Denair, CA 95316.

El Paso, TX

The El Paso 64's is a Commodore user's group with over 100 members. The club has a monthly newsletter, as well as a growing public domain library. Members can now order programs from the library through the mail.

If interested, contact Joe Grossinger (Club President), 1713 Dean Martin St., El Paso, TX 79936, 915-855-1107.

West Germany

Software Swappers Extraordinaire, a C-64 and VIC-20 club, is located in West Germany. The group specializes in all popular programs, especially those that are German-unique, and would like to hear from all Commodore lovers.

For more information, contact SFC Carroll Daniels (Club President), HQ 7th Medcom Box 1, APO NY 09102.

Wilkes-Barre, PA

The Wyoming Valley Commodore User's Group invites VIC-20 and C-64 users to attend their next meeting in Wilkes-Barre, PA. The group, which has 28 paid members, has been meeting biweekly since November 1983. The club has an extensive public domain library, and offers demonstrations and question and answer sessions at each meeting.

For information, contact Lee Zielen, 304 East Oriole Drive, Larksville, PA 18704, 717-288-7949.

Florida

The Citrus Commodore User's Group can be contacted through Ralph Juliano (Club President), PO Box 1494, Inverness, FL 32651, 904-344-2793.

Trinidad, West Indies

C-64 users living in Trinidad, West Indies, can join the Trinidad Association of Commodore Owners. Contact Mark Mahannah, 91 Cherry Cres, Westmoorings, Carenage, Trinidad, West Indies, 809-637-8091.

Philadelphia, PA

A new computer club, called the Oxford Circle 64 User's Group, was formed recently in Philadelphia, PA. The first meeting was held on May 21, 1984, and the group will continue to meet on the third Monday of each month from 7:30–9:00 PM, at the Trinity Church, 6901 Rising Sun Ave., Philadelphia, PA.

Meetings cover instruction in Basic (beginning, intermediate and advanced levels), equipment usage, program debugging, new products, trading of public domain programs, lectures by experts (and fellow members) and general exchange of knowledge.

For more information, contact Roger Nazeley, 4921 Caster Ave., Philadelphia, PA 19124.

Tulsa, OK

The Tulsa Area Commodore User's Group holds two meetings every month. The first is on the second Monday of the month at 7:30 PM (at the Martin East Library), consisting primarily of user demonstrations and presentations.

The second meeting, the date of which is floating in order to give everyone a chance to attend, is an open copy session for members to access the group's software library (which contains public domain programs for the VIC-20 and C-64).

For more information, contact TACUG, c/o Craig Bowman, 7804 N. 117th E. Ave., Owasso, OK 74055, 918-272-9755.

Commodore Kids of America

Commodore users under the age of eighteen are invited to join the Commodore Kids of America User Group, which was formed recently.

The Group offers a 24-hour bulletin board system, public domain programs, a monthly newsletter and special interest groups covering topics such as assembly language, Logo and hardware modifications. Membership is free, although donations are requested in order to support the bulletin board system.

For more information, contact Kelly Etheredge, Rt. 8, Box 280, Sumter, SC 29150, 803-469-8861.

RUN Amok

Item: In the article on Pascal in the October issue (p. 54), the address of Limbic Systems in Table 1 was incomplete. The city, which was omitted, is Palo Alto, CA 94306. Also, the name of the product that Limbic Systems distributes for Oxford Computer Systems, of Oxford, England, is not, as Table 1 states, Pascal Compiler, but Oxford Pascal.

Item: Regarding the Repeat the Sequence game published in the May 1984 issue (the article is "Flash Glance," p. 82), the author informs us that he neglected to silence the tone after the computer repeats the last sequence. This can be done by adding :POKEV,0:POKEWA,0 to line 640 in the program.

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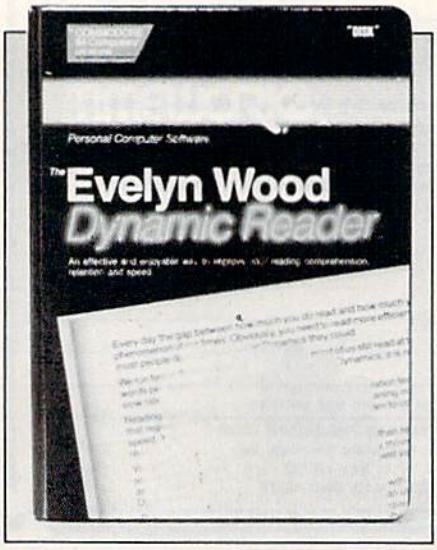

The Evelyn Wood Dynamic Reader, from Timeworks.

Evelyn Wood Reading Course

The Evelyn Wood Dynamic Reader is a two-disk software package designed to help you improve your reading speed, as well as your comprehension and retention.

One disk contains the instructional programs; the other contains text and comprehension quizzes for the reading exercises. As you work with the program, your progress is automatically measured and recorded. Color bar charts can be called up on the screen, allowing you to review the results of your efforts.

You can adjust the speed for performing the reading exercises, according to your individual skill level. The program stresses comprehension and retention as much as speed.

The Evelyn Wood Dynamic Reader is appropriate for both teenagers and adults. It is available for the Commodore 64, with a retail price of $69.95. Timeworks, Inc., 444 Lake Cook Road, Deerfield, IL 60015.

Check Reader Service number 400.

Copter Caper

As the pilot of a fast-moving helicopter, an adventurous race lies ahead of you in Mancopter, from Datasoft, Inc. (19808 Nordhoff Place, Chatsworth, CA 91311).

Your flight pattern is soon interrupted by flocks of birds, which create havoc with your craft's propellers. Misguided opponents present even more hazardous obstacles, which could send you plummeting into the sea—you'll need the favors of a gentle whale and a mermaid to protect you from a pack of hungry sharks and squids.

Mancopter is available on disk for the Commodore 64, with a retail price of $29.95.

Check Reader Service number 401.

Prehistoric Peril

Sierra (Sierra On-Line Building, Coarsegold, CA 93614) has introduced B.C.'s Grog's Revenge, another release in a series of games based upon Johnny Hart's B.C. comic strip.

Grog's Revenge follows Thor, on his trusty stone wheel, as he tries to climb a mountain and collect clams along the way. Pterodactyls and other fearsome creatures, as well as obstacles and rough terrain, block his path.

Thor must jump and dodge, sometimes taking shortcuts through caves, to make his way to the top—all the while staying ahead of Grog. If Grog catches up with Thor, then Thor will fall off the mountain.

The game has several difficulty levels and options for one or two players. It is available for the Commodore 64, with a retail price of $34.95 on disk and $39.95 on cartridge.

Check Reader Service number 402.

A new release from Sierra, based upon Johnny Hart's B.C. comic strip.

ChallengeWare Series

ChallengeWare is a series of 110 individual programs combined into a total of 56 titles. The series is divided into nine academic subjects, including Pre-school Concepts, Mathematics, Grammar, Science, Social Studies, Economics, Reading, Foreign Language and Logic & Strategy.

The programs are geared primarily for children in pre-school through the upper elementary grades. The graphics and sound presentation of each program is designed to make the lessons interesting and fun. In most of the programs, the child's performance is evaluated at the end of the session.

The programs can be used in the classroom or the home for group or individual study. Each program is available on disk for the Commodore 64, with a retail price of $39.95. Orbyte Software, PO Box 948, Waterbury, CT 06720.

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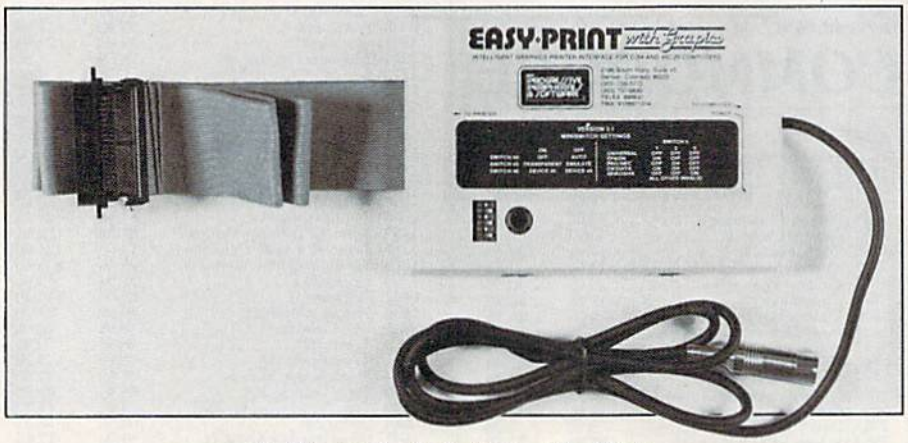

Graphics interface for the C-64 and the VIC-20.

Animal Crackers

Futurehouse, Inc. (PO Box 3470, Chapel Hill, NC 27514) has released Animal Crackers, the fourth program in its Playground Software series for the Commodore 64.

Animal Crackers is designed to draw upon the child's fascination with animals, computers and animation to teach the word development skills that are fundamental to reading readiness. Seven different educational games and eight colorful scenes are provided to instruct and entertain the child.

Voice synthesis by S.A.M., from Tronix, is incorporated in Animal Crackers. The narrator, Freddy the Frog, guides children through the program, telling them when they are wrong and when they are correct.

Animal Crackers requires the use of the Edumate light pen (Futurehouse) or the KoalaPad touch tablet (Koala Technologies). It is available on disk for the Commodore 64. Retail price is $34.95.

Check Reader Service number 404.

Olympic Challenge

Human Engineered Software (150 North Hill Drive, Brisbane, CA 94005) has released HES Games, allowing Commodore 64 users to re-create the 1984 Summer Olympics.

HES Games uses animated characters (in five different colors) and sound effects. Weightlifting, diving, running, long jump, archery and hurdles events are featured. The program includes an instant replay capability, and you can save your best performances to disk. World records are also displayed. HES Games is available on disk for $34.95.

Check Reader Service number 405.

Graphics Interface

Easy Print with Graphics is a graphics interface specifically designed to be used with the Commodore 64 and the VIC-20.

The interface requires no software overhead, and it connects to nearly all Centronics parallel printers. It is capable of several print modes. It can print the full Commodore character set, including all graphics characters. The List mode translates special Commodore characters into easily understood English words.

The interface is also capable of printing sprites, custom character sets and high-resolution or color bit maps with shading. A Graphics Utility disk for the Commodore 64 is included with the interface. Retail price is $119.95. Progressive Peripherals & Software, 2186 South Holly, Suite #2, Denver, CO 80222.

Check Reader Service number 403.

The Time of Your Life

Lifespan synthesizes art, music and action in a series of game challenges, each symbolizing stages of human development.

The program begins with birth, represented as a spiral of light accompanied by music. The spiral evolves into a playpen with animated figures, signifying the Childhood sequence.

Following childhood is the Opportunity Gate. Here you must match your on-screen character with an opportunity as it appears. Situations and Conversations places you on a grid, where you must become accepted by others living on the same grid. You must pursue common interests and avoid poorly timed encounters with others.

In the Experience Corridor, you will encounter worries, fears and doubts. The only way to survive is by touching white bits of hope. You must also keep an eye on the health gauge, which indicates years of life remaining. The game can be completed only if you survive with health. At the end, your entire life flashes on the screen in a sound and light finale.

Lifespan is available on disk for the Commodore 64. Retail price is $39.95. Trapeze, Inc., 3727 Buchanan St., San Francisco, CA 94123.

Check Reader Service number 407.

Transylvanian Terror

Castles of Dr. Creep is an arcade game combining spooky sound effects, eerie music and creepy antagonists in a Transylvanian setting.

Thirteen mysterious castles, containing a total of over 200 rooms, are filled with sinister surprises. Force fields, electrogenerators and meandering mummies are a few of the surprises awaiting you.

The game contains many different skill levels and options for one or two players. In the two-player game, cooperation, rather than competition, is the key to escaping from the castles.

Castles of Dr. Creep is available on disk for the Commodore 64. It retails for $29.95. Broderbund Software, 17 Paul Drive, San Rafael, CA 94903.

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Fight or Flight

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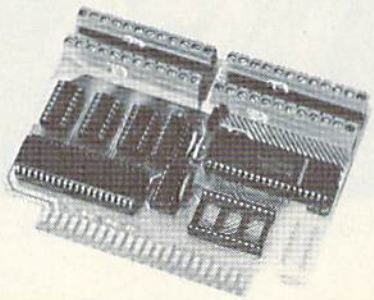

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C-64 version of the arcade hit Mr. Do!'s Castle.

Beverly, MA 01915) has released the Commodore 64 version of the arcade hit Mr. Do!'s Castle.

Mr. Do!, a good-natured clown armed with a hammer, finds himself in his castle, pursued by unicorns who can eliminate him with one deadly bite. You must continually make choices throughout the game, determining whether fighting or fleeing would best serve Mr. Do! in his quest to rid the castle of the unicorns and gather the keys that unlock the door at the top of the castle.

The unicorns change tactics frequently, and they can mutate into even more dangerous forms at will. The game is available on cartridge for $30.

Check Reader Service number 409.

Tear Up the Track!

Turbo 64 transforms your C-64 into the Laguna Seca Raceway, putting you at the wheel of a Formula 1 racing car. You can choose between automatic gear shift or manual shift (which offers greater acceleration).

The dashboard is equipped with a speedometer, rev counter, steering wheel, gear stick, lap timer and lap counter. The car also has an advanced, four-speed transmission.

Turbo 64 is appropriate for ages six and up, and up to ten players can compete. The program also offers you a choice of tracks. It is available on disk for roughly $20. Limbic Systems, Inc., 560 San Antonio Road, Suite 202, Palo Alto, CA 94306.

Check Reader Service number 410.

New Accounting System

Software Design, Inc. (1945 Mitchell Ave., PO Box 570, Waterloo, IA 50704) has released the 64-Accounting system for the Commodore 64.

Features of 64-Accounting include financial statements, check and statement writing and checkbook reconciliation. In financial statements, full dollar amounts are displayed. The system assures accurate transaction entry, requiring debits and credits to balance before allowing you to leave a transaction.

The system includes a mini accounts payable/receivable, and it can handle prior period adjustments and printouts. It allows an unlimited number of recurring transactions and up to 300 general ledger accounts. All reports are formatted for 80-column printouts on almost any printer.

The 64-Accounting system is available on disk for $69.95.

Check Reader Service number 411.

Calling All C-64s

Continental Software (11223 South Hindry Ave., Los Angeles, CA 90045) has released Phone Call, a telecommunications program for the Commodore 64.

Phone Call converts the C-64 into a smart terminal, capable of performing a variety of transactional operations, such as home banking, electronic mail, data retrieval and travel planning.

The program makes it possible to communicate with on-line databases, digitized appliances and other computers (micros or mainframes). It also permits uploading and downloading of machine language programs.

Phone Call is available on disk for $49.95.

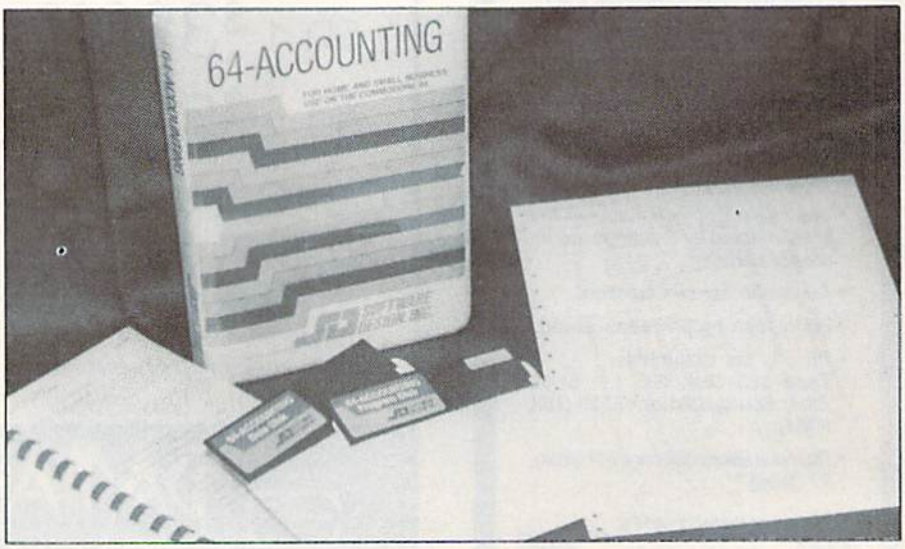
Check Reader Service number 412.

Reserve Power for Your Commodore

Creative Electronics (PO Box 4253, Thousand Oaks, CA 91360) has released a Battery Backup System for the C-64 and the VIC-20.

The unit plugs in between the computer and the power supply. When the power fails, the unit is automatically turned on, supplying one hour of reserve power.

The system also supplies power to the cassette for saving programs or data. It eliminates power surges and spikes from the power line. Retail price



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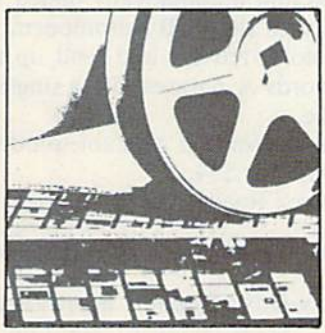

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The Stress Manager

The Stress Manager is a biofeedback system that allows you to assess your thought patterns and physiological impulses to gain a deeper understanding of the factors that contribute to stress.

The Stress Manager uses the G.S.R. (Galvanic Skin Resistance) method—an unobtrusive hard wire interface between the user and the computer. A pair of fingertip pads measure fluctuations in the skin's electrical conductivity; these impulses are transmitted to The Stress Manager for analysis.

Results are displayed on-screen in three detailed graphs. The graphic analysis and related data can be saved to disk and printed for future reference and comparisons. An audio cassette is provided to assist you in methods of relaxation and stress reduction.

The Stress Manager is available on disk for the C-64. Retail price is $79.95. Batteries Included, 3303 Harbor Blvd., Suite C9, Costa Mesa, CA 92626.

Check Reader Service number 414.

Grammatical Challenge for Young Editors

The Grammar Examiner is a new computerized, educational board game from DesignWare (185 Berry St., San Francisco, CA 94107).

The player starts by landing a job as a cub reporter with The Grammar Examiner newspaper. Editing copy and answering grammar questions pay off as the junior reporter earns promotions and moves his way to the top spot on the masthead—Editor-in-Chief.

The game covers areas such as punctuation, capitalization, subject-verb agreement, pronoun-antecedent agreement, verb tenses, adverb and adjective usage and homonyms. The built-in grammar editor allows you to add your own grammar problems.

The Grammar Examiner is available on disk for the Commodore 64. Retail price is $44.95.

Check Reader Service number 415.

Deluxe RS232 Interface for the C-64, VIC-20 and Plus/4.

Deluxe Interface

Omnitronix (PO Box 43, Mercer Island, WA 98040) has released the Deluxe RS232 Interface for the C-64, VIC-20 and Plus/4.

The interface plugs into the User I/O port, supporting virtually all RS232 signals, including Ring Detect. The unit has three user-selectable switches, allowing settings for DTE/DCE, pin 5 or pin 20 handshaking and selection of busy line polarity.

The unit can be supplied with either a male DB25 on a three-foot cable or a PCB-mounting female DB25. The interface comes with a detailed manual and a type-in Basic terminal program. It retails for $39.95.

Check Reader Service number 416.

Terminal Software

Electrosharp (1981 Sandalwood Drive, Santa Maria, CA 93455) has released Versaterm II, a new terminal program for the Commodore 64.

Versaterm II allows you to upload and download text and programs in ASCII or XMODEM protocol. Downloaded image files and Basic listings can be converted to programs that you can run on the C-64. Downloaded data can be saved to tape or disk and dumped to screen or printer.

Phone numbers can be stored, recalled and automatically dialed when used with the 1650 Automodem. You can store, retrieve and send up to 25 keywords or phrases with a single keystroke.

Versaterm II is available on disk or cassette for $34.95.

Check Reader Service number 417.

Low-Cost Speech Synthesizer

Currah Technology (50 Milk St., 15th Floor, Boston, MA 02109) has released The Voice Messenger–Speech 64, a speech synthesizer for the Commodore 64. The synthesizer features an infinite vocabulary, two voice selections and intonation.

The Voice Messenger plugs into the cartridge port of the C-64. The synthesizer's output is carried to the auxiliary C-64 sound input and is reproduced through the monitor speaker.

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For Commodore 64™

Personal Comments by Jim Gracely, Technical Editor, Commodore Magazine

IEA Instant Editor Assembler.

The IEA Instant Editor Assembler package is an invaluable asset to the beginning machine language programmer. The package contains an excellent editor/assembler system, a full featured monitor and a walk program with variable step speed and the ability to add break points. All three of these programs may be resident in memory at the same time. The individual programs are easy to understand, easy to use and work quickly and efficiently.

The package as a whole is quite professionally written. The Disk which contains the main programs also contains six programs assisting in the use of these programs and more than a dozen additional utility and example programs. One additional feature of the manual is a technical assistance number to aid you with any problems or questions you might have.

"I would have to recommend the IEA Instant Editor Assembler, the BEST VALUE-FOR-PRICE development package on the market!" **Jim Gracely**

"IEA is a nice simple assembler, good for beginners at an UNBELIEVABLE PRICE!" **Jim Butterfield, author of "Machine Language Programming for the Commodore 64 and Other Computers."**

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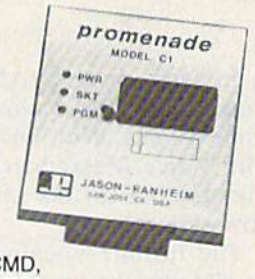

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It does not use any RAM in the Basic workspace, and it allows computing while it talks. With built-in software, The Voice Messenger allows your Commodore to talk immediately on power-up.

The infinite vocabulary is made possible by the use of an allophone-based synthesizer chip, which allows individual speech sounds to be strung together to make intelligible speech. By using The Voice Messenger, any word or sentence in the English language can be spoken. Retail price is $49.95.

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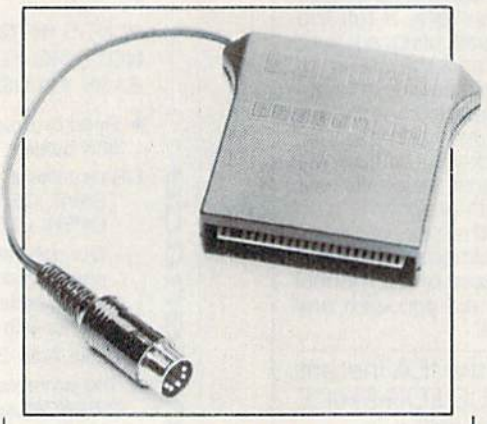

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Questron is available on disk for the Commodore 64, with a retail price of $39.95. Strategic Simulations, Inc., 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043.

Check Reader Service number 420.

C-64 Spreadsheet

Swift is a new spreadsheet for the Commodore 64, from Regenics, Inc. (PO Box 767, 1025 Tularosa Ave., Orange, CA 92666).

Swift permits entries in response to scripted text prompts without regard to actual placement of values in spreadsheet cells. Conditionals may be used to jump to specified cells or do alternate computations.

Functions of the program include sums, standard deviation, mean and variance, range sort, present value and table look-up.

Swift is available on disk for $29.95.

Check Reader Service number 421.

Fiery Fray

Penguin Software (830 4th Ave., PO Box 311, Geneva, IL 60134) has released The Quest, a graphics adventure for the Commodore 64.

As King Galt's newest advisor, you must accompany his champion, Gorn, on a quest to rid the kingdom of a vengeful dragon that has been terrorizing the southern provinces.

The lands lie in ruin. The harvests have been burned and the villages have been ravaged. The king has instructed Gorn to heed your advice as the two of you set off together.

The Quest is available on disk for $34.95.

Check Reader Service number 422.

Taxpayer's Helper

Ksoft Co. (845 Wellner Road, Naperville, IL 60540) has released the 1984 edition of Tax Return Helper, a software package for income tax preparation.

The program includes Form 1040, Schedules A, B, C, D, E, G, SE, W and Form 2441. The disk version also contains a separate database program that allows building and maintaining files of tax-related records that can be automatically used by the tax program.

Data is entered directly onto an on-screen copy of the tax form. The program works like an electronic spreadsheet, performing all necessary computations.

Tax Return Helper is available for the Commodore 64 and the VIC-20 (16K). It retails for $33 on disk and $23 on cassette.

Check Reader Service number 423.

Numbers Plus

Numbers Plus is a series of educational software packages focusing on mathematics. The series is designed for ages 10 through adult.

Each program in the series provides both Instruction and Practice modes. The Practice mode generates an unlimited supply of questions with fully-explained answers. The six packages in the series are Basic Mathematics, Basic Algebra, Intermediate Algebra, Geometry, Problem Solving and Consumer Math.

Each program in the series is available on disk for the Commodore 64, with a retail price of $29.95. Quality Input, Inc., 309 W. Beaufort, Normal, IL 61761.

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It's Only Rock n' Roll

It's Only Rock n' Roll is a text adventure game that pits the adventurer, gambler and fighter within you against the many hazards of the unstable pop music world.

Whether you will be a superstar or a "has-been" depends upon your skill, luck and hard work as you climb the ladder toward fame and fortune. You must avoid long tours, bad managers, lousy material and an excessive amount of carousing.

If you can keep your money, stay happy and interpret the record charts, song material and newspaper headlines, you'll make it to the top of the charts and reign as the King of Rock n' Roll.

It's Only Rock n' Roll is available on disk for the Commodore 64. Retail price is $24.99. K-tel Software, Inc., 11311 K-tel Drive, Minnetonka, MN 55343.

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Coming Next Month

- **Cover Story** Did you ever dream of creating your own game programs for the Commodore? The January issue will present a series of articles to help you do just that. You'll learn how to create maze games and word games and how to add sprite graphics to arcade games. Now your game-design dreams can become a reality. Scott Adams, watch out!

- **Selecting the Right Printer** Don't you think it's time you threw away your typewriter and hooked up a printer to your Commodore computer? This article by noted Commodore author, Jim Strasma, takes a look at some of the available printers and their accessories, so you'll be better informed to choose the equipment that best meets your needs.

- **Let There Be Light (Pens)** For graphics and other applications, light pens are now available and affordable for the Commodore computerist. This article examines how these input devices work and what they can do for you.

- **What's the Date?** What better way to start off the new year than with a computer calendar program for your Commodore? This appointment calendar lets you store and display the important dates in your life. You need never again be late for a meeting or forget that important birthday or anniversary.

- **Disk Tips for Beginners** *RUN* readers will pick up some valuable hints on using the Commodore 1541 disk drive. They'll be able to use the useful tips in this article for such disk functions as disk handling, cataloging and file naming.

- **Guide to Troubleshooting** Have you ever come across an interesting program in a magazine, only to be put off by the length of the program listing? Well, fear no more. In January, *RUN* will publish useful tips on entering program listings into your Commodore. This article will put the fun back into the computing experience.

- **Let the Good Times Scroll!** If you've ever seen the bright lights of Broadway, you were probably fascinated by the moving messages that were displayed on the marquees. Now you can create the same effect on your VIC-20 or C-64 with a Moving Marquee subroutine that will scroll information across the bottom of your computer screen.

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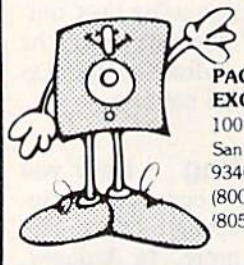

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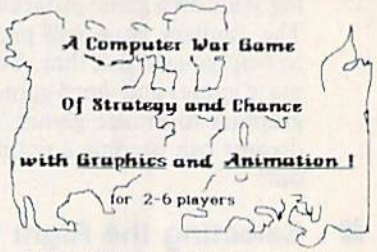

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How to type listings from *RUN*

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

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

{SHIFT L}—means hold down the shift key and press the L key at the same time.

{COMD J}—means hold down the Commodore key (it is on the lower left side of the keyboard) and press the J key at the same time.

{SHIFT CLR}—hold down the shift key and press the CLR/HOME key.

{HOME}—press the CLR/HOME key without shifting.

{CTRL 6}—hold down the control key and press the 6 key.

{FUNCT 2}—function 2 (in this case, you hold down the shift key and press the function 1 key).

{CRSR UP} {CRSR DN} {CRSR LF} {CRSR RT}—these are the four cursor directions.

{UP ARROW}—means the arrow key (the one with the pi sign under it).

{LB}—the British pound sign (£).

{PI}—the pi sign key (π); (shift and press the up arrow key).

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

Print vs Print#

RUN readers should be aware of difficulties that may arise when entering listings that contain the PRINT and PRINT# commands.

These two commands may look very similar, but they are different. If, for example, you use a question mark (?) to abbreviate PRINT in a line such as 10 PRINT#4,A$, then you are signaling to the Commodore computer that you are trying to print the variable #4, which is not a legal variable name.

The command PRINT#4 actually means "print to device number 4." You can abbreviate PRINT# by hitting the P key and the shift and R keys at the same time and then entering the device number. But *do not* abbreviate PRINT# with a question mark.

If you think of PRINT as one command and PRINT# as an entirely different command, then you should have no problems.

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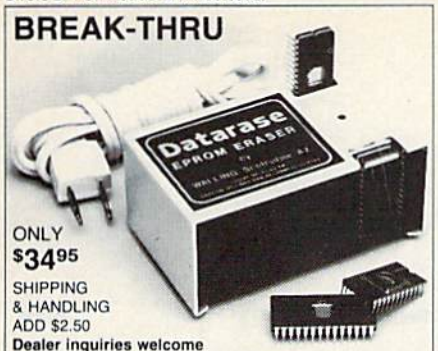

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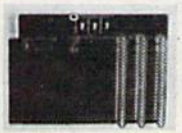

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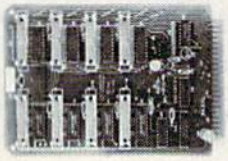

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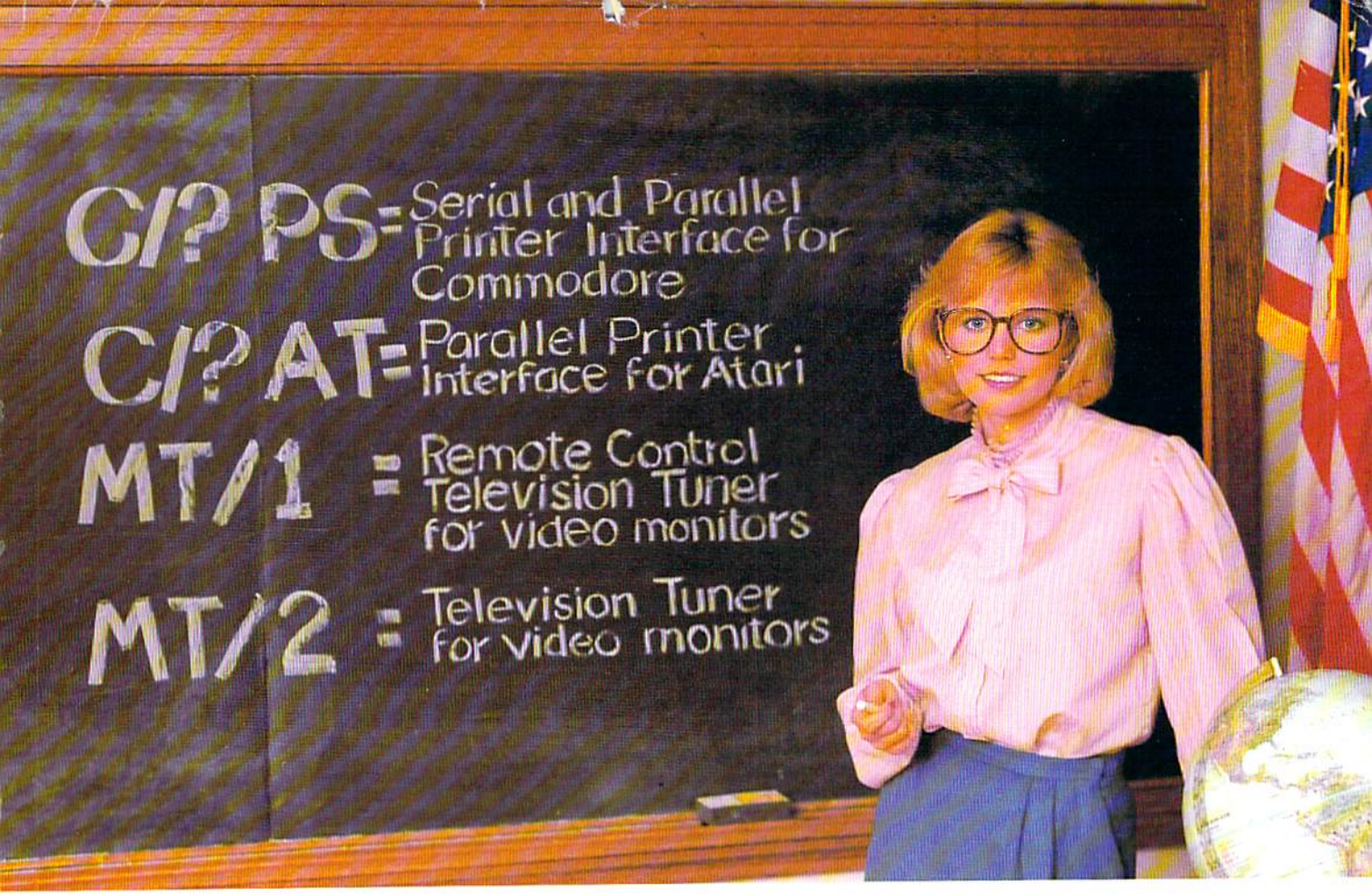

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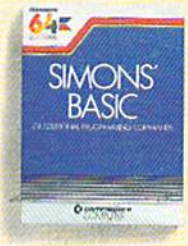

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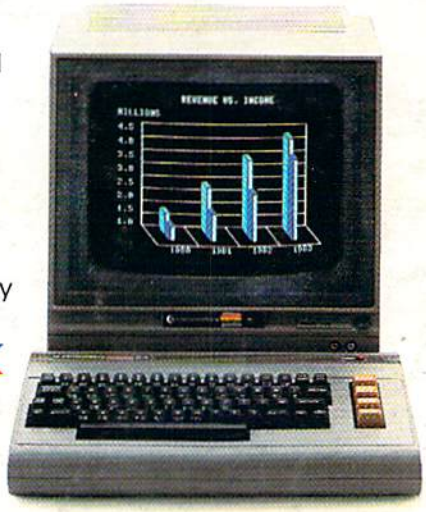

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