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August 1985 A CWC/I Publication



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If you have been searching for a letter quality printer you probably found that the flood of claims and counterclaims were a real roadblock in your search. Not long ago we were in the same position. We tried to determine which daisy wheel printer had all the features anyone could want, but would also appeal to the cost conscious buyer. Recently several manufacturers introduced printers that had features we were seeking. After a thorough assessment we eliminated all but one which precisely met our qualifications.

THE RESULTS ARE IN

We found the printer which has all the features anyone could want. We've named it the Aprotek Daisy 1120, a real heavy-duty workhorse printing at 20 characters per second. The manufacturer is Olympic Co. Ltd., a highly respected Japanese firm.

FEATURES GALORE

This printer has it all. To start with, it has a front control panel with indicators for Pitch Selection which allows for 10, 12, or 15 characters per inch (CPI) or Proportional Spacing. There is a Select (Online) button (with indicator) and a Line Feed button. You can also set Top-of-Form or Form Feed with the touch of the TOF button. Other front panel indicators include Power and Alarm.

To load a sheet of paper, simply place it in the feed slot and pull the paper bail lever. The paper feeds automatically to a 1 inch top margin and the carriage aligns to the selected left margin. In this manner, each page can have identical margins.

You can continue to use your Commodore while the Daisy 1120 is printing.

The built in 2K buffer allows a page or two of concurrent printing and use of your computer for the next job. To really take advantage of your printer's optional features, the automatic Cut Sheet Feeder eliminates tiresome paper handling. Also available is the adjustable Tractor Feed option. *Compare our option prices!*

Best of all the Daisy 1120 is quiet: only 57 dB-A (compare with an average of 62-65 dB-A for others).

COMPLETE COMPATIBILITY

The Daisy 1120 uses industry standard Diablo® compatible printwheels. Scores of typeface styles are available at most computer or stationary stores. You can pop in a 10, 12, 15 pitch or proportional printwheel and use paper as wide as 14". At 15 CPI you can print 165 columns—a must for spreadsheet programs.

The Daisy 1120 uses the Diablo Hytype II® standard ribbon cartridges. Again universally available.

Not only is the hardware completely compatible, the control codes recognized by the Daisy 1120 are Diablo 630® compatible (industry standard). You can take advantage of all the great features of word processing packages and automatically use superscripts, subscripts, automatic underlining, bold-face (shadow printing) and doublestrike.

The printer has a set of rear switches which allow the use of standard ASCII as well as foreign character printwheels. Page length can be set to 8, 11, 12, or 15". The Daisy 1120 can also be switched to add automatic line feed if required.

THE BEST PART

When pricing a daisy wheel printer with all these features (if you could find one), you would expect to pay $600 or $700 dollars. The options would add much more, but our exhaustive research has paid off for you the Commodore user. We can now offer this printer for only **$353.** Order yours today!

NO RISK OFFER

Try the Daisy 1120 for 2 weeks. If you are not satisfied for ANY reason we will refund the full price—promptly. A full 1-year parts and labor warranty is included. Another indication of quality and reliability.

THE BOTTOM LINE

Aprotek Daisy 1120 (Order#1120) $353 w/standard Centronics parallel interface and 2K buffer.

Options

Auto Cut Sheet Feeder (#1110) $188

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Interface with cable for all Commodore (except PET) (#1105) $44

Ask about cables and interfaces for other computers.

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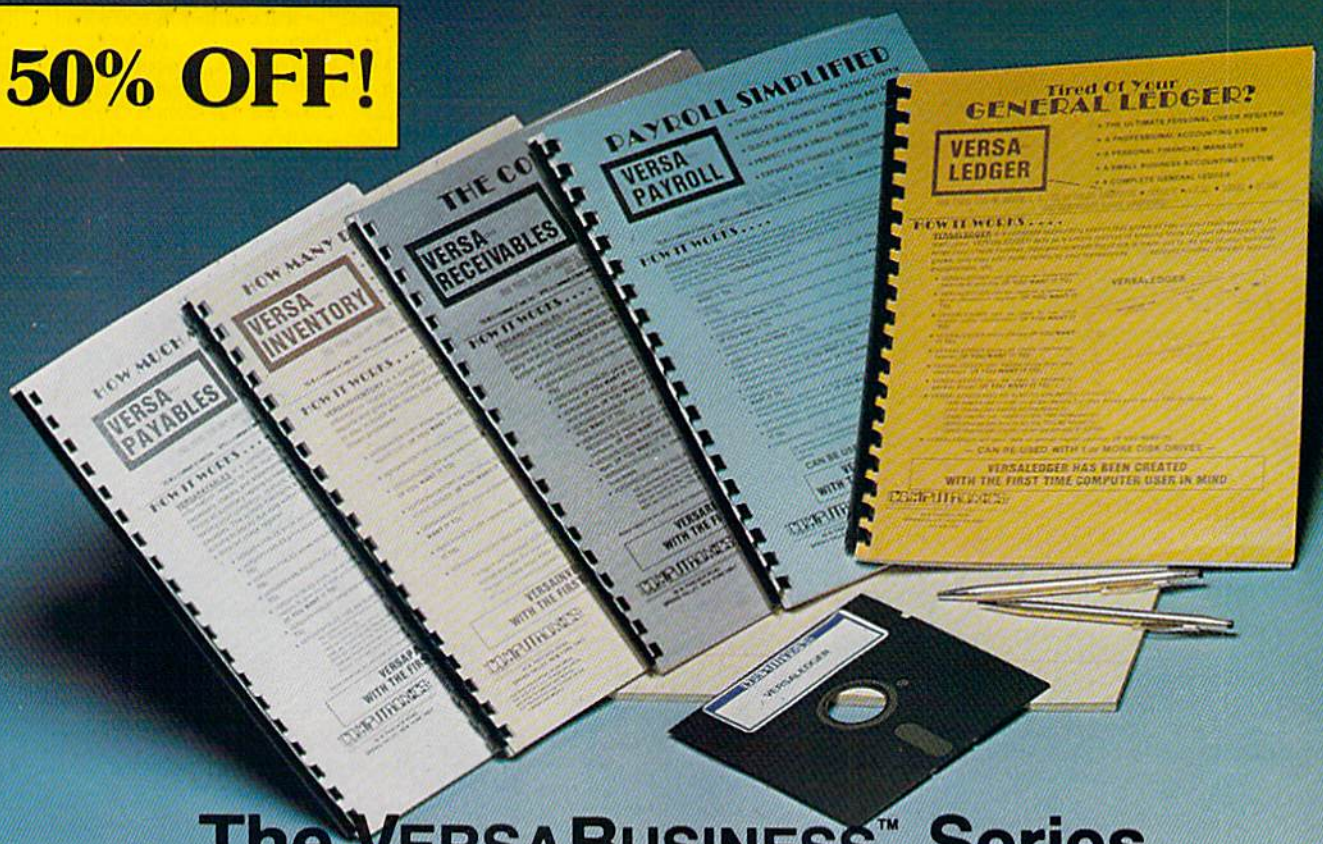
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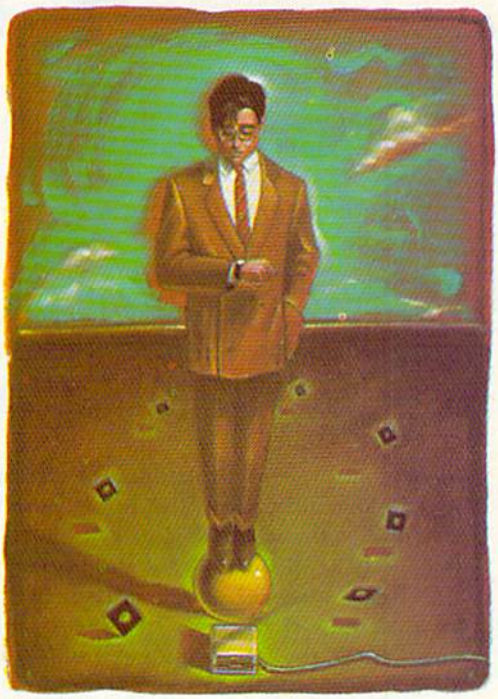
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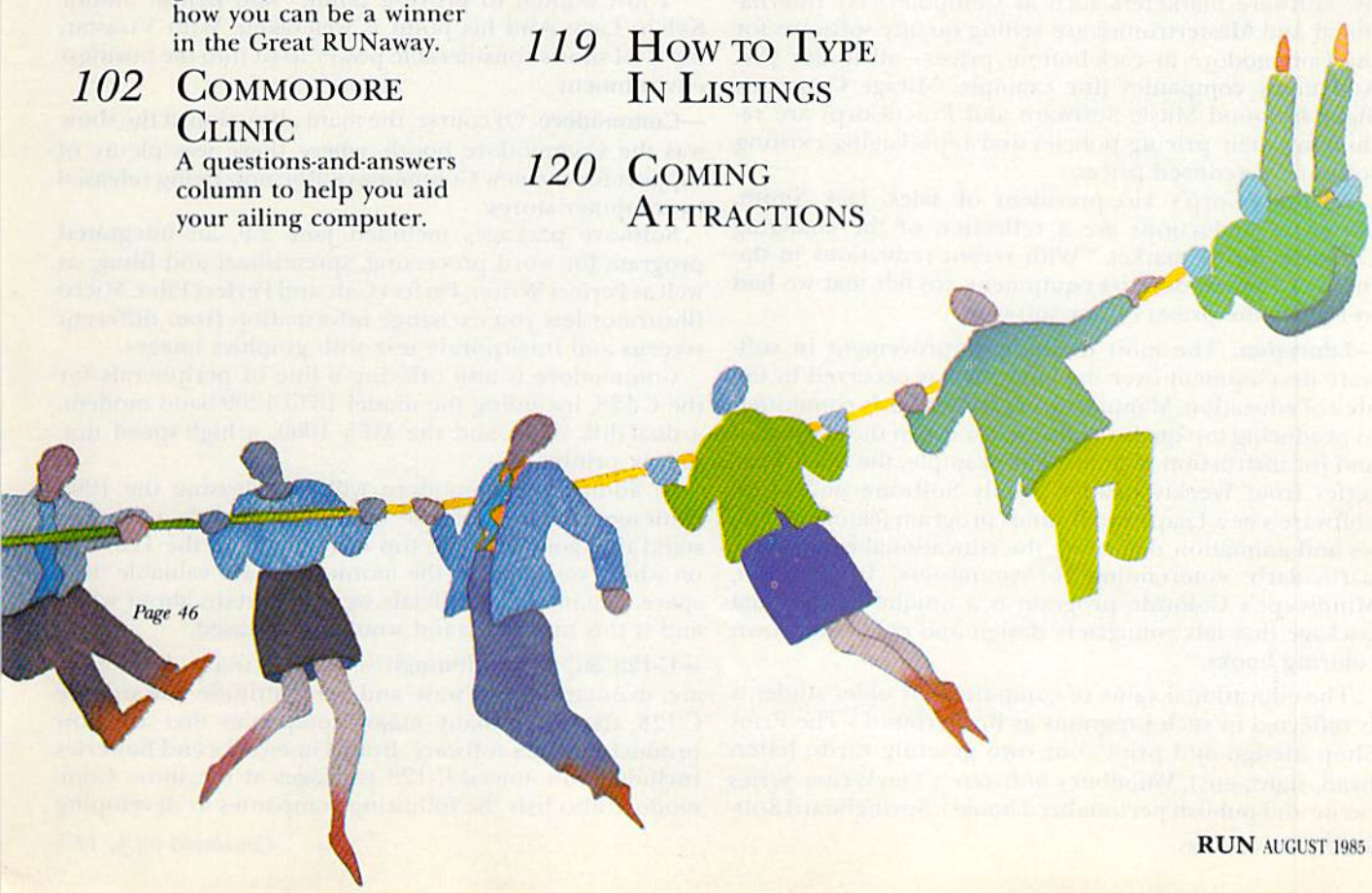
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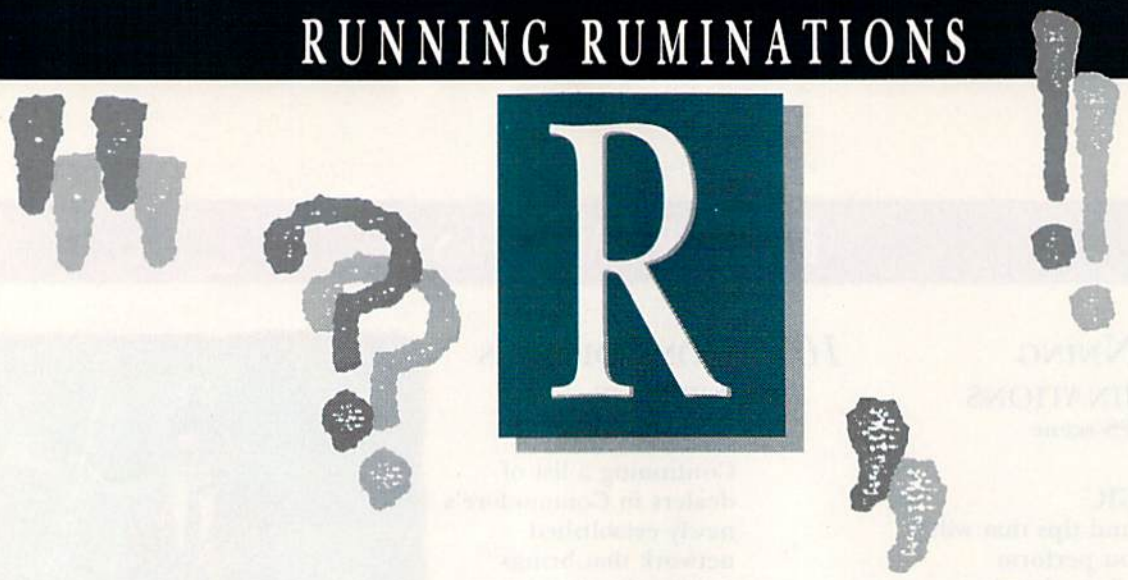
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The Scene at CES

Industry pundits are quick to forecast the demise of the home computer industry, pointing to the slowdown of computer sales, the plummeting computer stocks and recent upheavals at major computer companies such as Wang and Apple.

But if the recent Consumer Electronics Show in Chicago is any indication, the home computer industry is alive and well and kicking, as evidenced by the following themes that ran throughout the four-day event:

—Low-cost software. A few years back, computing, while not exactly a rich man's sport, certainly could make a huge dent in the family budget. But Commodore changed all that by slashing the cost of its computer systems and making them available through mass merchandisers.

Now the same price breakthrough is occurring in the software arena. Inexpensive no longer means poor quality. Software marketers such as ComputerEasy International and Mastertronics are selling quality software for the Commodore at rock-bottom prices—all under $20. And many companies (for example, Mirage Concepts, Sight & Sound Music Software and PractiCorp) are rethinking their pricing policies and repackaging existing software at reduced prices.

As PractiCorp's vice-president of sales, Jack Smith, notes, the reductions are a reflection of the changing Commodore 64 market. "With recent reductions in the price of Commodore 64 equipment, we felt that we had to reduce the prices of our software."

—Education. The most dramatic improvement in software development over the last year has occurred in the area of education. Manufacturers are seriously committed to producing top-quality software for use in the classroom and for instruction at home. For example, the Stickybear series from Weekly Reader Family Software and Muse Software's new Leaps and Bounds program feature graphics and animation that make the educational experience particularly entertaining for youngsters. In addition, Mindscape's ColorMe program is a unique educational package that lets youngsters design and color their own coloring books.

The educational value of computers for older students is reflected in such programs as Broderbund's The Print Shop (design and print your own greeting cards, letterhead, signs, etc.), Woodbury Software's PlayWriter series (write and publish personalized books), Springboard Software's The Newsroom (write and design your own newsletter) and also Scarborough's Build a Book series.

For the high-school student, there are programs to help him study foreign languages (from Gessler Educational Software) and to prepare for the SAT and other college entrance exams (Simon & Schuster and Intelligent Software).

—Getting Down to Business. New game releases from such home-entertainment developers as Access Software (Beach Head II), Activision ("There's Someone Living Inside My Computer"), MicroProse (flight programs), SubLogic (Jet) and Epyx (Summer Games II and Winter Games) attracted much attention at the show.

But applications for use in the home and business were also represented. I was particularly impressed with Vizastar, an integrated business package that combines a spreadsheet, database and graphics. These capabilities rival those found on much larger machines.

"I just wanted to prove a point," said British author Kelvin Lacy. And his point is well-taken: With Vizastar, the C-64 shows considerable power to fit into the business environment.

—Commodore. Of course, the main attraction at the show was the Commodore booth, where there was plenty of support for the new Commodore 128, now being released to computer stores.

Software packages included Jane 2.0, an integrated program for word processing, spreadsheet and filing, as well as Perfect Writer, Perfect Calc and Perfect Filer. Micro Illustrator lets you exchange information from different screens and incorporate text with graphics images.

Commodore is also offering a line of peripherals for the C-128, including the model 1670 1200-baud modem, a dual-disk drive and the MPS 1000, a high-speed dot-matrix printer.

In addition, Commodore will be releasing the 1902 color monitor and a mouse. Also on display was a monitor stand that goes over the top of the back of the 128, and on which you can rest the monitor to save valuable desk space. Commodore officials were uncertain about when and if this monitor stand would be released.

—C-128 Support. Although several software developers are maintaining a "wait and see" attitude toward the C-128, there are many major companies that are now producing C-128 software. Both Timeworks and Batteries Included announced C-128 packages at the show. Commodore also lists the following companies as developing

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BELIEVE IT OR NOT!

- A neutrino has neither mass nor a charge, but travels at the speed of light!
- A 1950 study predicted all computing in the U.S. through 1999 could be done by 5000 computers!
- An integrated program with the power of Lotus 1-2-3 is available on the C64!

Until now, while useful programs existed for the C64, you had to use different commands for each. Even worse, they couldn't share data. Now there *is* one integrated program with the power of Lotus 1-2-3: **VIZASTAR.** It has a spreadsheet, a database and graphics. It took Kelvin Lacy, who wrote the acclaimed "Omniwriter" for Hesware, 15 months to develop Vizastar. It is totally menu-driven and written 100% in 6502 machine code. You can go instantly from spreadsheet to database or graphics and data is shared by all. It is compatible with virtually all word processors and printers. All Vizastar commands can be automated, so you can create your own applications and run them with one keystroke. Bet you think, with integration must come compromises. Nope. Read on and decide for yourself.



Actual Screen Dump Printed by VIZASTAR

The VIZASTAR Spreadsheet

It is a full-featured spreadsheet, as powerful as Multiplan. But much faster — faster than many on the IBM-PC! Remarkably, 10K of memory is available for spreadsheet use. Below VIZASTAR is compared against the other leading spreadsheets.

	CALC RESULT	MULTI-PLAN	VIZA STAR
No. of Rows	254	255	1000
No. of Columns	63	63	64
Vary Indiv. Columns	NO	YES	YES
Date Calculations	NO	NO	YES
No. of Windows	2	8	9
Built-in Functions	21	39	33
Link Spreadsheets	NO	YES	NO
Sort	NO	YES	YES
Program Mode	NO	NO	YES
Money-back Guarantee	NO	NO	YES
Retail Price	99.95	99.95	119.97

The VIZASTAR Database

It is a fast, random-access database, with file size limited only by available disk space. Create file layouts by simply painting a picture of the layout on up to 9 screens, showing where each field starts and ends. Vizastar does the rest. You can modify the layout at any time. To process the data, you use the familiar environment of the spreadsheet.

The VIZASTAR Graphics

Open a window anywhere and display a high-resolution bar or line graph of spreadsheet or database data. Or display the data as a pie chart or spectacular, 3-D multibar graph.

"I have been using Vizastar daily. I find it is the most powerful spreadsheet on the market for the C64 and the only spreadsheet that I will personally recommend for serious use."

Richard Tsukiji, President,
U.S. Commodore Users Group

"The power and design of Vizastar is spectacular. One of the "Best 5" software for the C64 of the 1000s I've seen."

Mike Hayes, Commodore Dealer

[Vizastar is] a phenomenal piece of programming which could turn the home computer market on its head."

California Magazine 2/85

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VIZASTAR comes with a cartridge, a 1541 diskette with a backup, reference and tutorial manuals. The 50 page tutorial manual is full of examples and pictures, to guide you step-by-step. Vizastar is priced at *ONLY* $119.97. The power of Vizastar may be hard to believe, but its value is hard to beat. We are so positive you will be delighted with it that we offer a hard-to-believe 15 day Money-Back Guarantee. Try it Risk-Free. Call us today or send a check or Money Order. VISA/MC accepted.

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Compiled by LOUIS F. SANDER

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Printers, programs, pointers, precepts. Prestidigitation? Precisely. Prodigious? Possibly. Partake!

$225 COL to the colors—The following program makes it easy to set your C-64's border, screen and cursor colors. You can always set them by Poking locations 53280, 53281 and 646, but, when you hit the run/stop along with the restore key, your hues become blues, and you have to Poke again.

As printed, the program includes a checksum routine to verify the correctness of your Data statements. Run it, and if you get a Data Error message, check your typing. When your Data statements are correct, you'll be asked to delete lines 2–4. Do that, then save the resulting program.

When you run the data-verified program, it will ask for the colors you prefer; unless you like the defaults I've provided, you should respond with the Poke values of your favorite colors (see Appendix G of the user's guide). After that, any time you wish to set the colors, simply type COL and press the return key. The run/stop and restore keys will still give you the blues, but a COL will brighten your screen and your day. Unfortunately, COL doesn't work from inside a program. You can insert your own default values by plugging them into the initial statements of lines 50–70.

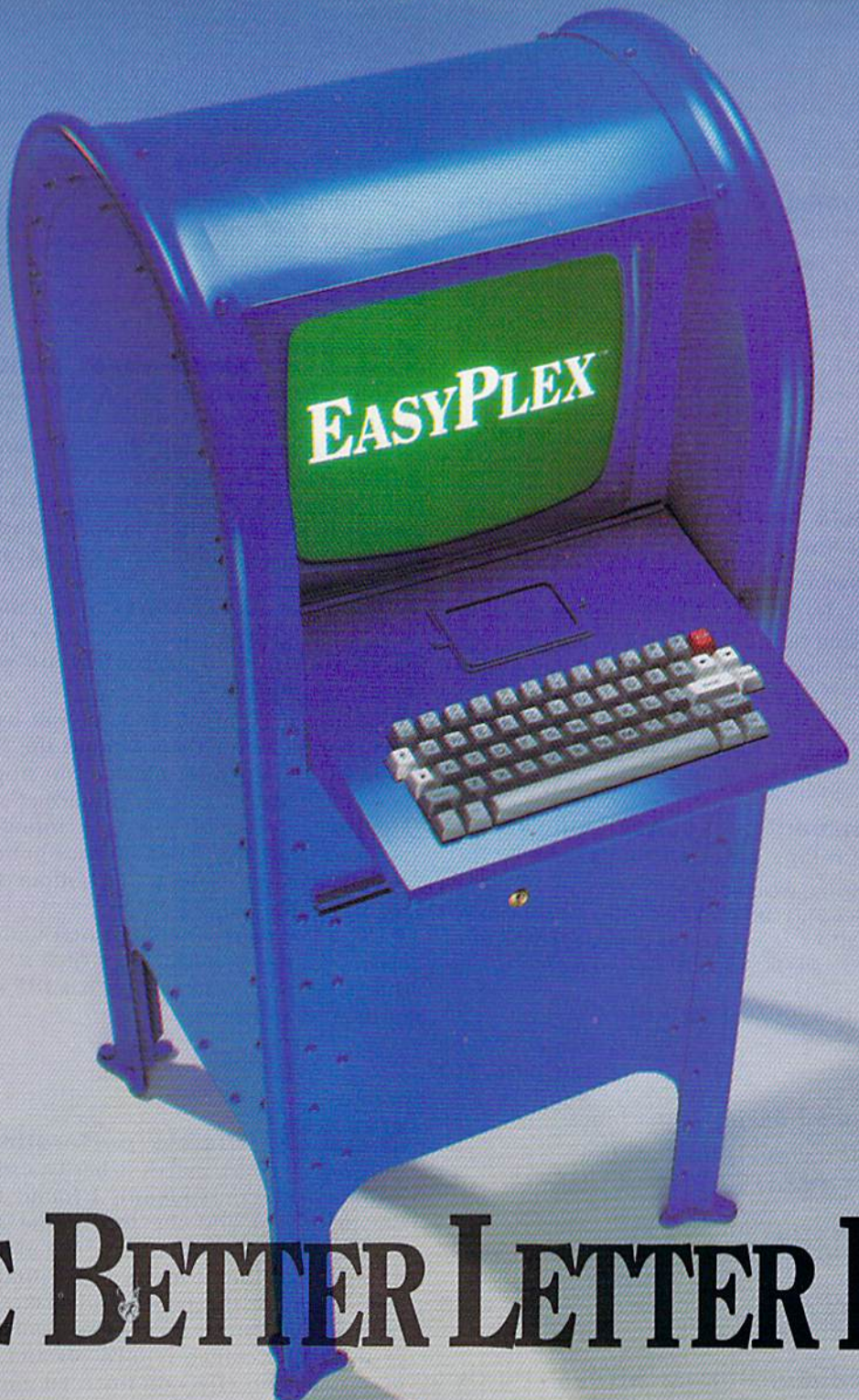
```
1 REM COL TO THE COLORS - ERIC BREAULT
2 FORJ=1TO92:READK:CS=CS+K:NEXT
3 IFCS<>10512THENPRINT"DATA ERROR":END
4 PRINT"DELETE LINES 2-4":END
10 FORJ=49152TO49230:READK:POKEJ,K:NEXT
20 FORJ=828TO840:READK:POKEJ,K:NEXT
30 PRINT"COLOR POKES FOR COL COMMAND:{CRSR
   DN}"
40 PRINT"(RETURN GIVES GREY/BLU/GRN){CRSR D
   N}"
50 B=12:INPUT"BORDER";B:POKE49174,B
60 S= 6:INPUT"SCREEN";S:POKE49179,S
70 C=13:INPUT"CURSOR";C:POKE49184,C
80 SYS828:PRINT"NOW TYPE COL <RETURN>"
81 DATA 173,000,002,201,067,208,030,173
82 DATA 001,002,201,079,208,023,173,002
83 DATA 002,201,076,208,016,169,012,141
84 DATA 032,208,169,006,141,033,208,169
85 DATA 013,076,048,192,234,230,122,208
86 DATA 003,076,119,000,076,121,000,096
87 DATA 141,134,002,169,000,162,007,157
88 DATA 255,001,202,240,004,076,055,192
89 DATA 234,096,234,234,096,000,251,000
90 DATA 251,000,251,000,251,000,251,169
91 DATA 076,133,115,169,000,133,116,169
92 DATA 192,133,117,096
```

Eric Breault
Pawtucket, RI

$226 Multi-selective directory—It's well-known that you can load a selective directory by using something like $0:AB*, which will load a directory of all disk files whose names begin with AB. It's less well-known that you can use $0:AB*,CD* to get all those files whose names start with AB *or* CD.

You can make up to five selections at one time, and the trick works with or without the wedge. The entries for the different selections are not separated on your screen, but appear intermingled in the order in which they appear on the directory as a whole.

Lowell K. Unger
Wynyard, Saskatchewan
Canada



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Circle 64 on Reader Service card.

$227 Disabling Epyx Fast Load—This popular cartridge sometimes interferes with the loading or running of other programs. You can disable it by entering:

entering:

```
POKE 770,131 : POKE 771,164
```

This will re-enable it:

```
POKE 770,106 : POKE 771,223
```

Greg B. LaPorte
Blacksburg, VA

$228 Plus/4 and C-16 easy saves—Make your first program line

```
1 REM {SPACE} programname
```

Then you can save it by listing that line, putting the cursor on the 1 and pressing the f5 key. DSAVE" will overwrite the 1 REM {SPACE} and pressing the return key will save the program.

G. Bradford Tiffany
Needham, MA

$229 Summertime sounds—This will produce the sound of rolling waves on your C-64.

```
10 REM WAVES - DANIEL WOODIE
20 V=54272:POKEV+6,240:POKEV+4,129:POKEV+1,34:POKEV,75
30 FORA=1TO15:POKEV+24,A:FORD=1TO50:NEXTD:NEXTA
40 FORB=15TO1STEP-1:POKEV+24,B:FORD=1TO200:
   NEXTD:NEXTB
50 FORD=1TO600+1200*RND(0):NEXTD:GOTO20
```

Daniel Woodie
Annapolis, MD

Here is a version for the newer machines.

```
10 REM PLUS/4 & C-16 WAVES - LOUIS F. SANDER
20 S=720+20*RND(1):FORV=1TO8:VOLV:SOUND3,S,V+2:
   NEXTV
30 FORV=8TO1STEP-1:VOLV:SOUND3,S,7*(8-V):NEXTV
40 SOUND3,S,250:FORD=1TO1500*RND(1):NEXTD:SOUND3,S,0:
   GOTO20
```

L.F.S.

$22A Redimensioning arrays—Here's a technique you can use to free up memory space and redimension arrays without getting a fatal Redim'd Array error. It resets the array pointer, clearing the array space without clearing other variables. To use it, simply insert the following line before the computer encounters another DIM statement.

```
POKE 49,PEEK(47) : POKE 50,PEEK(48)
```

Jim Knarr
N. Manchester, IN

$22B Selective load and run on tape—To use the shifted run/stop key on a named program, type four spaces, then your program name in quotes. Move your cursor back to the start of the line, using cursor-lefts or a shifted return plus a cursor-up. When you press the shifted run/stop key, the selected program will automatically load and run.

Steve Hedemann
Richfield, MN

$22C Single-sheet printing tips—Many printers have a paper alarm that discontinues printing when the paper runs out or breaks. The details of these alarm systems vary, but they work on the same general principles. On Commodore's 1526, for example, normal-feeding paper closes a microswitch placed inconspicuously in its path. When a paper outage opens the switch, the printer stops and the paper-advance button flashes as a warning.

The paper-alarm feature can be a nuisance when printing single sheets, especially when it activates partway down your printed page. Here are some ways to avoid this inconvenience.

- If tape is too much trouble, wait until printing stops, then feed another sheet behind the first one. Just push it in until the printer mechanism stops it, and there's a good chance it will clear the alarm. Sometimes you must also press a switch to resume printing. On the 1526, you press the flashing paper-advance button.
- Tape a second sheet to the bottom of your page, avoiding the paper-out condition.
- Use a DIP switch on the printer to deactivate the paper alarm. On the Gemini 10X, switch #1 on the back serves this purpose. If your printer has DIP switches, see if one of them does likewise.

B. Franklin
Philadelphia, PA

$22D Visible perforations—My printer's smoke-gray cover makes it hard to see the paper perforations, and, consequently, I found it difficult to align the printhead and the top of the sheet. I solved the problem by running a dark, felt marking pen over the points of all four corners of the folded paper. The ink soaks through the paper and makes it easy to see the perforations. Since they appear only on the outer edge of the paper, which is torn off and discarded, the ink marks have no effect on my final documents.

John B. Boninger
Rock Island, IL

$22E Tractor-feed fodder—Some printers, like the 1525 and MPS-801, waste a sheet of paper every time they are set to top of form. Keep a clipboard handy, and, as you remove your printout from the printer, tear off that first blank sheet and add it to the clipboard. Clean, full-size sheets have plenty of uses around the house.

Phillip D. Deem
Indianapolis, IN

$22F Printing stencils—Dot-matrix printers strike hard enough to cut a mimeograph stencil. I've used

Continued on p. 100.

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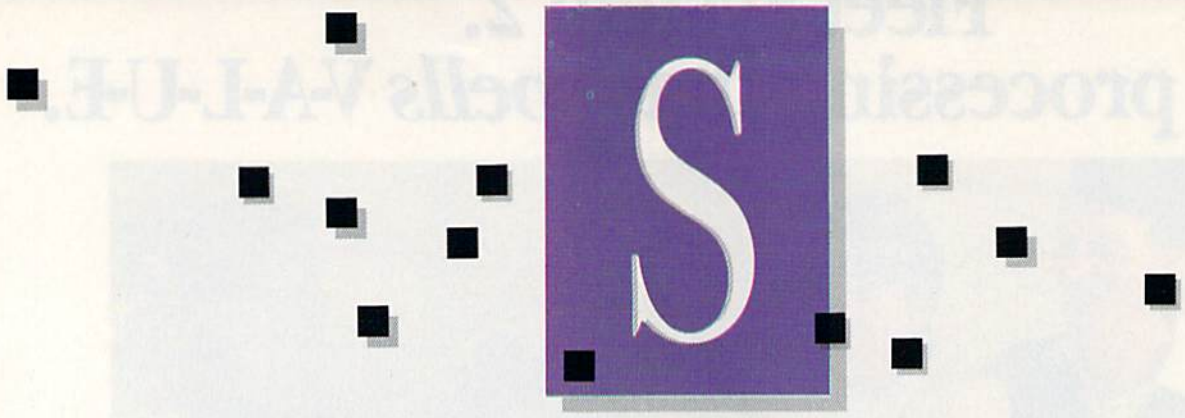
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Circle 93 on Reader Service card.



Compiled by SUSAN TANONA

Creative Filer

B

An Efficient Data Management Program For Home Applications

If you're a first-time computer owner looking for something useful to do with your C-64, an inexpensive, easy-to-use database package might be a good place to start. Creative Filer is one of many such programs on the market that could fit the bill nicely.

At $49.95, it's inexpensive. As for ease of use, you would be hard-pressed to find anything easier. The user's manual is a skimpy 30-page pamphlet that assumes you know nothing about data management. There's nothing to overwhelm you here.

The program is made up of seven modes, or options, listed on the Main menu. The manual guides you step by step through the process of designing a form, entering your data and recalling and modifying records.

A convenient Quick Reference Summary card is included, listing all commands and functions. Help screens are also available throughout the program, listing the special keys and their functions.

Creative Filer's storage capacity is comparable to other data management programs in its price range. It allows up to 1300 records per disk and 100 fields per record. Forms can be up to 98 lines. This should be more than enough for most home applications.

Once you've created your file, the Browse/Modify mode lets you easily recall and modify your records. You can search for records using criteria from any field, and multiple-field searches are also possible. In this mode, you can print the record that appears on your screen, but you're limited to printing one record at a time.

To print an entire file, you must enter the Report Writing mode. This is the most sophisticated part of the program, and it allows for a surprising amount of flexibility in generating reports.

Any or all records can be included in the report. Unless you specify otherwise, Creative Filer automatically sorts records in ascending order according to the primary field (the first field on the form). You can also sort and print your records in order according to a user-defined secondary field.

You can also perform arithmetic calculations combining data from various fields. These calculations, called derived fields, can be included in your printed report. Formatting the report is fairly easy, and you can save your report formats to disk, which could prove to be a big time-saver in the long run.

Creative Filer is compatible with Creative Writer, which is also available for $49.95. Creative Writer has embedded commands that allow you to include data from Creative Filer in your word processing documents.

Combining these two programs will give you an efficient home productivity system for $100. There are, however, less expensive programs on the market that may be powerful enough to suit your needs.

Also, some companies now offer integrated software that gives you, for example, word processing, data management and spreadsheet capabilities, all in one modestly-priced package.

So, shop around. Compare prices and features. If your intended application is fairly simple, you may be able to find what you need for less. *(Creative Software, 960 Hamlin Court, Sunnyvale, CA 94089. C-64/$49.95 disk.)*

Shawn Laflamme
***RUN* staff**

Report Card

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

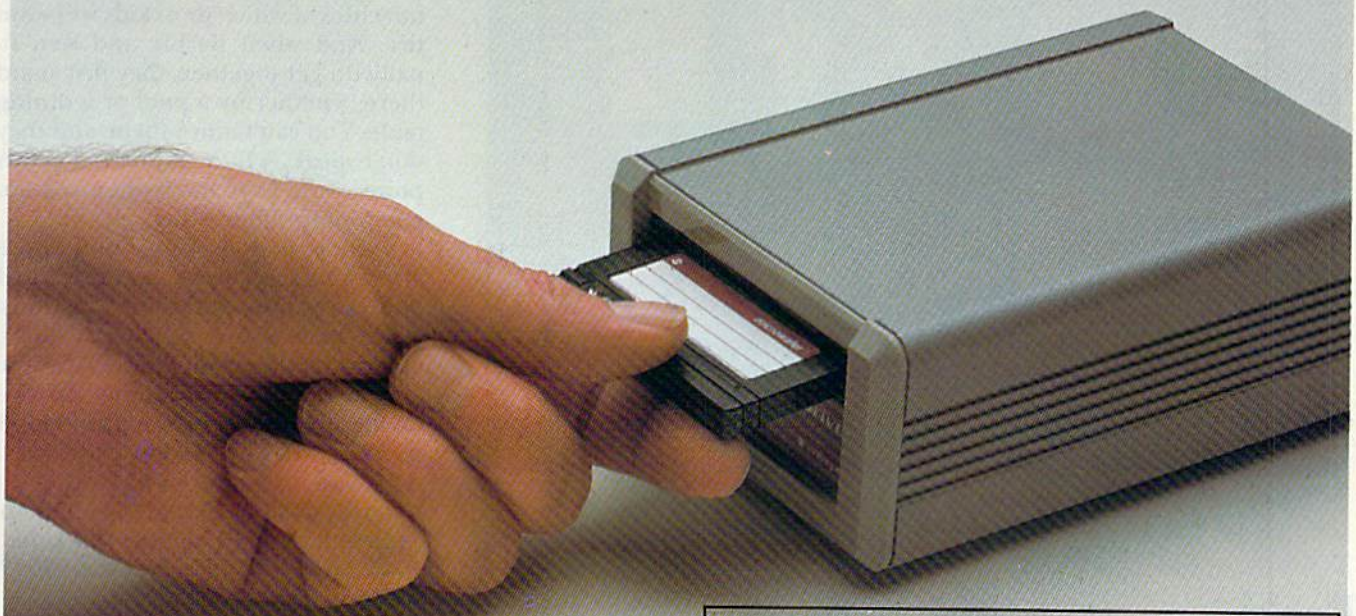
B ***Very Good.*** One of the better programs available in its category. A worthy addition to your software library.

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 deepsixed!

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Barbie

C

Change Her Clothes, Hairstyle and Shoes, And Listen to Her Talk

Barbie features superb graphics and sound. Unfortunately, these impressive capabilities are applied to a most unimpressive, trivial and sexist end.

Scene 1. Barbie walks into a room and her phone rings. She picks it up. It's Ken, who, in a realistic (and optimistic) voice, asks her out on a date—to dinner. Barbie must be ready in one hour. "Sounds like fun," Barbie cheerfully replies.

Cut to scene 2. Barbie is seated in a sports car, which you control with a joystick, on a shop-lined street. You must dress her in something appropriate for the occasion. To enter a shop, you press the fire-button. Let's say you stop at Eva's Boutique.

On to scene 3. Soap-opera type music accompanies Barbie's visit to this and every shop. Various outfits hang on the racks. To try an outfit on Barbie, you position a small white glove on the garment and press the fire-button; Barbie is instantly garbed in that outfit. You can try on as many outfits in as many variations as you wish (you have a choice of colors and patterns). But don't take too long—Ken expects Barbie back in an hour.

If Barbie doesn't return home in time, she is met with a note from Ken, who was there, but, alas, has gone. If Barbie gets home too early, she must answer to a capricious Ken, who calls and announces a change of plans—now Barbie must prepare for a tennis game or swimming or maybe a prom, picnic or a workout at the gymnasium. "Sounds like fun" is her ever-pleasant, remarkably tolerant response, and off she goes, to find something new to wear.

Why can't Barbie call Ken? Why can't Barbie say no? Why does Barbie have nothing to do but shop? Ken calls, Barbie jumps. It took Mattel's Barbie 20 years to come out of her box and enter the real world. How long will it take the computerized—technologically progressive—Barbie?

While Barbie is admirably rich in colorful, finely detailed graphics and unusually realistic sound, its plot and characters are embarrassingly underdeveloped. The program's many sexist aspects aside, Barbie just isn't captivating enough for children.

While most kids might find it fun to dress and redress Barbie, move her car along (you can vary its speed by pressing the joystick left or right) and hear her and Ken talk (though their conversation never varies), these are novelties of which most kids will soon tire. And when Barbie and Ken finally do get together, they just stand there, whether by a pool or a dining table. You can't move them, and they don't speak. A little animation at this point could have made the program much more interesting.

With real dolls (the kind whose arms and legs break or are pulled off), kids can use their imaginations. They, themselves, speak for the dolls, about anything from shoes to the sun. Maybe Barbie would rather go skydiving. Real dolls can be thrown off porches, windowsills and chairs. Real dolls are as kind, funny, cruel or tough as the kids who play with them. This doll is just pathetic. *(Epyx, Inc., 1043 Kiel Court, Sunnyvale, CA 94089. C-64/$39.95.)*

Marilyn Annucci
***RUN* staff**

Adventure Master

A

Your Imagination is the Only Limit as You Create Your Own World

There comes a time when every adventure player begins to long for an adventure all his own. However, this kind of programming is specialized, time consuming and difficult to learn. So what's an adventurer to do?

CBS Software's Adventure Master for the Commodore 64 is a comprehensive program-generation package that will walk you through the creation process as painlessly as possible.

All adventures possess some common elements that should be included in such a construction program. There must be rooms or locations, passageways or transferals, objects, and verbs by which object-manipulation may



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occur. Locations and objects must have descriptions, and the use of verbs must create consequences. Characters should be able to move in different directions and the game must contain a puzzle to solve or some goal to attain.

Adventure Master provides you with simple, easy-to-use instructions with which to accomplish all of this and more. The generator program is menu-driven, allowing easy access to all of the individual cells that make up the final dump. You can create passageways and objects, write descriptions and an introduction, list and edit words, set up a scoring system, test your adventure before it's completed and create your game's graphics.

Adventure Master employs a building-block style of creation that makes the entire process very simple to use. You can put your adventure together one piece at a time, saving each completed segment to disk.

The program's word acceptance is user defined, as is the interaction between nouns and verbs. Magic words are teleportation devices and are also user controlled. For example, you can define the word home as a magic word and use it to transfer a character from one location to another in order to rescue him from some impossible situation.

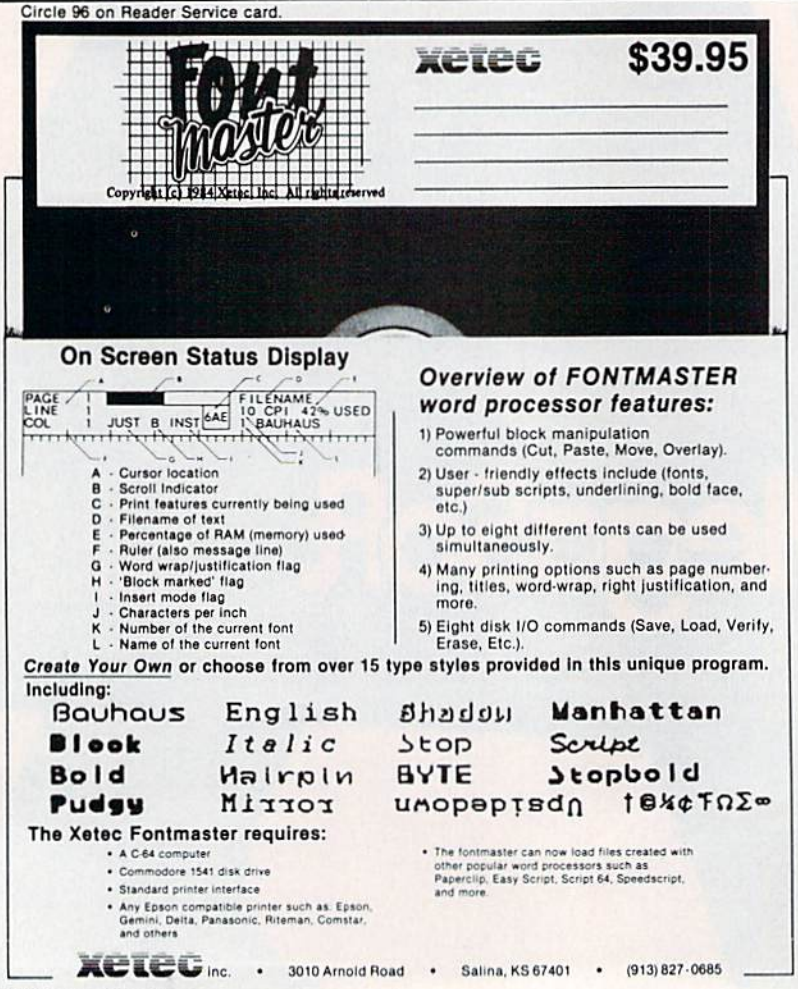
Your final product can contain movement in eight directions and it can be chock-full of colorful graphics. Adventure Master can turn ideas into adventures with little or no programming skill, giving you machine-code programs that are fun to play and allow you the sheer satisfaction of writing your own adventure.

I found Adventure Master quite easy to use. The individual module instructions leave no doubt as to how the program works. The graphics section seems fully capable of making the end product come alive with colorful illustrations. The test adventure that I created performed as though a talented machine-language programmer had carved it out of an editor/assembler. I was so impressed with Adventure Master that I decided to buy the review copy of the program after I'd completed this review.

If you love adventures, and would like to write your own in a painless, hassle-free way, I believe you'll find Adventure Master to be an invaluable tool. Whether you want to entertain your friends, produce a professional-quality product for resale, or simply putter around, Adventure Master is a lot of fun. *(CBS Software, One Fawcett Place, Greenwich, CT 06836. C-64/ $44.95 disk.)*

Bob Liddil
Peterborough, NH

Circle 96 on Reader Service card.



The Banner Machine

B

Create Professional-Quality Signs and Banners with This No-Fuss Program

The Banner Machine is a solid, meat-and-potatoes graphics utility that might be of special interest to businesses and organizations. It produces sharp, professional-quality signs with a minimum of fuss.

The program automatically computes proportional spacing on signs that are up to 14 lines long, with letters up to eight inches high. You can add a border to your signs, shade the background and choose from 11 different letter fonts. Although for personal use, this program is expensive and limited compared to some similar programs on the market, The Banner Machine signs are of much higher quality and are worth the cost difference if you really need that quality.

The Banner Machine is very easy to use. The sign editor keeps track of all the interrelated parameters. For example, if the paper is 8½ inches

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long, the program allows up to eight lines on your sign. If you add a border or change to a larger letter size, the editor will recompute the maximum number of lines available. Functions such as letter size, space between letters, and disk operations are accessed on the function keys.

The Banner Machine offers many options. Two Gothic fonts provide about a dozen graphics symbols in addition to the standard letters. The holiday symbols, for example, include a birthday cake with a programmed number of candles, a Christmas tree and a shamrock.

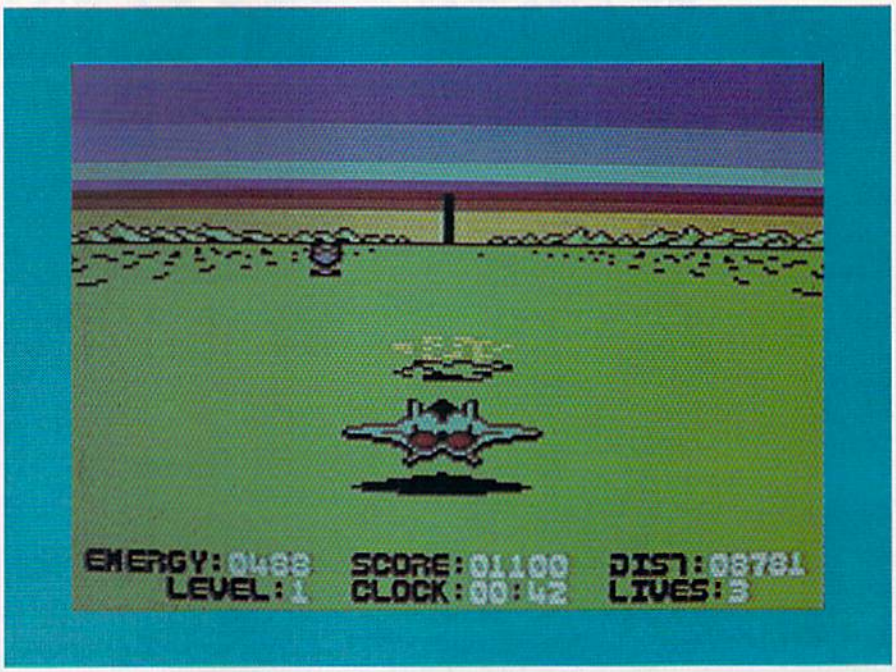
Besides eight letter sizes, you can choose from eight border widths and 16 background shades. The user manual illustrates the shades, as well as the difference between standard, emphasized and compressed print, and also displays the 13 fonts that are offered on the complete set of disks.

The Banner Machine package includes a printer-configuration program that matches the software to common non-Commodore printers and most of the popular printer interfaces. It supports disk operations, including saving banners or chaining several together to be printed out. Everything I tried was trouble-free.

The Banner Machine is not exciting, but it fills a unique niche in the business-graphics area. The basic disk offers only five letter fonts and one font with holiday symbols. These fonts are all variations of Gothic, which has the widest application but the least interesting design. If you buy the extra disks, your total cost for the package is more than $100, making The Banner Machine somewhat pricey for occasional use.

However, businesses and organizations that pay sign-painters for routine signs and banners may find this program a real bargain. You don't have to be an artistic genius to produce satisfactory signs and advertising flyers with The Banner Machine, and I think that's one of the biggest advantages of the program. *(Cardinal Software, 13646 Jefferson Davis Hwy., Woodbridge, VA 22191. C-64/The Banner Machine with Gothic Font, $49.95; Font Disks I and II, $39.95 each; Single Font Disk, $19.95.)*

Annette Hinshaw
Tulsa, OK



Stealth

A

Pilot Your High-Speed Fighter 10,000 Miles in Search of the Black Tower

Imagine the perspective you'd have if you were following a high-speed fighter on a bombing and strafing mission—you'd see the ground rushing past beneath you, you'd observe the impact of rockets on targets dead ahead in the distance and you'd see the horizon tilt as you went into a turn. If that sounds impressive, then you'll enjoy Stealth, because these are only some of the unique features of this fast-paced game.

As the pilot of this fighter, your mission is to destroy the Black Tower on each of five levels of play. To reach this tower, however, you'll have to traverse a distance of some 10,000 miles, and it will probably be the most difficult journey you'll ever experience with your C-64.

The enemy has fortifications to prevent such intrusions into their perimeter—radar installations, rockets, tanks, bunkers and heat-seeking missiles. On the plus side, your craft is highly maneuverable, lightning fast, and it uses a new type of energy-propulsion system that can be fortified throughout the game. (There are also numerous negative-energy pods that will drain your supply of fuel.)

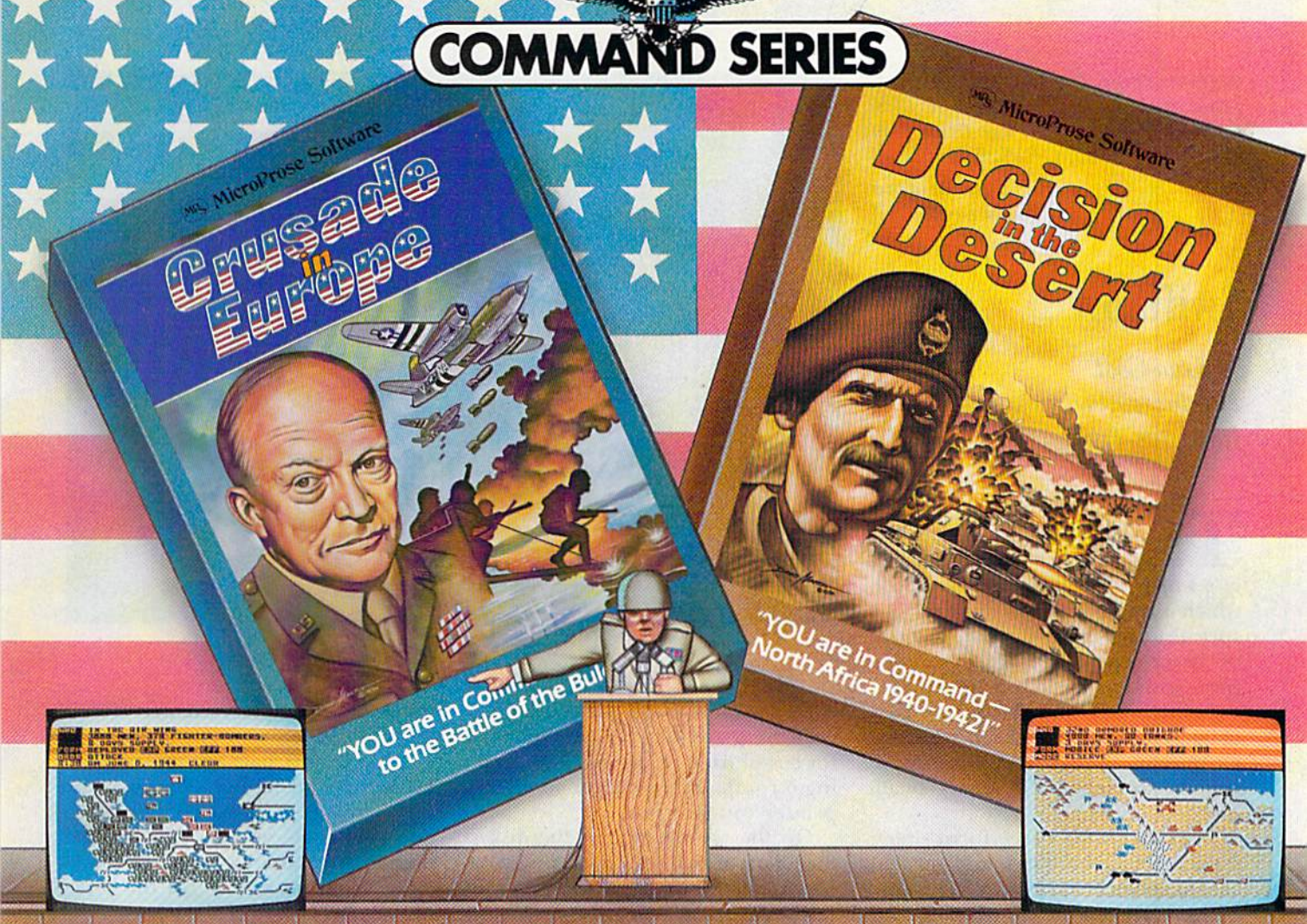
To destroy the Black Tower requires one direct hit on the first level, two on the second level, three on the third, and so on. In general, it's fairly easy to destroy the tower, but it's extremely difficult to survive long enough to get within firing distance of it. The game requires excellent reflexes and a sixth-sense for judgment calls. I can't imagine anyone wanting more action than Stealth provides.

Every facet of this game—play-action, interest level, sound, graphics, animation and documentation—is of the highest quality. If it were possible to give Stealth an A+, I would do so without hesitation.

Level 1 is fairly easy to complete, Level 2 a bit more difficult, and from Level 3 on, only the sharpest of computer pilots will succeed. Your performance is rated against two factors: how long it took you to complete a given level, and how many enemy installations you knocked out along the way. Your rating is compiled for each level and a cumulative assessment is given of your performance.

Stealth is one of those games you'll find yourself going back to for many

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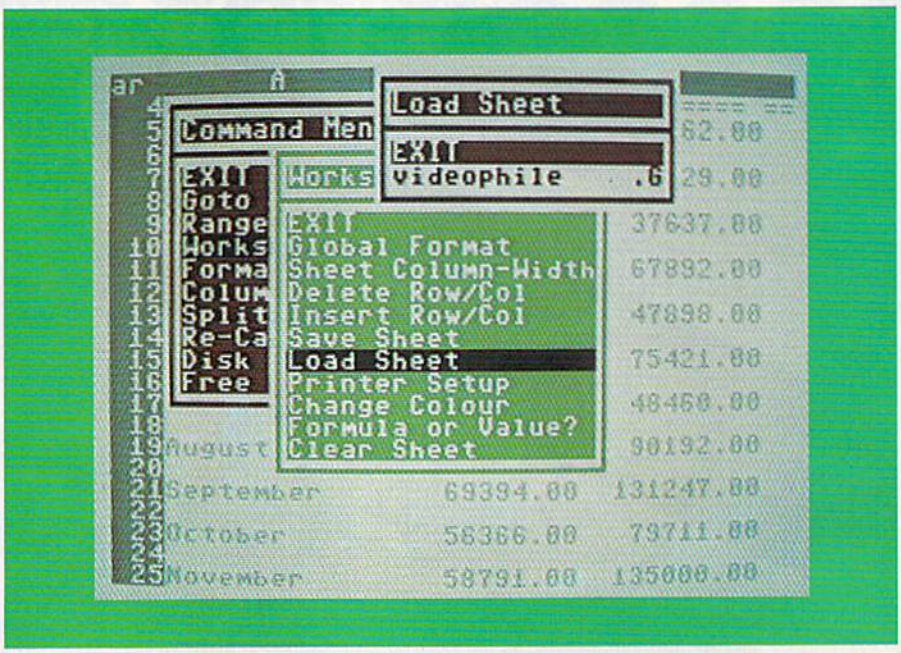
years to come. It's one game I guarantee you won't grow tired of. *(Broderbund Software, 17 Paul Drive, San Rafael, CA 94903. C-64/$29.95 disk.)*

Tom Benford
Osborneville, NJ

SwiftSoft

B

A Low-Cost Productivity Package Ideal for Home Use



The people at Cosmi seem determined to give you your money's worth and more with SwiftSoft, which is a disk that contains a serious spreadsheet on one side and a series of home-organizer packages, complete with templates, on the other.

SwiftCalc, the spreadsheet, provides 6600 cells for data entry, which is more than enough for home applications, as well as for many small-business needs.

In addition to a free-form sheet, there are four built-in templates that can help with figuring your home budget, car costs, expense reports and loan analysis.

SwiftCalc resides entirely within the memory of the C-64; thus, there is instant execution of all commands, as there is no need for disk access. SwiftCalc uses only about 5K of memory.

As with any good spreadsheet, all math functions are supported. Since many of the more complicated functions are built-in, you can avoid memorizing a lot of formulas.

You can use the Label mode to automatically link adjoining cells, so that you don't have to use cryptic abbreviations and then later try to remember what they are supposed to represent.

I did not like the default colors of SwiftCalc—gray on white—as they created very little contrast and were difficult to see. Colors may be changed, but the method for changing may best be described as blind experimentation. One more menu for choosing colors would have helped.

In addition to all of its number-crunching abilities, SwiftCalc allows for customized printer settings, making it compatible with just about any printer you may own.

On the reverse side of the disk is SwiftServ, which is a group of databases (each with one or more built-in templates), to make your record-keeping easier. The five databases are CheckServer, PhoneServer, HomeServer, DateServer and InfoServer.

CheckServer presents you with a template in the form of a ledger sheet, onto which you enter your checking-account information. All the math functions are built in.

PhoneServer allows you to build your own telephone directory, keep track of your calls and compute the rate, based on the time of day the call was made.

HomeServer keeps an inventory of household goods, jewelry, hobby items and so on. You can enter information such as brand name, serial number and purchase price.

DateServer allows you to keep track of important dates, and provides room for notes and comments.

InfoServer is a rudimentary word processor that offers such common word processing options as tab setting, line insertion and delete. This program is adequate for writing notes, but if you're working on anything more complex, you may find it less than suitable.

Overall, this package offers good value for your money. Although the word processor is barely adequate, and the databases are a bit limited in their applications, the spreadsheet alone is more than worth the price of the package.

Buy it for that and consider everything on the flip side simply icing on the cake. Then join me in thanking Cosmi for making quality software very affordable. *(Cosmi, Inc., 415 N. Figueroa St., Wilmington, CA 90744. C-64/$29.95 disk.)*

Ervin Bobo
St. Peters, MO

Agent USA

B

Learn Geography as You Fight to Save the World From the FuzzBomb

As the supply of new software for the Commodore 64 continues to grow, it's more difficult than ever to make choices, especially when the programs will be used by children. Agent USA proves that it's still

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RSoftware Gallery

possible to find programs that meet the needs of parents who want a computer to provide their children with some intellectual stimulation, as well as an escape from the pressures of being a kid.

Agent USA is an engrossing adventure that is intended for youngsters, ages nine and older. The player assumes the role of a spy on assignment for the Central Intelligence Bureau. The agent must save the United States from being hit with a FuzzBomb that threatens to turn the entire population into FuzzBodies.

Agent USA is quite easy to play. The documentation, instructions and hints are cleverly presented as a series of letters and memos to the agent from the director of the Central Intelligence Bureau. A separate reference card is also provided.

Also included in the package are a colorful poster, stickers and a map of the United States that shows all the cities to which the agent may travel as he works to disarm the FuzzBomb. Agent USA must trek by train from city to city, collecting the special crystals needed to neutralize the bomb.

Traveling by train is a very realistic experience. You must enter the ticket booth at each train station, check the schedule and buy a ticket to the city that will bring you closer to the FuzzBomb. Keep a sharp eye on the clock so that you don't miss your train.

To keep track of the FuzzBomb, you may stop at an Infobooth, located in each state capital, for updates from your headquarters. Infobooths provide information concerning how many crystals are fortifying each city and a prediction of the path of the fuzz menace.

Agent USA is a game that requires logic and reasoning, as well as some manual dexterity. By the time a child wins the game and defeats the FuzzBomb, he has learned to plan a travel itinerary and to be aware of the passing of time, and has become familiar with the names and locations of the states and their major cities.

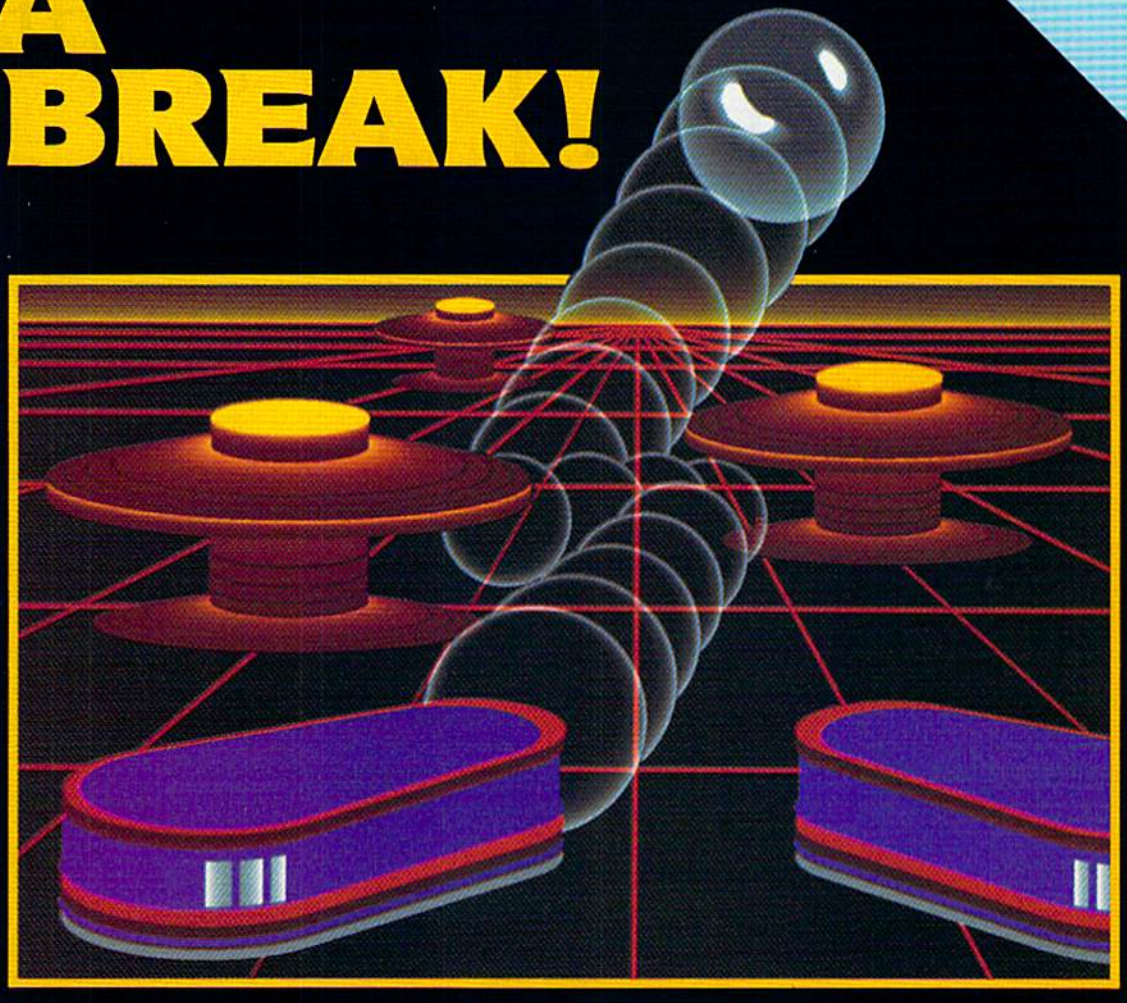
The child must accurately spell the names of the cities in order to purchase a train ticket. A map is the only aid that's needed to play the game. The action is fast enough to keep a youngster's interest, but the lesson in geography is one that could also benefit many adults. And parents will undoubtedly appreciate the lack of violence in Agent USA. People simply turn into FuzzBodies—no one ever dies.

Agent USA is a welcome addition to any software library that is overloaded with action and arcade games. The hours a child spends with this game will prove to be productive as well as enjoyable. *(Scholastic, Inc., 730 Broadway, New York, NY 10003. C-64/$39.95 disk.)*

John Premack
Lexington, MA

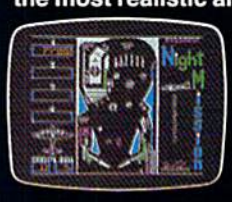
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Competing with The 1541

By GUY WRIGHT

If you're frustrated with the Commodore 1541's lack of speed, you might be considering the purchase of a new drive. This article reviews Commodore's popular disk drive and examines how it stacks up against some of its competitors.

Up until now, if you wanted a disk drive for your C-64 or VIC-20, you bought a Commodore 1541. It's not that the 1541 is such a wonderful drive, but it was the only one available that did not require using an interface. The 1541's low price tag was somewhat of a compensation for this lack of choice.

One reason C-64 and VIC-20 owners were limited to the 1541 was that those machines were specifically designed for it, and the 1541 is a difficult drive for manufacturers to emulate. The 1541 has a microprocessor and memory of its own. Rather than storing the DOS (disk operating system) program inside the VIC-20 and C-64, Commodore placed it on a chip inside the 1541. If Commodore hadn't done this, you wouldn't have been able to use a disk drive with the unexpanded VIC-20—there just wouldn't have been enough memory to hold the DOS program.

Manufacturers were thus deterred from making disk drives for Commodore computers. They would have had to emulate one of the most intelligent peripheral devices—almost a computer by itself—and then try to compete with Commodore's low prices (Commodore owns the company that makes the chips for 1541s and could manufacture them at a much lower cost.)

There was (and still is) another major hurdle that manufacturers must overcome if they want to sell a Commodore-compatible disk drive. The 1541's built-in DOS is not perfect, and, since the drive is programmable (to a certain extent), many software manufacturers have developed copy-protection schemes that rely on the 1541's peculiarities and DOS bugs.

Commodore was aware of most of these bugs and could have fixed them in newer drives, but, for a number of reasons, the company never did. For a new manufacturer to expect all copy-protected software to run on his 1541 clone, all of Commodore's DOS has to be copied—bugs and all.

This has two ramifications. One, since the 1541's DOS is copyrighted, anyone who copies it is breaking the law. Two, if you replicate the 1541



DOS (bugs and all), your drive can't work any better than a 1541 (except mechanically)—no speed increases, no extra features, no time-saving modifications.

Recently, however, a number of companies have maneuvered around these obstacles, either by charging more or by using other, newer chips. At the time of this writing, there are several non-Commodore disk drives (see sidebar) for Commodore computers, ranging from about $200 to nearly $600. All of them, in varying degrees, emulate the 1541.

If you're planning on buying a disk drive, the following reviews will help you make an educated decision in selecting your purchase.

Commodore 1541

Any reviews of disk drives for either the VIC-20, C-64, Plus/4 or C-16 computers should start with the 1541 disk drive from Commodore. Now that you've been informed about the 1541's background, let's take a look at its performance.

If you have never seen a 1541 in action and are used to other computer disk drives, then be prepared to wait a while. The 1541 can make a solid claim for being the slowest disk drive ever made. It also has a reputation for slipping out of alignment, which means a $30 to $50 adjustment, unless you do it yourself. (See "Keep Your Disk Drive in Line" in the July 1985 issue for do-it-yourself instructions.)

Early versions had bugs in the ROMs that made Save with Replace unreliable, and some people have had trouble with the 1541 overheating. With commercial software protection schemes using intentional errors that cause the drive to go into convulsions, the 1541 may also be one of the noisiest drives ever made.

The worst feature of the 1541 is probably the manual, which contains numerous errors, misleading information, inaccuracies and omissions that no one has been able to completely undo.

With all these things against the 1541, why would anyone want to buy one? There are a number of reasons.

First, the Commodore 1541 was designed to work with Commodore computers, so you don't have to go through any strange start-up procedures, buy any interface devices or worry about software incompatibility. Besides that, the 1541 is a sturdy machine, and, if maintained properly, it's fairly reliable. (It is also more forgiving than a number of other computers' drives, which are quick to destroy the contents of your disks if you just look at them the wrong way.)

Overall, the 1541 is an inexpensive, sometimes temperamental, completely compatible disk drive that has a lot of years behind it. While the manual is poor, there are other sources of information and thousands of satisfied owners who can help make the most of its unique capabilities. (Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380; $199.)

The Commander II

The Commander II, from Commander Electronic Systems, Inc., is a sturdy-looking metal-encased disk



ED JUDICE

Durable and reliable, the Commander II is one of the best alternative drives for the money.

drive. It is slightly smaller than the 1541, measuring $11 \times 6 \times 3\frac{3}{4}$ inches. It has a built-in power supply (something that adds to the overall weight and size of the unit).

Its metal enclosure eliminates most of the RFI (radio-frequency interference). However, there has been a surprising amount of "fish-bone" interference. (A company representative said the RFI problem stemmed from the unshielded cables shipped with the first units, and that they had a new supplier of better cables that would solve the problem.)

One thing you'll immediately notice (if you have grown used to the squeaks, clatter, hiss and clunks of the 1541) is the quietness of the Commander II. While operating, the drive *sounds* solid, efficient and professional. Externally, there are two serial ports (mounted on the side of the drive) for connection to the computer and other peripherals, a port for the power cord, an on/off switch at the back, a power-indicator light, an operation light and an error light on the front.

The disks are held inside the drive by a spring-latch system, which you squeeze to close and to eject the disks. I feel this system requires too much pressure to close; while using the drive, I kept thinking that if I didn't insert the disk far enough, I could crimp its edge without realizing it.

Included with the drive is some questionable cable (used to connect the drive with the computer), a drive test disk (which will only tell you "yes, your drive is working" or "no, your drive isn't working") and a one-year warranty card. Also included is a small, 16-page manual, which avoids some of the shortcomings of the 1541 manual (in regard to organization and clarity), but falls far short of being complete.

It makes no reference at all to sequential, relative or random files, even though the drive does support all of them. It also neglects to mention that the drive device number can be changed by cutting an internal lead. Even though there is an easy-to-find reference chart of commands (inserted in the center of the manual), it would be hard for a complete novice to learn much beyond how to load and save Basic programs.

In spite of the poor-to-fair manual and the RFI problems, the Commander II is one of the best alternative drives for the money. It is a durable and reliable unit, and, of all the drives tested, it's probably the most compatible with 1541 software and hardware.

While the Commander II won't provide you with blinding speed increases, easier file handling or a lot of bells and whistles (you can see in Table 1 that the Commander II drive is almost identical to the 1541 in loading and saving times), it's still well worth considering if you want an alternative to the 1541 without sacrificing compatibility. (Out of dozens of pieces of software tested, only one wouldn't load on the Commander II.)

I rate the Commander II very high on the list for what it does. If, on the other hand, you are not interested in running commercial software, the Commander II doesn't give you much more than a 1541, and the 1541 is far from being a top-of-the-line drive. Also, because the Commander II is compatible with 1541 software, it also replicates most of the 1541's shortcomings.

It's a good drive for the price, being nearly 100% compatible, quiet and sturdy. Its drawbacks are minor. (Commander Electronic Systems, Inc., PO Box 15485, Santa Ana, CA 92705; $369.95.)

Function	1541	NPH-501C	Commander II	MSD II
Format	1:22	:38	1:17	:18
Save 27K program	1:47	2:47	1:46	1:48
Load 27K program	1:37	2:02	1:37	1:46
W/Fast Load (Epyx) 27K	:20	NO	:22	NO
Change device number:				
Software	YES	YES	NO	YES
Hardware	YES	?	YES	YES
File types:				
Random	YES	YES	YES	YES
Sequential	YES	YES	YES	YES
Relative	YES	YES	YES	YES
Load commercial software:				
Pro #1	:58	NO	:58	NO
Pro #2	1:43	NO	1:44	NO
Pro #3	1:20	1:43	1:20	1:27
Pro #4	3:09	NO	3:09	NO

Note: The MSD II performs a full disk backup (including formatting the destination disk) of non-copy-protected software in 1:55.

Pro #1 = Gemstone Warrior (SSI)
Pro #2 = Snokie (Funsoft)
Pro #3 = Dino Eggs (Micro Fun)
Pro #4 = Axis Assassin (Electronic Arts)

Table 1. *Comparisons of the disk drives reviewed.*

The NPH-501C

I wanted this drive to perform as well as it looked, but. . .

The NPH-501C, from Video Logic Corporation, is the most attractive disk drive I've seen for the Commodore computer, and the price is attractive, too.

It is a clean, compact drive that looks like disk drives for those "other" computers. It is white and off-white, with a single operation light in the

Overviews of Other Storage Devices

Following are brief descriptions of five additional Commodore-compatible disk drives and storage devices that are now available. (Unfortunately, review units of these were not available to *RUN* before publication. The information was supplied by the manufacturers of the equipment.)

SFD 1001

A recent addition to the market is the Commodore SFD 1001 disk drive. This drive offers a storage capacity of one megabyte, on a double-sided, double-density format. Compatible with the entire line of Commodore computers, the SFD 1001 is similar in size and appearance to the 1541.

Included in the package is a disk containing several utilities. The SFD 1001 is available now for $399.95. Progressive Peripherals & Software, 2186 South Holly, Denver, CO 80222.

CS-1

The CS-1 single-disk drive offers 100% compatibility with the Commodore line of computers. The drive's operating system, called Q-DOS, is designed to avoid many of the quirks that exist within the 1541 disk drive.

The CS-1 disk drive features an accessible exterior switch for device numbers, a reset button and the ability to automatically correct data errors. The drive has a format time of 16 seconds.

Included in the CS-1 package are Copy-Q, a single- or dual-drive copy program, and Q-Load, a program that speeds up the drive's loading of most software. The CS-1 is available now, for a retail price of $239.99. Peripheral Systems of America, Inc., 2526 Manana Road, Suite 209, Dallas, TX 75220.

Indus GT

The Indus GT disk drive is capable of handling all software that's available for Commodore computers; it performs approximately four times faster than the 1541. This drive can provide readouts that display track location, drive number and error codes, and has a built-in electronic write-protect feature.

Accompanying the Indus GT is a software package that contains a database, spreadsheet and word processor. Compatible with the entire line of Commodore computers, the Indus GT is available now at a retail price of $399. Indus Systems, 9304 Deering Ave., Chatsworth, CA 91311.

Quick Data Drive

The Quick Data Drive is a storage system that uses wafer-drive technology. The device stores data on miniature cassettes and utilizes an operating system called Dyna QOS, which the manufacturer claims will perform at a faster rate than either the 1541 disk drive or other cassette drives.

The unit is compatible with the VIC-20, the C-64 and the C-128, and plugs directly into the cassette port. No rewinding of the tapes is necessary, as they are fully automatic.

Included in the package are file management and utility programs. The Quick Data Drive is available now, at a retail price of approximately $85. Entrepo, Inc., 1294 Lawrence Station Road, Sunnyvale, CA 94089.

Hard-Disk System

Fiscal Information, Inc. (PO Box 10270, Daytona Beach, FL 32020) has released a new hard-disk subsystem and DOS for the C-64.

The system supports storage capacities from five to 144 megabytes and implements all 1541 DOS functions. The package consists of a cartridge-port interface, disk/controller subsystem and compatible software. Retail price is around $1500.

front (it blinks different colors during use). It is only slightly wider than a 5¼-inch disk, measuring 10¾ × 5¾ × 2 inches. This makes it the smallest of the drives tested. A simple turn latch secures the disk in place. One remarkable feature of the NPH-501C is that it only takes about 38 seconds to format a disk.

The 28-page manual has a glossy cover and goes into more detail than any of the other manuals about the use and operation of the drive. It covers just about everything, including explanations of block-read, block-write, block-allocate, block-free, user commands, memory read, memory write, memory execute and relative, random and sequential files. All in all, it's a fairly comprehensive manual.

From there on, it's all downhill. The manual, while glossy and extensive, should have been written in a language closer to English. It reads as though originally written in Japanese and then translated by a computer. For instance, "Any computer whatever it's large or small, comes into its own only when it can access data more quickly or can store data more than other device as like the cassette drive", ". . .otherwise you will get danger or take trouble in your system", ". . .it won't get any upside down."

A poor manual might be somewhat forgiven if the disk drive performed well, but, apart from the speedy format times, everything else about the NPH-501C was either slower than the 1541 or didn't work at all.

The drive is one of the smallest on the market. However, the external power supply weighs as much as the drive and is twice its height, thus canceling any advantage in size that the drive affords.

Finding commercial software that would run on the NPH-501C was a chore. It tried to load one piece of heavily protected software and, when it couldn't, printed a message on the screen (Defective Diskette. Please Send It Back to the Company), then proceeded to reformat the diskette for me (in only 38 seconds, of course). I can't say whether this was the fault of the software or the drive, but other drives didn't destroy the disk when they found they were unable to load the program.

Not only was the NPH-501C slower than the 1541 in all but one area, but it wouldn't run commercial software. It was the worst of both worlds. If you only save and load your own programs and don't mind waiting around, then it might be worth buying an NPH-501C to save money. Otherwise, you'll only be saving yourself 82 seconds each time you format a new disk.

The NPH-501C falls into the second class of disk drives for the Commodore computer—drives (and other storage devices, like wafer and hard-disk drives) that don't claim to be 100% compatible. This second class of "mass storage devices" are for people who may already own a 1541 and are looking for a second drive that is faster, sturdier, more convenient or just less expensive than a 1541.

The 1541 is then used for commercial software, while the other storage device is used for everything else. Drives that fall into this second category should be measured by a slightly different standard. Unfortu-

nately, the NPH-501C can't compete with the 1541 in any class but price and looks. (Video Logic Corporation, 597 N. Mathilda Ave., Sunnyvale, CA 94086; $189.)

The MSD Super Disk Drive

The MSD drives, both single and dual, from Micro Systems Development, Inc., have been on the market for longer than any other Commodore-compatible drive. Since Micro Systems was the first, and may still be the only, company to come out with a dual drive (MSD II) that will work with the Commodore computer, the company had a distinct advantage over its competition. There are also other reasons for the MSDs' popularity.

Like the other disk drives reviewed here, the MSD drives come out of the box "plug" compatible, which means you don't have to buy any special interfaces to use them. However, the MSDs, like the other drives reviewed, are not 100 percent compatible with the 1541. Also, there are many commercial software packages on the market that will not work with these drives, which are more expensive than the 1541. A quick glance at Table 1 shows that the MSD II is not any faster than a 1541 (except in formatting times). So, why are the MSDs so popular?

First, as previously mentioned, MSD was the first company to come out with an alternative to the 1541, and there were a lot of people who wanted to buy *anything* other than a 1541. Second, the MSD II is one of the most durable disk drives ever. It is built like a tank and can run 24 hours a day for weeks. (This has been tested both in the *RUN* offices and in numerous places that run electronic bulletin boards. I was unable to test MSD's single drive.)

For sheer storage capacity (349,696 bytes), the MSD II cannot be matched by anything else on the market. For many people, that was and is the primary reason for buying a disk drive in the first place. For backing up unprotected disks and copying files, the MSD II is ideal. For some, this feature alone is worth the price.

The MSD drives will also handle IEEE, which means they will work with Commodore series 2001 (with Basic 3.0 or higher), series 3000 (with Basic 3.0 or higher), series 4000 (with Basic 4.0), series 8000 (with Basic 4.0), VIC-20s, C-64s, and so on. They are also upward-compatible with the Commodore 2040 disk drive, and read/write compatible with the 2031, 4040,

New Life for the 1541

By MARGARET MORABITO

New C-128 owners have two options regarding disk drives: Buy the 1571—Commodore's newer, faster double-sided floppy disk drive—or stick with the 1541 (or compatible drive), which, although it has its limitations, is a more-than-adequate short-term solution. The choice is yours.

The new C-128 has its own double-sided floppy disk drive, the 1571. While this drive is much faster than the single-sided 1541 and offers greater storage capacity, you can still use your 1541 with the C-128, in all three of its modes. In fact, those of you with third-party C-64-compatible disk drives can also use *them* with the C-128.

There are drawbacks to using the 1541 with the C-128, but for those of you who want to move up to this computer one step at a time, your 1541 will get you going without any cash outlay beyond the price of the computer itself.

Strengths

First, let's see what you *can* do with the 1541 on your C-128 personal computer; then, we'll see what you can't do.

Your 1541 disk drive will run all C-64 software on the C-128 in C-64 mode. This is one of the great advantages of this new computer.

In addition, software for the 128 mode will work on your 1541 drive, as long as it requires only single-sided disk access, since the 1541 is a single-sided disk drive. It's likely that some of the new software for the 128 mode will be designed to include use of the 1541, if only because there are one-and-a-half million 1541 disk drives out there.

As for CP/M, you'll be happy to know that the 1541 drive will run the new CP/M software being developed specifically for the C-128. This CP/M Plus 3.0 software adheres to the Commodore GCR format, which is read- and write-compatible with the 1541. Of course, as with the 128 mode, you'll only be able to use CP/M software with single-sided disk access.

Now that you know what your 1541 can do on the C-128, you should also be aware of its limitations, which aren't significant for short-term use.

Limitations

There are three limitations you'll eventually want to overcome by buying the new 1571. First, there is the speed problem. The 1541 transfers data at a much slower rate than the 1571. If you've grown accustomed to your 1541's pace, this won't be a big burden immediately. However, knowing that there's a faster drive available for your C-128 at a cost comparable to what you paid for your 1541, you'll probably want to get the faster drive. At least you're not being pressured with the requirement of buying it immediately.

The second limitation is that the 1541 can't read off-the-shelf MFM-formatted CP/M software. What this means is that the Kaypro, Osborne and other IBM System 34-compatible software programs won't be immediately accessible to you. Also, much of the public domain CP/M software won't be open to you with the 1541. But in the short run, this is not significant.

Even if you don't already have any CP/M software, by the time the C-128 is released, there'll be plenty of C-128 CP/M software available that is Commodore-GCR-formatted to run on your 1541. However, as a long-term strategy, you'll probably want to buy either the new 1571 single-disk drive or the proposed dual drive from Commodore, so you can tap the thousands of CP/M 3.0 software programs on the market and in the public domain.

The third limitation with using the 1541 is its smaller storage capacity. The 1541 has a capacity of 170K, while the 1571 has up to 410K. Initially, this won't be a significant difference in any of the C-128's modes. Most programs won't take up an entire 170K of disk space. In the long run, however, a double-sided disk drive will be essential as more and more new software takes advantage of the added storage capacity.

In the meantime, your 1541 drive will serve quite adequately with your new 128 as you use CP/M software, become familiar with the 128 mode and continue to employ your library of C-64 programs.

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1540 and 1541 drives. (With an IEEE interface, the C-64 or VIC-20 can access the drive much faster than a 1541.)

The MSD II's documentation is well-written and comprehensive. It covers all the details of drive use, but, like every other drive manual, only skims the surface when discussing the user commands. The manual also gives a much better description of how to change the drive device number through hardware modification than does any of the other manuals where there is a similar feature.

This leads to a question about drive numbers and device numbers. The MSD II is configured as device number 8, with drive 0 and 1 being the two drive slots. You can change the device number, either through hardware modification or, temporarily, through software commands, to device number 9, 10 or 11, but you can't change the drive numbers.

This means, for example, that you may change the dual drive to respond to commands sent to device number 10, but the individual drives are still 10/0 and 10/1. This may not seem like much of a problem, but, if you are using two drives, some software requires that they be numbered 8 and 9. Therefore, you can't always take advantage of the dual-drive features.

You should also note that a number of companies (especially those whose software is I/O-intensive, like databases or BBSs) are coming out with versions of their software that will work with either configuration (two 1541s with device numbers 8 and 9, or an MSD II with drive numbers 0 and 1).

The MSD drives are dependable, sturdy and sound; they are fast (if you're using an IEEE interface); the MSD II will store twice as much information as a single 1541; they will run all day and night without overheating; and they are excellent for I/O-intensive operations.

On the other hand, they are not very compatible with copy-protected software, and they are expensive and just as noisy as a 1541. In some instances, as previously discussed, you may not be able to make full use of the dual-drive features. (Micro Systems Development, Inc., 10031 Monroe Drive, Suite 206, Dallas, TX 75229; $399/single, $695/dual.) R

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Does moss grow under your feet while you wait for your 1541 disk drive to load? Well, put a little zip into your life with some high-velocity solutions to the Commodore drive speed problem.

Life in the Fast Lane With the 1541

By DOUGLAS F. WATT

Let's face it: The only thing slower than the 1541 disk drive is watching the grass grow.

At roughly 360 characters per second (cps), the drive cannot pass much more than about 10K of information without subjecting the user to long waits or brief calisthenics sessions. And it is only slightly faster if it is operating from a direct load command from the keyboard—roughly 400 cps on program files.

In its defense, the 1541 is also quite inexpensive and reasonably reliable, now that its alignment woes seem to have been fixed. Fortunately, since the 64 has become such an immensely popular computer due to its uncommon value for the money, there have been some efforts by third parties to deal with this lack-of-speed problem.

The following is a summary of what is currently available as a result of these efforts in the areas of software and the 1541 DOS rewrite. [For a description of a third approach to speed-up, see Guy Wright's article on disk drives in this issue—Eds.]

Software Speedup

There are three major pieces of commercial software that were designed explicitly to speed up loading of programs from disk: Kwik-Load, from Datamost; Turbo 64, from Megasoft; and Fast Load, from Epyx.

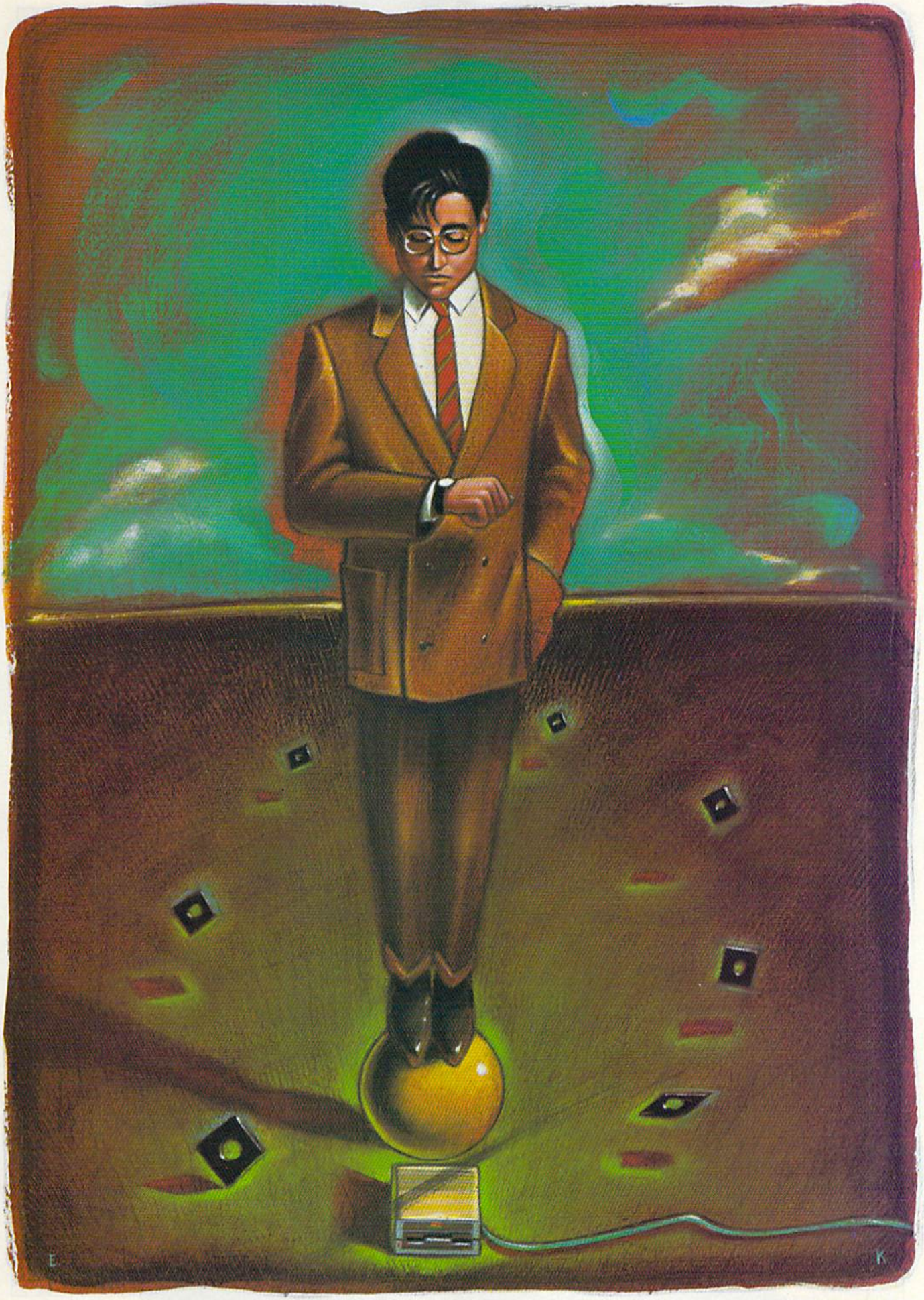
Kwik-Load has been available longer than the others and is sold for around $16–$18 at most software stores and large chain stores that sell Commodore equipment.

It includes two parts: a roughly 1K speedup loader program and a disk-utility program that speeds up a variety of disk functions (such as file copying, whole-disk copying, scratching files, formatting disks, and so on). It also includes a drive-speed check, and it lets you gain some extra speed from the disk-utilities section by turning off the verification of data that is being written.

First, the good news about Kwik-Load. With most program files, the speedup loader program is roughly five times faster than normal and will load a 20K Basic program (80 blocks on the disk) in ten seconds. (Its baud rate is about 2.1–2.3K per second, depending on the program.) This is close to the theoretical limits of the data transfer rate of the 64's serial port.

The speedup loader part of Kwik-Load turns off the screen to keep the video chip from interrupting things.

Continued on p. 34.



EARL KELLENY

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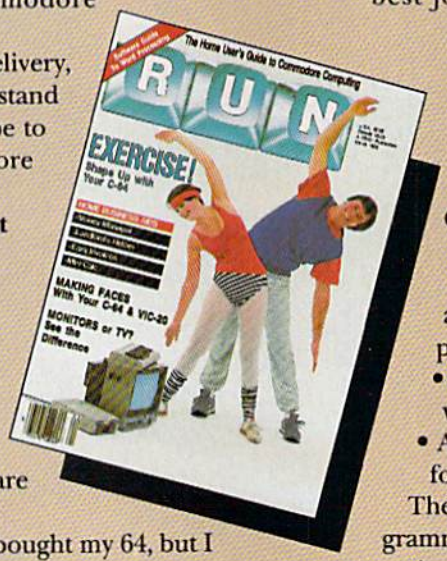
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Programs	1541 Stock	1541 Flash!	Kwik-Load and Turbo 64	Fast Load
PaperClip	85	25	14.6	14.1
Neutral Zone	123	39	—	30
Beach Head	150	52	—	30
Fort Apocalypse	85	34	—	85
Necromancer	103	—	—	—
Zeppelin	115	40	—	115
Zaxxon	120	38*	—	120
Sentinel	210	62*	—	210
Shamus I	103	44	—	103
Pharaoh's Curse	170	50	—	170
Choplifter	60	30	22	27
Drol	172	60	—	44
Bungeling Bay	185	67	—	54
Lode Runner	84	34	34	32
Repton	120	39	—	23
KoalaPad	72	34	—	72
Pogo Joe	68	23	—	15.5
Jumpman	100	32	—	19
50.5K file	127	38	22	21

— means incompatible with program loading.
* means that load is executed but program does not run properly.

Maximum Speeds for Various Drive Configurations

1541 Stock—.40K per second
1541 Flash!—1.3K per second
Kwik-Load—2.3K per second
Turbo 64—2.3K per second
Fast Load—2.4K per second

Table 1. *Comparison of drive speeds, with load times given in seconds for a broad sample of games.*

From p. 30.

The other speedup approach I'll discuss (the DOS rewrite) doesn't match the level of speedup offered by the software approach.

The second part of the program—the utilities section—does not turn off the screen, and speeds up both reading from and writing to the disk by a factor of roughly 300 percent.

Now for the bad news. There is no speedup of the saving of programs, just the loading of them. The speed-loading portion of the program will not load many commercial software programs, particularly if the initial boot program uses a lot of the RAM "underneath" the Kernal ROM or loads into high RAM (around $C000). This is something most commercial software programs do to prevent illegal copying of programs through the use of the machine language monitor.

There is also a small bug in the speed loader, so it occasionally will not read a file that is present; instead, it will return a File-Not-Found error.

Both Turbo 64 and Kwik-Load offer exactly the same amount of speedup and, unlike Fast Load, turn off the screen. For example, PaperClip 64D, which is written both to load and to save like a Basic program, loads in 15 seconds using either Turbo 64 or Kwik-Load; normally, it takes 85 seconds on an unaltered 1541 and 25 seconds for the 1541 Flash! ROM kit.

However, you can forget about loading any Synapse, Electronic Arts or most Broderbund games. You also can't load most commercial software that has boot programs residing in high RAM or that loads into high RAM (where the DOS 5.1 wedge sits) or in the RAM underneath the Kernal. Neither Kwik-Load nor Turbo 64 will speed up file-saving or the

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The 1541 is the slowest disk drive on planet earth. Even simple operations seem to take forever. Quickloaders and Fastloaders that software-patch the operating system are vulnerable to being knocked out of memory, rendering them totally useless. Even Flashier products that require permanent modifications to the 64 and 1541 can't compete with the blinding speed of STARDOS.

STARDOS accelerates every (yes, we said every) function of the 1541 disk drive. Other fast loaders only load PRG files faster. STARDOS also speeds up SEQ, REL, USR and DIRECT ACCESS files. Everything including FORMAT, VERIFY, SCRATCH, VALIDATE, INITIALIZE and COPY are much faster. In addition STARDOS adds a vast array of easy to use commands and utilities all at the touch of a key.

A sampling of STARDOS features:

- Accesses ALL types of files up to 1,000% faster!
- Saves up to 300% faster than normal (with extended verify)
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- Makes your 1541 MORE RELIABLE and LESS PRONE TO BREAK DOWN or OVERHEAT!
- STARDOS is fully expandable for multiple fast disk drives
- Easy (5 minute) plug in installation. User friendly manual
- 100% compatible with software and serial bus peripherals
- Adds years of life to your disks and drive in reduced wear
- Cures a number of bugs in the Commodore 64 and 1541 disk drive including :
  - The damaging 'Head Knock' that can mis-align your 1541
  - The @: Save with replace bug!!
  - The Editor lock-up bug
- Harness the full power of your disk drive with the built in DOS wedge
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handling of relative or random files; they will only speed up program and sequential files.

Both Kwik-Load and Turbo 64 do, however, provide a nice speed loader for virtually anything in Basic, and Kwik-Load also provides you with a good menu-driven and well-written disk-utility package.

Turbo 64 offers somewhat more flexibility than Kwik-Load (you can locate the program in virtually any area of RAM) and allows you to transplant the speedup loader to any number of disks. It does not, however, provide you with any disk utilities, and, like Kwik-Load, it appears to have an occasional lapse in directory reading, refusing to load files that are clearly present and intact.

Of this group of software speedup loaders, Fast Load may be the best value. It lists for $35, which is somewhat more than either Kwik-Load or Turbo 64, which both list for $19.95, but it comes on a ROM cartridge that you can simply leave in the machine, thereby avoiding the need to load it each time you use it. It is also the fastest of these three programs by about 5 percent, loading program and sequential files at a truly remarkable rate—around 2.4K per second. (For example, it will load PaperClip 64D in 14.1 seconds.)

Fast Load will load virtually everything except Electronic Arts and a few other game disks. It also includes a nice set of disk utilities, and, since it seems to rewrite part of the Kernal routines, it does not have to rely on turning off the screen to keep the video chip from fouling up high-speed serial-port data transfer.

I suggest you check out the compatibility of each of these three software speedup programs with the programs that you use frequently. Each represents an inexpensive way to get a vast improvement in drive speed for at least all Basic and some machine language applications. None of them, however, speeds up the handling of random or relative files.

Finally, none of them speeds up the saving of data, and, from within many applications programs, the speedup does not work. Speedscript, however, is compatible with Fast Load, though Omniwriter and PaperClip are not.

The DOS Rewrite Approach

Another possible solution to the 1541's speed problems is the 1541 Flash! kit from Skyles Electric Works. This kit changes both the C-64's Kernal and the DOS of the 1541.

The kit includes one 8K Kernal replacement ROM chip, one 16K DOS replacement chip, a clip-on board that sits on the user port and a cable that attaches several leads from the new C-64 Kernal chip to various connections in the drive. You may switch the new and old Kernal in and out of the machine via a switch on the back of the user port, but once you change the DOS in the 1541, you cannot have the old DOS ROM in the circuit unless you physically remove the new ROM and place the old one back in the socket.

The 1541 Flash!
Skyles Electric Works
231E South Whisman Road
Mountain View, CA 94041

Fast Load
Epyx, Inc.
1043 Kiel Court
Sunnyvale, CA 94089

Kwik-Load
Datamost
20660 Nordhoff St.
Chatsworth, CA 91311

Turbo 64
MegaSoft, Ltd.
PO Box 1080
Battle Ground, WA 98604

Table 2. *Addresses of manufacturers.*

The installation process is fairly easy, as long as the C-64 Kernal ROM is socketed, and not soldered, into the board. If it is soldered directly to the board, I would recommend leaving at least that part of the kit installation to someone with some experience working on printed circuit boards. The total installation takes no more than 35–40 minutes—if you're slow and careful.

The 1541 Flash! includes a number of nice features, including a built-in wedge program, a well-written manual and the convenience of a two-keystroke load of the first program on the disk. (Simultaneously hitting the shift and run/stop keys executes a LOAD "*",8,1.)

This kit is overall (input and output) one of the fastest and most transparent (that is, does not block or interfere with program operations) of all of the various options. However, saving files with 1541 Flash! is only about one-and-a-half times faster (vs. the roughly three times faster speed of loading).

There is one additional bug. Since the serial-port timing is altered to allow for faster data transfer, the presence of some serial-to-parallel printer interfaces on the port seems to mess up the reading of data, and the drive locks up. This is not a problem with all of the interfaces, just some, such as Cardco's older Card?A. Since I have not tested this kit with all of the current printer interfaces, I suggest you check out a particular interface before buying it if you plan to use the 1541 Flash! kit.

What Should You Do?

Depending on your needs, there are clearly a number of options here. (You may also choose to do nothing if you find the 1541 drive speed adequate.)

I think that the current best value for the money, if you have the 1541, is the Skyles 1541 Flash! ROM kit.

Perhaps the fastest route would be to combine the Fast Load cartridge with the Skyles ROM kit (they are more or less compatible), as this would give you almost six times faster loads on program files for most games, three times faster loads on all random and relative files and virtually complete transparency for applications software. Kwik-Load and Turbo 64 will also work without a hitch with the 1541 Flash! Kit installed.

If you do combine Fast Load and the Skyles ROM kit, it makes sense to set the 1541 Flash! kit to "slow," so that the original ROM Kernal is in place. You will also have to give the drive the command to return to its slow speed of operation. That way, when the Fast Load cartridge takes over the serial-bus routines, it will not "bump into" an unexpected change in the serial-bus timing from the Skyles Kernal chip. (If it does, no damage is done; the drive just locks up and has to be reset.)

Perhaps the most encouraging sign in all of this is that there are several options, something that wasn't the case even just a year ago. Try out a few before deciding. R

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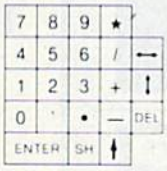
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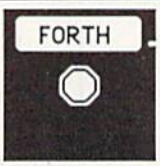
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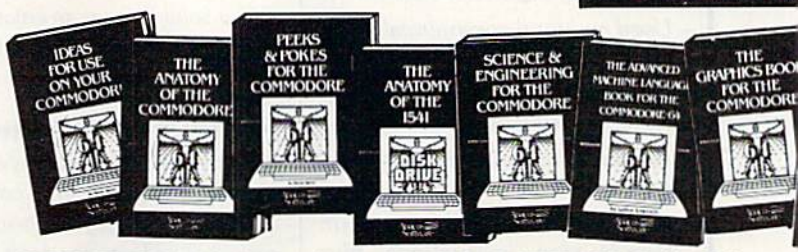
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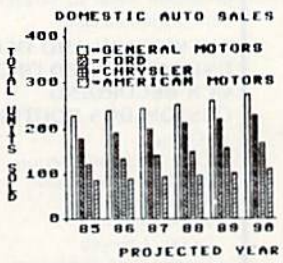
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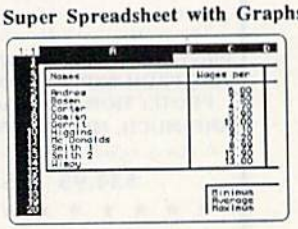
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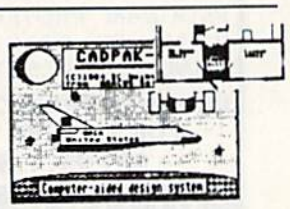
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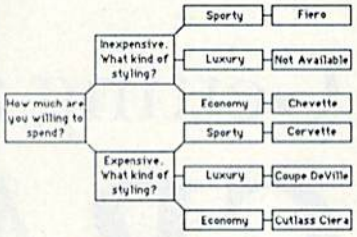
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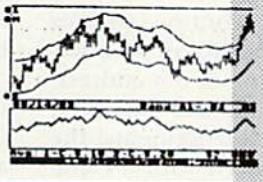
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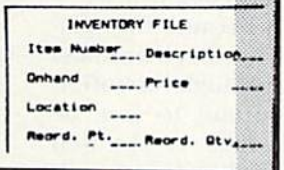
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Getting a Hold on Your GRAPHICS

By GLENN Van VALKENBURG

Both the C-64 and the Plus/4 (my old flame and new love) lack a built-in routine for a high-resolution screen dump. Neither machine's instruction book contains a program to accomplish this. While this is a mild blemish on the 64, it is a wart on the nose of the otherwise beauteous Plus/4.

On the C-64, if you are determined enough to figure out how to generate high-resolution graphics, you probably at least have a shot at working out a screen dump as well.

On the Plus/4, however, the drawing process is so easy that there will be a lot of people creating graphics they want to print out without having any notion as to how to do it. The accompanying program uses Basic commands to achieve a high-resolution screen dump on the Plus/4 (and C-16).

Why use Basic for a job like this? Although speed is not one of Basic's strong points, and there are 64,000 pixels to be individually addressed in making a high-resolution screen dump, there are still several reasons for using it.

First, probably anyone able to generate graphics on the Plus/4 would be comfortable with typing in the required five lines of Basic, while a machine-code routine might intimidate him. Second, some of the commands available on the Plus/4 greatly speed up the process compared to a Basic program on, say, a Commodore 64.

Third, the program is so flexible that a novice can alter it. The picture comes out oriented correctly on the page and can be centered. Finally, at the time of this writing, there isn't much information yet available on the Plus/4 memory map on which to base a machine-code program.

One last point before I discuss the program itself. This routine requires a VIC-1525 or MPS-801 or another printer that understands dot-addressable graphics commands. However, in almost all its advertisements, the Plus/4 is shown paired with a Commodore 1526 or MPS-802 printer.

This is probably because the computer is intended as a small-business machine. If printable high-resolution graphics are important to you, be advised that the 1526 is not well suited for this and will not work with this routine.

Let's go through the program (Listing 1) step by step, including for clarity even those parts not directly involved in the dump itself.

Program Description

Line 5. As most readers know, the REM statement at the beginning of this line means that the computer will not attempt to take any action. This line is for information only.

Line 10. The GRAPHIC 1,1 command first sets the computer in High-resolution mode, then clears the screen. There are five graphics modes to choose from. The designation for modes 0 to 4 are, respectively, Text, High Resolution, High Resolution Plus Text, Multicolor and Multicolor Plus Text. The screen will not be cleared if the second number is 0 or if the comma and second number are left off.

Lines 10 to 30. Six Circle commands follow, running through line 30. This command can be a very lengthy one, as it is highly versatile, drawing not only circles but also ellipses and polygons, and rotating the figures a certain amount around their centers or displaying only a specified portion of the perimeter of the figure.

The commands used (see Figure 1) generate a circle, two ellipses, an octagon, a triangle and a diamond. Trailing values can be left off if not applicable, but all interim parameters between desired options must be represented at least by a comma. If no value is shown, then standard defaults are followed.

A possible nine parameters can be controlled on the Circle command and are entered in the following or-

RUN It Right

Plus/4; C-16; VIC-1525, MPS-801 or other similar printer

der—draw or erase (color source), row number of the center, column number of the center, vertical radius, horizontal radius, perimeter-starting angle, perimeter-ending angle, angle of rotation and increment of angle used to establish number of sides.

The figures, of course, appear on screen in the same order as the commands, so you can easily match up commands with figures to analyze the parameters used to achieve the example figures, if you desire.

To draw circles that look round on the screen, you must specify that the vertical radius be about 30 percent smaller than the horizontal radius. To find the proper figure for your system, measure the circles you generate and adjust the proportions as necessary. Your hard-copy printout will be in about the same proportion as the actual numbers used in your radii.

Line 40. The Draw command is used to create points or straight lines. The parameters are: draw or erase (color source); the coordinates (column and row) of a point to be drawn; or the coordinates of the starting and ending points of a line to be drawn.

Line 50. This line first opens logical file number 4 for device number 4. Then it sets up two loops to cover all points on the screen in successive left to right rows, each row being seven pixels high.

PRINT#4,CHR$(15)

returns the printer to Text mode so that each new printed line of graphics can be indented ten spaces (SPC10) to center the display.

Line 60. The Locate command directs the computer's attention to the location of each pixel, and the RDOT command asks if they are on (>0) or off (0). If they are on, they are assigned a value relative to their vertical position in the row, that being 1, 2, 4, 8, 16, 32 or 64, respectively, from top to bottom in each seven-pixel column. The values of all "on" pixels are added together in each column as you go along.

Line 70. The sum value of all the pixels that are on is now added to 128, and that number is converted to a string so it can be understood by the MPS-801 or VIC-1525 graphic printers. These strings are added together (concatenated) to provide a long string to the printer at one time, instead of a multitude of short ones.

If, during the course of this procedure, you reach the end of the row (X = 319), then the string is printed using PRINT#4,CHR$(8)B$, which converts to Graphic mode, then prints the data contained in B$. B$ is set to "" (an empty string) and a new line is started by jumping to line 90.

Line 80. Since strings can hold only 256 characters, you need two strings to cover each row of 320 seven-pixel-high columns. This line stops the first string at 246, while the second string is stopped when X reaches 319, with the length of B$ at 65.

Line 90. The start of this line is the end of the X and Y loops. When all loops are finished, you convert to Text mode in the printer (CHR$(15)) and then enter PRINT#4 to move down an additional line.

Lines 100 and 110. These lines print the caption under the drawing and then close the channel (logical file number) through which the printer was addressed.

Familiar Commands

Those of you who have a Super Expander cartridge for your C-64 will no doubt find these graphics commands very familiar. In fact, they, and others in the Plus/4 not covered here, are virtually identical.

If you have a Super Expander for your C-64, you can use Listing 1 with but a single change. In line 10, change the GRAPHIC values from 1,1 to 2,1. You also might want to delete or correct the text in lines 5 and 110.

Running time of this screen dump is about 23 minutes on the VIC-1525 and should be a little faster on the MPS-801. A Basic high-resolution dump strictly from Commodore Basic is much more complicated and much slower than Listing 1, but the program itself is not much longer. It takes from an hour to an hour and 15 minutes, depending on how much memory you are willing to use.

If anyone out there is willing to wait that long for a printout and would like a program listing, send me a self-addressed stamped envelope, and it's yours. R

Address all author correspondence to Glenn Van Valkenburg, 1 Randolph St., Plymouth, NH 03264.

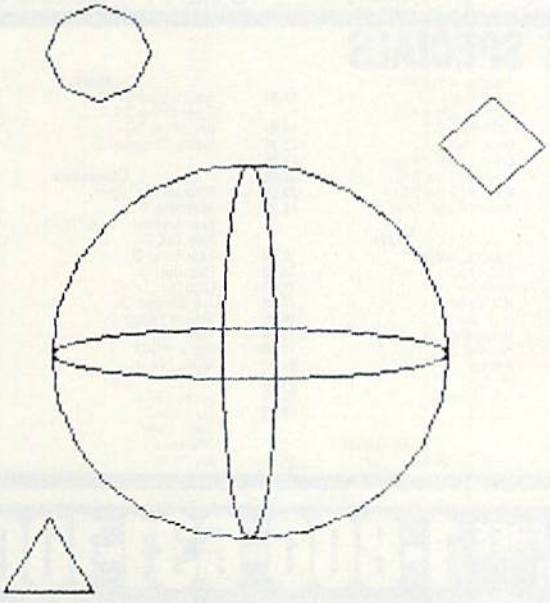


Figure 1. *Demonstration hi-res printout.*

Listing 1. *High-resolution screen dump program.*

```
5  REM HI RESOLUTION SCREEN DUMP FROM BASIC
   ON THE COMMODORE PLUS/4
10 GRAPHIC1,1:CIRCLE1,160,100,75,75:CIRCLE
   1,160,100,75,10
20 CIRCLE,50,40,20,20,,,,45:CIRCLE1,160,
   100,75,10,,,90:CIRCLE,270,40,20,,,,,90
30 CIRCLE,50,140,20,20,,,,120
40 DRAW,0,0TO319,0TO319,199TO0,199TO0,0
50 OPEN4,4:FORY=0TO199STEP7::PRINT#4,CHR$(
   15)SPC(10);:FORX=0TO319:B=0:FORZ=0TO6
60 LOCATEX,Y+Z:IFRDOT(2)>0THENB=B+2↑Z
70 NEXT:B$=B$+CHR$(B+128):IFX=319THEN
   PRINT#4,CHR$(8)B$:B$="":GOTO90
80 IF LEN(B$)>245 THEN PRINT#4,CHR$(8)B$;:
   B$=""
90 NEXTX,Y:PRINT#4,CHR$(15):PRINT#4
100 PRINT#4,SPC(10) "A DEMONSTRATION HIGH
    RESOLUTION PRINTOUT FROM BASIC"
110 PRINT#4,SPC(17)"UTILIZING THE
    COMMODORE PLUS/4 COMPUTER":CLOSE4:END
```

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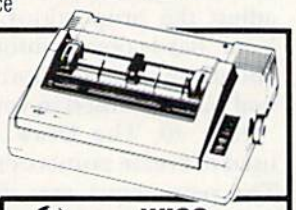


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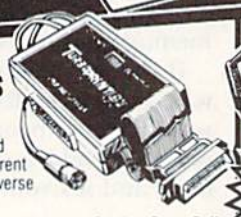


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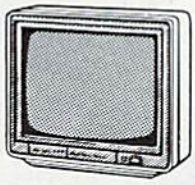
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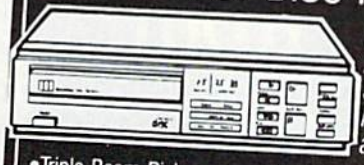
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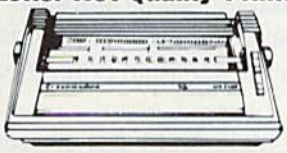
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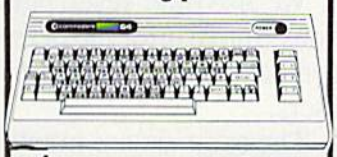
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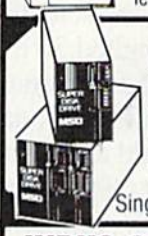
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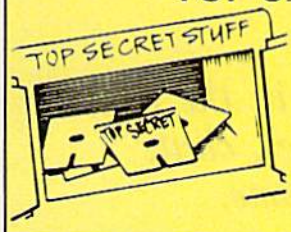
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On-Line with PlayNet and People/Link

By MARGARET MORABITO

Computerized on-line utilities are not solely devoted to business and professional activities. Networks such as CompuServe and The Source offer interactive communications services that are enjoying immense popularity today. Entrepreneurs, noticing this trend, are now making their own debuts with on-line utilities devoted exclusively to socializing and entertainment, but at lower per-hour costs than the larger general-interest on-line utilities.

These on-line utilities deliberately avoid the serious side of life, concentrating instead on evening and weekend socializing and game playing. More and more home computer owners are using their computers for on-line entertainment, and telecommunicating for fun is becoming a primary focus.

This growing national pastime goes way beyond just being a large cocktail party, however, because it's open to anyone and everyone, regardless of age, sex, race or economic level. Also, you don't have to be invited. These traditional roadblocks to successful communication are eliminated by the computerized medium. People know you only through your words and ideas.

Two on-line services that are totally directed toward socializing are PlayNet and People/Link. They are both national networks, easily within reach of any Commodore owner with a modem.



KATHERINE MAHONEY

PlayNet

PlayNet gives home computerists an opportunity for on-line socializing and game playing, weeknights from 6:00 PM to 7:00 AM and around the clock on weekends. Initiated under the auspices of Rensselaer Polytechnic Institute in Troy, New York, PlayNet was offered to local residents of the Albany-Troy area on an experimental basis in early 1984. It quickly became so popular that by October 1984 it was entering homes across the nation.

PlayNet was developed specifically for C-64 owners. This choice was a smart mass-marketing move based on the fact that there are more C-64s than any other computer in American homes. (New C-128 owners can also access PlayNet in the C-64 mode.) This year, PlayNet plans to broaden its computer compatibility to include non-Commodore computers.

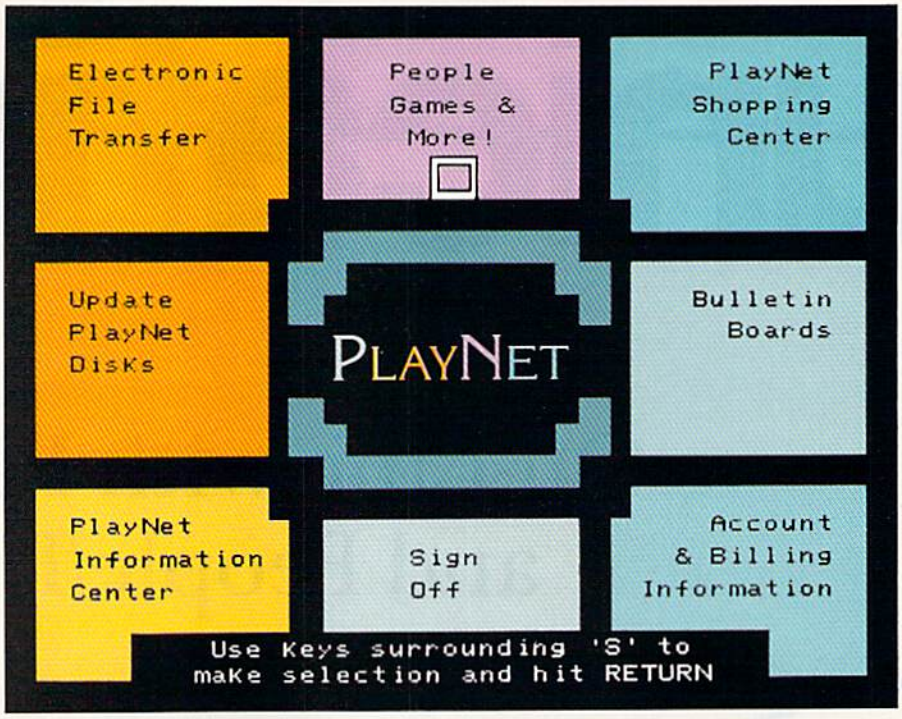
PlayNet is different from other on-line utilities in several ways. It has color graphics throughout its system, including both its communications options and its game sections. Even when you are in the Talk mode with other users, there are colorful screen displays.

To use PlayNet, you need special software: a system disk, which holds a customized terminal program for PlayNet, and two separate game disks. Once you're within the system, the PlayNet options are loaded into your computer from these disks.

The system is totally menu-driven; you don't type in any commands. Menu selection and movement throughout the system are handled by the function keys, which are labeled for quick reference by an overlay provided by PlayNet.

You access PlayNet through your local Telenet phone connection or by calling the network directly. The log-on procedure is one of the simplest you'll find. Once you have connected your modem and are receiving a carrier signal, just press the return key and wait. If you've made a successful connection, PlayNet will prompt you to enter your account number and password.

You will see a brief news section and then a colorful graphics display that features eight large blocks encompassing a central PlayNet logo. This is the main menu, a far cry from the usual text displays of many other services.



From the main menu, you may select one of the following: Electronic File Transfer; Update PlayNet Disks; People, Games and More; Bulletin Boards; Accounting and Billing Information; PlayNet Information Center; PlayNet Shopping Center; or Sign Off.

The most frequently used option is the People, Games and More section, where you socialize in one of many reception rooms. You can stay there and chat with others in the room or choose a partner and leave for any of the 13 colorful, interactive games. You also can create your own room, to which you can invite others for private conversations or through which you can send electronic mail and on-line messages to other subscribers.

Games offered by PlayNet are Backgammon, Boxes, Capture the Flag, Checkers, Chess, Chinese Checkers, Contract Bridge, Four-in-a-Row, Go, Hangman, Quad 64, Reversi and Sea Strike. During game play, you can chat with your game partners. This interaction makes for a more natural setting.

PlayNet uses windows for temporarily holding your words and phrases whenever you are chatting with someone else. They are sent only after you have finished composing your thoughts and signaled PlayNet to display them on the public screen. This feature makes communicating in a shared room much easier, as your typed phrases are not haphazardly broken while another person types his or her words.

In the Electronic File Transfer area, you can send disk files to other PlayNet people. There is a small download fee, but all uploading is free. You'll find this area valuable for trading noncommercial software programs.

The Bulletin Board provides a forum for traditional classified advertisements as well as club activities. The main topic menu for the Bulletin Board offers current events, arts and entertainment, hobbies and sports, computers, software information, classified ads, PlayNet updates, club activities and games

The PlayNet Shopping Center and the Information Center were not completed on any of my visits in late April, but should be available by the time you read this article. The Shopping Center, in particular, will be attractive, as more and more people are starting to take advantage of the convenience of on-line shopping. The Information Center will contain news items on various subjects.

There is a $39 subscription fee to PlayNet, which will give you the three disks, a manual full of colorful screen shots and 90 free minutes of on-line time. There is also a $6 monthly service fee, which helps handle PlayNet's costs for newsletters, updates and product development. The hourly on-line fee is rock bottom at $2, including Telenet charges.

You can purchase the PlayNet package of disks and the manual at a computer store, and then make a phone call to receive your account number and password. Or, you can phone PlayNet first and order their

package, which will arrive by mail with your account number and password inside.

It's a good idea to call PlayNet before buying their software, just to make sure your particular modem will work with their terminal software. Most C-64-compatible modems should work, but it never hurts to check first.

For more information, contact PlayNet, Inc., PO Box 587, Wynantskill, NY 12198, or call 1-800-PLAYNET.

People/Link

People/Link made its public appearance in early January 1985, and, by April, had 2000 subscribers from all across the United States and some from Europe. It is accessed through Telenet and Tymnet.

People/Link, like PlayNet, is devoted to providing entertainment and socializing activities for its members. Although both networks have the same goal, they differ in their formats and offerings. People/Link doesn't have colorful graphics displays and was still in the process of developing its games section when I visited them in late April.

Its strength lies in its PartyLine feature, which is an open party for all subscribers to enter. On any evening, you will find people from all walks of life participating in open on-line discussions. If you wish, you have the option for private conversations.

When you're in PartyLine, you can find out which talk lines are active and can join in simply by a menu selection. If you're looking for someone special, you just choose the menu option for finding that person. You will be told if that person is on-line and on what particular talk line to find him or her.

PartyLine is one of ten different options offered in People/Link's main menu. The other options include subscribers' mail service, a user directory, bulletin boards, changing your password, general information about People/Link, modem settings, finding a particular member, billing information and the *OnLine Herald*.

The user directory is quite helpful in finding out about other members. For example, you can see a list of subscribers, with information about where they live, their interests and what computer equipment they use. If you see someone with similar interests, you can easily contact that person through the mail, PartyLine or in the club section.

People/Link has its own on-line newspaper, the *OnLine Herald*. This holds feature stories about People/Link news, letters to the editor, editorials, movie reviews and assorted general-interest tidbits for subscribers. There's also a feature called Jennifer's Advice, which provides answers to members' questions concerning People/Link.

This is a great opportunity to meet people from all across the nation and to share ideas with them.

Features not active at the time this article was written, but which are advertised as coming soon, are Club Link, Catch-a-Star, interactive games and uploading and downloading files. Club Link is for hobbyists and special-interest groups. Catch-a-Star is a novel feature that provides the opportunity for members to participate in on-line interviews with noted celebrities.

You navigate through People/Link by means of menu selections as well as commands. Most menus include the command for each option, so, when you are familiar with the service, you can easily get from one location to another without having to return to the main menu. You can get help at any time by just typing HELP at a menu prompt.

People/Link can be accessed by any computer with either a 300- or 1200-baud modem. You supply your own modem and terminal package. The initial sign-up fee is $30. Occasionally, you'll find special sign-up rates advertised for $19. As of June 1, there is no monthly service fee or minimum usage fee.

Subscribers with a 300-baud modem pay $4.78 per hour of non-prime connect time for the first three hours each month; subsequent hours per month cost $2.95. Non-prime time is from 6:01 PM to 7:01 AM during the week and all day on weekends. Prime-time rates are substantially higher.

If you have a 1200-baud modem, your initial three hours cost $7.78 per hour, with a $5.95 hourly fee for each hour beyond. All 1200-baud rates apply to prime and non-prime time.

You subscribe to People/Link in one of two ways. You can telephone them and request an information packet. This contains a membership form that you fill out and submit to People/Link. Or, you may sign up over the telephone. A major credit card is required for this. In three to five days, you'll receive your password and identification number. Then you're ready to log on.

Here is the Telenet log-on procedure for People/Link: Once you have dialed your Telenet access number and have a carrier signal, press the return key three times. After the @ prompt, type in either C 31263 or C 31270, followed by Return. You will then be welcomed into People/Link and prompted to proceed. Press the return key again. You'll be asked for your identification number and then your password. Both of these entries should be followed by Return. After your ID number and password have been cleared, you will enter the main menu.

For more information about People/Link, write to American People/Link, Suite 1505, 3215 N. Frontage Road, Arlington Heights, IL 60004, or telephone 1-800-524-0100.

Bridging the Gaps

There's an extra benefit to joining one of these inexpensive on-line networks. You could join simply to avoid the long-distance telephone rates. If you'd like to keep in touch with friends or relatives by more than just an occasional letter or phone call, then try PlayNet or People/Link.

If you happen to have a Telenet or Tymnet connection, which is toll free, you would only have to pay for your connect time. Instead of a traditional phone call, you could make it a real visit by playing games and chatting at the same time. It's worth looking into.

The inherent benefits are those derived from social interaction with a wide variety of people. This is a great opportunity to meet people from all across the nation and to share ideas and opinions with them. Your home computer can broaden your horizons by giving you this chance to travel beyond your own hometown. R

Address all author correspondence to Margaret Morabito, c/o RUN *editorial, 80 Pine St., Peterborough, NH 03458.*

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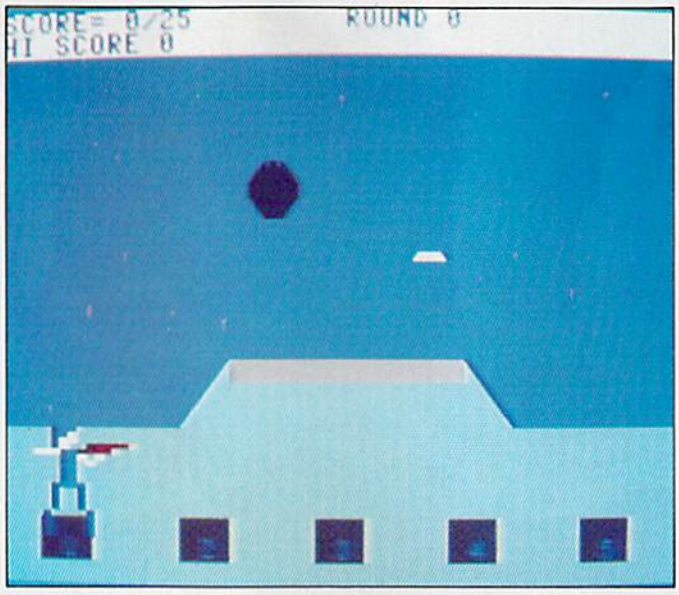
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Trap Shoot

By LEE FRALEY

The object of Trap Shoot is to improve your aim by shooting at flying clay pigeons, or blue rocks. There are 25 blue rocks on which to practice.

To begin, plug your joystick into port 2 and run the program. The C-64 will draw the playing field on the screen. To prepare for play, answer the three questions that appear on the field. First, choose your rock speed, from 1 (slow) to 15 (fast), and the gun muzzle speed, from 1 (slow) to 40 (fast). These factors will determine the difficulty level of the game. Keep in mind that the faster the rock's speed and the slower the gun's speed, the more difficult it will be for you to hit your target.

Next, press the fire-button to see how fast the blue rock speeds across the screen, or push the joystick in any direction to move to the last question. You will be asked if you wish to change the difficulty level. If you do, press the fire-button; otherwise push the joystick in any direction to go on to the game.

At the bottom of the playing field are five posts. The shooter at the first post is there only to indicate which post you're on. The shooter will move on to the next post after you have used up five shots.

Trapshooting is an expensive sport, but with this program, you can fire away with unlimited ammo and clay pigeons.

The black gun muzzle is at the far left of the trap house, above the shooter. You use your joystick to move the gun muzzle to shoot at the rocks. When the shooter moves on to the next post, the muzzle will move to a different starting location on the trap house.

Now that you're at your post, press the fire-button to release a blue rock. With your joystick, move the gun muzzle over the moving target and shoot it by pressing the fire-button. If you hit the target, it will shatter, and one point will be added to your score, displayed at the top of the screen. You get only one shot at each of the five rocks; then you move on to the next post.

The game is over when you have shot all 25 bullets. The computer will ask if you want to play again. If so, press the fire-button; if not, push the joystick in any direction.

For you programmers who wish to modify Trap Shoot, I used sprite 0 for the shooter, sprite 1 for the gun muzzle and sprite 2 for the blue rock. The joystick is read by the Define statement. I have also provided an outline of the program in Table 1.

Happy Shooting! R

Address all author correspondence to Lee Fraley, 3903 Avenue F, Kearney, NE 68847.

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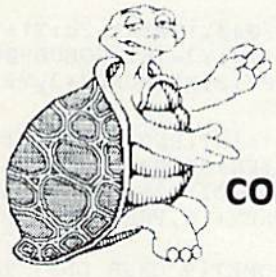
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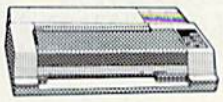
Line	Description
0-99	Screen and variables setup.
100-199	Muzzle movement.
200-299	Blue-rock movement.
300-399	Wait for Pull and display score.
400-499	Difficulty level input.
500-599	Setup for post.
600-699	Game over.
800-899	Fire.
900-999	Move man to new post.
1000-1999	Sprite data and enter.
2000-2999	Title screen.

Table 1. *Line descriptions for Trap Shoot.*

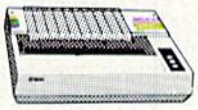
Listing 1. *Trap Shoot program.*

```
1 V=53248:POKEV+16,.:POKE54296,15
2 J=5632Ø:POKEV+28,1:POKEV+37,1:POKEV+39,9:
  PO=-1
3 GOSUB2ØØØ
4 POKEV+38,22:POKE2Ø41,192:POKE2Ø42,193:POK
  EV+27,4:POKEV+23,1:POKEV+29,1
5 POKEV+21,4+2+1:POKEV+4Ø,.:POKEV+41,1:DEFF
  N JO(O)=15-(PEEK(5632Ø)AND15)
6 DEFFNFB(O)=PEEK(5632Ø)AND16
1Ø PRINT"{SHFT CLR}{15 CRSR DNs}"TAB(12)"{C
   TRL 9}{COMD 6}{SHFT LB.}{COMD 8}{14 SPAC
   Es}{COMD 6}{COMD *}"
11 PRINTTAB(11)"{CTRL 9}{SHFT LB.}{16 SPACE
   s}{COMD *}"
12 PRINTTAB(1Ø)"{CTRL 9}{SHFT LB.}{18 SPACE
   s}{COMD *}":FORT=1TO4
13 PRINT"{CTRL 9}{4Ø SPACEs}";:NEXT
14 PRINT"{CTRL 9}{COMD 6}{2 SPACEs}{COMD 4}
   {3 SPACEs}{COMD 6}{5 SPACEs}{COMD 4}{3 S
   PACEs}{COMD 6}{5 SPACEs}{COMD 4}{3 SPACE
   s}{COMD 6}{5 SPACEs}{COMD 4}{3 SPACEs}{C
   OMD 6}{5 SPACEs}{COMD 4}{3 SPACEs}{COMD
   6}{3 SPACEs}";
15 PRINT"{CTRL 9}{2 SPACEs}{COMD 4} 1 {COMD
    6}{5 SPACEs}{COMD 4} 2 {COMD 6}{5 SPACE
   s}{COMD 4} 3 {COMD 6}{5 SPACEs}{COMD 4}
   4 {COMD 6}{5 SPACEs}{COMD 4} 5 {COMD 6}{
   3 SPACEs}{HOME}";
16 PRINT"{CTRL 2}{CTRL 9}{4Ø SPACEs}";
17 PRINT"{CTRL 2}{CTRL 9}{4Ø SPACEs}":PRINT
   "{2 CRSR UPs}{CTRL 9}HI SCORE"PEEK(2)
18 FORT=1984TO2Ø23:POKET,16Ø:POKET+54272,13
   :NEXT
98 IFDI=.THEN4ØØ
99 GOTO3ØØ
1ØØ JV=FNJO(.):IFWBTHEN111
1Ø1 IFJV=1ORJV=5ORJV=9THENY2=Y2-S
1Ø2 IFJV=2ORJV=6ORJV=1ØTHENY2=Y2+S
1Ø3 IFJV>3ANDJV<7THENX2=X2-S
1Ø4 IFJV>7ANDJV<11THENX2=X2+S
1Ø5 IFX2>255THENPOKEV+16,PEEK(V+16)+2:X2=X2
   -255
1Ø6 IFX2<.AND(PEEK(V+16)AND2)=2THENX2=255--
   X2:POKEV+16,PEEK(V+16)-2
1Ø7 IFY2<.THENY2=.
1Ø8 IFY2>255THENY2=255
1Ø9 IFX2<.THENX2=.
11Ø IFX2>255THENX2=255
111 KL=PEEK(53278):POKEV+2,X2:POKEV+3,Y2:IF
   FNFB(.)=.ANDWB=.THEN8ØØ
2ØØ H=H+1:X3=X3+D1:Y3=Y3+D2:IFX3>255THENX3=
   .:POKEV+16,PEEK(V+16)+4
21Ø IFY3<.ORY3>255THEN3ØØ
211 IFH>4ØANDWB=1THEN3ØØ
212 IFX3<.THEN3ØØ
299 POKEV+4,X3:POKEV+5,Y3:POKE54276,128:GOT
   O1ØØ
3ØØ WB=.:H=.:PO=PO+1:IF(PEEK(V+16)AND2)=2TH
   ENPOKEV+16,PEEK(V+16)-2
3Ø2 ONINT((PO+5)/5)GOSUB5ØØ,51Ø,52Ø,53Ø,54Ø
   ,54Ø
3Ø3 PRINT"{HOME}{CTRL 9}{CTRL 2}SCORE=";SC"
   {CRSR LF}/25","ROUND"PO
397 IFPO=25THEN6ØØ
398 JV=FNJO(.):FB=FNFB(.):IFJV=.ANDFB=16THE
   N398
399 GOTO1ØØ
4ØØ PRINT"{HOME}{CTRL 9}{CTRL 1}{9 SPACEs}>
   >>>> TRAP SHOOT <<<<<{9 SPACEs}"
4Ø1 INPUT"{CRSR DN}ENTER BLUE ROCK SPEED (1
   -15)";DI:INPUT"ENTER SIGHT SPEED (1-4Ø)
   ";S
4Ø2 PRINT"{CRSR DN}SEE ONE (FB=Y/UP=N)"
4Ø3 FB=FNFB(.):JV=FNJO(.):IFFB=.THEN4Ø6
4Ø4 IFJVTHEN41Ø
4Ø5 GOTO4Ø3
4Ø6 GOSUB59Ø:X3=17Ø:Y3=167:POKE2Ø42,193:POK
   EV+21,4:FORT=1TO1Ø
4Ø7 H=H+1:X3=X3+D1:Y3=Y3+D2:IFX3>255THENX3=
   .:POKEV+16,PEEK(V+16)+4
4Ø8 IFY3<.THENY3=.
4Ø9 POKEV+4,X3:POKEV+5,Y3:FORY=1TO75:NEXTY,
   T:POKEV+21,7
41Ø PRINT"{CRSR DN}CHANGE (FB=Y/UP=N)
411 FB=FNFB(.):JV=FNJO(.):IFFB=16ANDJV=.THE
   N411
412 PRINT"{HOME}";:FORT=1TO1Ø:PRINT"{4Ø SPA
   CEs}";:NEXT
413 IFS<1ORS>4ØTHEN4ØØ
414 IFDI<1ORDI>15THEN4ØØ
498 IFFB=.THEN4ØØ
499 X3=.:Y3=.:GOTO1Ø
5ØØ REM POST >1<:PDATAV+16,.
5Ø1 X=X1:Y=Y1:POKE2Ø4Ø,191:X1=33:Y1=192:X2=
   126:Y2=157:X3=17Ø:Y3=167
5Ø2 POKEV+1,Y1:POKEV+2,X2:POKEV+3,Y2:POKEV+
   4,X3:POKEV+5,Y3:POKEV,X1:GOTO59Ø
51Ø REM POST >2<
511 X=X1:Y=Y1:POKE2Ø4Ø,191:X1=97:Y1=192:X2=
   149:Y2=157:X3=17Ø:Y3=167:GOSUB9ØØ
512 POKEV+1,Y1:POKEV+2,X2:POKEV+3,Y2:POKEV+
   4,X3:POKEV+5,Y3:GOTO59Ø
52Ø REM POST >3<
521 X=X1:Y=Y1:POKE2Ø4Ø,191:X1=161:Y1=192:X2
   =169:Y2=157:X3=17Ø:Y3=167:GOSUB9ØØ
522 POKEV+1,Y1:POKEV+2,X2:POKEV+3,Y2:POKEV+
   4,X3:POKEV+5,Y3:GOTO59Ø
53Ø REM POST >4<
531 X=X1:Y=Y1:POKE2Ø4Ø,19Ø:X1=22Ø:Y1=192:X2
   =189:Y2=157:X3=17Ø:Y3=167:GOSUB9ØØ
532 POKEV+1,Y1:POKEV+2,X2:POKEV+3,Y2:POKEV+
   4,X3:POKEV+5,Y3:GOTO59Ø
54Ø REM POST >5<
541 X=X1:Y=Y1:POKE2Ø4Ø,19Ø:X1=28:Y1=192:X2=
   216:Y2=157:X3=17Ø:Y3=167:GOSUB9ØØ
542 POKEV+1,Y1:POKEV+2,X2:POKEV+3,Y2:POKEV+
   4,X3:POKEV+5,Y3
59Ø POKE2Ø42,193:D1=INT(RND(.)*5)+DI:D=INT(
   RND(.)*1ØØ)+1:IFD>5ØTHEND1=-D1
591 D2=INT(RND(.)*5)+DI:D2=-D2:IF(PEEK(V+16
   )AND4)=4THENPOKEV+16,PEEK(V+16)-4
599 RETURN
6ØØ PRINT:PRINT"{HOME}{9 CRSR DNs}"TAB(15)"
   {CTRL 9}GAME OVER":PRINTTAB(15)"{CRSR D
   N}FB=START"
6Ø1 PRINTTAB(15)"{CRSR DN}FB=START":PRINTTA
   B(15)"UP= END "
```

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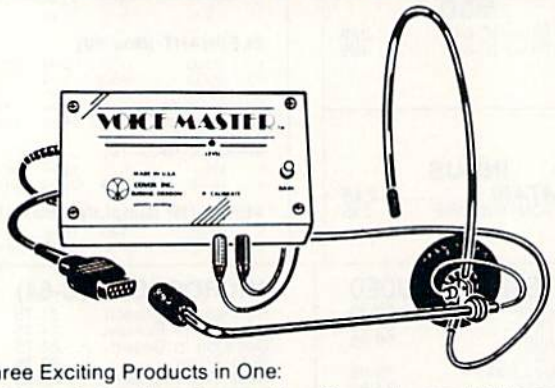
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Listing 1 continued

```
6Ø2 IFSC>PEEK(2)THENPOKE2,SC:PRINT"{HOME}{C
    RSR DN}{CTRL 9}HI SCORE"SC
6Ø3 JV=FNJO(.):FB=FNFB(.):IFFB=ØTHENPOKEV+2
    1,Ø:RUN
6Ø4 IFJVTHENEND
6Ø5 GOTO6Ø2
8ØØ WB=1:REM SHOOT
8Ø1 POKE54273,2:POKE54272,255:POKE54277,.:P
    OKE54278,252:POKE54276,129
81Ø IFKL<>6THEN2ØØ
811 POKE2Ø42,194:D2=-D2:SC=SC+1
89Ø GOTO2ØØ
9ØØ IFX=X1THENRETURN
9Ø1 POKEV+16,.:IFX<X1THENFORT=XTOX1:POKEV,T
    :FORY=1TO1Ø:NEXTY,T
9Ø2 IFX>X1THEN91Ø
9Ø3 RETURN
91Ø U=.:FORT=XTOX1+255:IFT>255THENPOKEV+16,
    PEEK(V+16)OR1:U=1
911 IFU=1THENPOKEV,T-256:GOTO913
912 POKEV,T
913 FORY=1TO5:NEXTY,T:RETURN
1ØØØ FORT=1216ØTO12479:READA:POKET,A:NEXT
1ØØ1 REM SPRITE Ø
1ØØ2 DATAØ,Ø,Ø,Ø,63,Ø,Ø,31,Ø,Ø,23,.,17Ø,135
     ,.,1Ø,189,8Ø,4,124,.,1,6Ø,.,.,6Ø,.
1ØØ3 DATA.,6Ø,.,.,6Ø,.,.,255,.,.,195,.,.,19
     5,.,.,195,.,.,195,.,3,.,192,3,.,192
1ØØ4 DATA3,.,192,3,.,192,3,.,192,.
1Ø1Ø REM SPRITE 1
1Ø11 DATA.,.,.,3,24Ø,.,3,2Ø8,.,3,8Ø,.,3,66,
     17Ø,21,25Ø,16Ø,.,244,64,.,241,.
1Ø12 DATA.,24Ø,.,.,24Ø,.,.,24Ø,.,3,252,.,3,
     12,.,3,12,.,3,12,.,3,12,.,12,3,.,12
1Ø13 DATA3,.,12,3,.,12,3,.,12,3,.,.
1Ø2Ø REM SPRITE 2
1Ø21 DATA.,.,.,1,57,.,3,57,128,7,255,192,15
     ,255,224,31,255,24Ø,63,255,248
1Ø22 DATA127,255,252,255,255,254,255,255,25
     4,255,255,254,255,255,254,255,255
1Ø23 DATA254,255,255,254,127,255,252,63,255
     ,248,31,255,24Ø,15,255,224,7,255,192
1Ø24 DATA3,255,128,1,255,.,.
1Ø3Ø REM SPRITE 3
1Ø31 DATA,,,,,,,,,,,,,,,,,,,,,,,,3,255,128,
     7,255,192,15,255,224
1Ø32 DATA,,,,,,,,,,,,,,,,,,,,,,,,,,,
1Ø4Ø REM SPRITE 4
1Ø41 DATA.,.,.,.,.,.,6,.,2,.,2,.,.,.,.,32,12,.,
     33,.,.,.,.,.,36,96,64,.,.,.,.,4,.,32
1Ø42 DATA4,4,.,3,1Ø4,1,32,16,49,.,.,.,.,.,16,
     .,6,16,.,6,8Ø,.,.,.,1,128,3,.,.,.,.,.,16
1Ø43 DATA128,.,.,
1999 RETURN
2ØØØ N$=" BY LEE FRALEY ":PRINT"{SHFT CLR}{
     CTRL 2}{5 CRSR DNs}"TAB(3)"{CTRL 9}{SH
     FT LB.}{5 SPACEs}{CTRL Ø}{SHFT LB.}"
2ØØ1 PRINTTAB(5)"{CTRL 9}{SHFT LB.}{CTRL Ø}
     {SHFT LB.}"
2ØØ2 PRINTTAB(4)"{CTRL 9}{SHFT LB.}{CTRL Ø}
     {SHFT LB.} {CTRL 9}{SHFT LB.} {CTRL Ø}
     {SHFT LB.}{CTRL 9}{SHFT LB.}{2 SPACEs}
     {CTRL Ø}{SHFT LB.}{CTRL 9}{SHFT LB.}{2
      SPACEs}{CTRL Ø}{SHFT LB.}"
2ØØ3 PRINTTAB(3)"{CTRL 9}{SHFT LB.}{CTRL Ø}
     {SHFT LB.} {CTRL 9}{SHFT LB.}{CTRL Ø}{
     SHFT LB.} {CTRL 9}{SHFT LB.}{CTRL Ø}{S
     HFT LB.}{CTRL 9}{SHFT LB.}{CTRL Ø}{SHF
     T LB.}{CTRL 9}{SHFT LB.}{CTRL Ø}{SHFT
     LB.}"
2ØØ4 PRINTTAB(12)"{CTRL 9}{SHFT LB.}{CTRL Ø
     }{SHFT LB.}":PRINT
2ØØ5 PRINTTAB(15)"{CTRL 9}{SHFT LB.}{5 SPAC
     Es}{CTRL Ø}{SHFT LB.}"
2ØØ6 PRINTTAB(14)"{CTRL 9}{SHFT LB.}{CTRL Ø
     }{SHFT LB.}{5 SPACEs}{CTRL 9}{SHFT LB.
     }{CTRL Ø}{SHFT LB.}"
2ØØ7 PRINTTAB(14)"{COMD *}{CTRL 9}{4 SPACEs
     }{CTRL Ø}{SHFT LB.}{CTRL 9}{SHFT LB.}{
     CTRL Ø}{SHFT LB.}"
2ØØ8 PRINTTAB(17)"{CTRL 9}{SHFT LB.}{CTRL Ø
     }{SHFT LB.}{CTRL 9}{SHFT LB.}{2 SPACEs
     }{CTRL Ø}{SHFT LB.}{CTRL 9}{SHFT LB.}{
     2 SPACEs}{CTRL Ø}{SHFT LB.}{CTRL 9}{SH
     FT LB.}{2 SPACEs}{CTRL Ø}{SHFT LB.}{CT
     RL 9}{SHFT LB.}{2 SPACEs}{CTRL Ø}{SHFT
      LB.}"
2ØØ9 PRINTTAB(12)"{CTRL 9}{SHFT LB.}{4 SPAC
     Es}{CTRL Ø}{SHFT LB.}{CTRL 9}{SHFT LB.
     }{CTRL Ø}{SHFT LB.}{CTRL 9}{SHFT LB.}{
     CTRL Ø}{SHFT LB.}{CTRL 9}{SHFT LB.}{2
     SPACEs}{CTRL Ø}{SHFT LB.}{CTRL 9}{SHFT
      LB.}{2 SPACEs}{CTRL Ø}{SHFT LB.} {CTR
     L 9}{SHFT LB.}{CTRL Ø}{SHFT LB.}":PRIN
     T
2Ø1Ø GOSUB1ØØØ:PRINT"{CTRL 1}"SPC(5)"."
2Ø11 PRINT"{CTRL 9}{6 SPACEs}"
2Ø12 PRINT"{CTRL 9}{2 SPACEs}"
2Ø13 FORT=1TO5ØØ:NEXT
2Ø14 POKE54273,2:POKE54272,255:POKE54277,.:
     POKE54278,252:POKE54276,129
2Ø15 PRINT"{2 CRSR UPs}{6 CRSR RTs}{COMD 7}
     {2 COMD Ys}{CTRL 9}"N$
2Ø16 FORT=1TO1ØØ:NEXT:POKE54276,128:FORT=1T
     O2ØØØ:NEXT:RETURN
```


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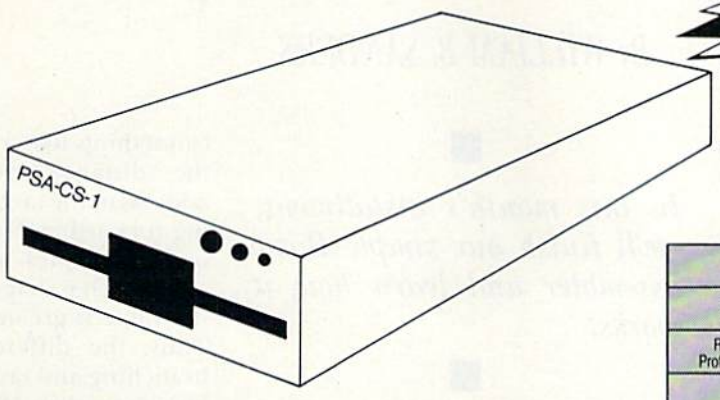
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Easy Assembly III

By WILLIAM B. SANDERS

In this month's installment, we'll finish our simple Basic assembler and learn how it works.

This month, you're going to finish the assembler and get started programming in assembly language.

In the first installment of the assembler, I provided all of the steps for getting the information into the computer. Now you have to put it in a way that can be processed as machine code.

First, you will compile the code simply by Poking the values into sequential addresses. Remember that B% is the number of bytes the opcode/operand combination will use. (Single-byte opcodes with no operands were Poked in previous sections of the program.)

```
42Ø REM ************
43Ø REM COMPILE CODE
44Ø REM ************
45Ø IF B%=2 THEN POKE SA,D%
    : SA=SA + 1
46Ø IF B%=2 THEN POKE SA,OPE
    R : SA=SA+1 : OPER=Ø :{2
     SPACEs}GOTO 23Ø
47Ø POKE SA,D%: SA=SA+1
48Ø POKE SA,LB : SA=SA+1 : P
    OKE SA,HB : SA=SA+1 : OP
    ER=Ø : GOTO 23Ø
```

At this point, all of the work is done, and you need only enter the subroutines and data that previous parts of the program have used. First, the hex to decimal conversion got all of the values ready to be Poked in.

```
49Ø REM ********************
    **
5ØØ REM CONVERT HEX TO DECIM
    AL
51Ø REM ********************
    **
52Ø H$=MID$(OPER$,2)
53Ø FOR L=1 TO LEN(H$) : HD=
    ASC(MID$(H$,L,1))
54Ø OPER=OPER*16+HD-48+((HD>
    57)*7)
55Ø NEXT L : RETURN
```

Next is some error trapping to help beginners get used to the opcodes and values that can be entered.

```
56Ø REM **********
57Ø REM ERROR TRAP
58Ø REM **********
59Ø PRINT CHR$(18);"ERROR-MU
    ST BE LESS THAN 256"
6ØØ FOR W=1 TO 4ØØ : NEXT W
    : PRINTCHR$(146); : PRIN
    T CHR$(145);
61Ø FOR X=1 TO 27 : PRINTCHR
    $(32); : NEXT
62Ø PRINT CHR$(157);CHR$(157
    );CHR$(145) :RETURN
63Ø PRINT CHR$(18);"VALUE OV
    ER 65535 ($FFFF)";CHR$(1
    46) : RETURN
```

As you will learn as we go along, your 6510 microprocessor stores and reads addresses in high-byte/low-byte configuration. This following subroutine stores the high byte in the variable HB and the low byte in the variable LB.

```
64Ø REM ********************
    ****
65Ø REM CONVERT TO 2 BYTE NU
    MBER
66Ø REM ********************
    ****
67Ø LB=OPER-INT(OPER/256)*25
    6
68Ø HB=INT(OPER/256)
69Ø RETURN
```

When using different branching operations to addresses, the branch (something like a Goto) is based on the "distance" from the branching address to the target address. Branching forward and backward uses only one-byte values, so the direction of the branch is determined by whether the value is greater or less than 128. Thus, the difference between the branching and target address cannot be greater than 127. There is no trap for that with this assembler, since you will not be making big jumps.

```
7ØØ REM ************
71Ø REM BRANCH OFFSET
72Ø REM ************
73Ø IF SA > OPER THEN OPER=
    254-(SA-OPER)
74Ø IF SA < OPER THEN OPER=
    (OPER-SA)-2
75Ø RETURN
```

Now you come to the ending routine, which saves everything to disk. (A separate tape routine appears below, to use if you don't have a disk drive.) Basically, this routine determines the number of bytes in the program in line 790, reads that area of memory used for your program (where everything was Poked in) and writes it to disk.

The routine saves the program both as a machine-code file, which can be loaded from disk and accessed into operation with the SYS command (920–970), and as a "source" file, which shows all the mnemonic opcodes and operands you employed (990–1040). The source code cannot be reloaded into the assembler, but you can reload it to examine its contents.

The object code, or the program that executes, is saved with an "address tail" on disk. When you load the program from disk, the address tail tells you which address to access with the SYS command.

Save to disk only:

```
76Ø REM **************
77Ø REM ENDING ROUTINE
78Ø REM **************
79Ø NB = SA-BA
8ØØ PRINT CHR$(147)
81Ø FOR X=1 TO 5 : PRINT : N
    EXT
82Ø INPUT"SAVE PROGRAM(Y/N)"
    ;AN$
83Ø IF AN$="Y" THEN 89Ø
84Ø PRINT : PRINT : PRINT "P
    ROGRAM IS";NB;"BYTES LON
    G"
85Ø PRINT "TO EXECUTE 'SYS'"
    ;BA : PRINT
86Ø INPUT "(B)EGIN AGAIN OR
    (E)ND";DE$
87Ø IF DE$="B" THEN{2 SPACEs
    }12Ø
88Ø PRINT : PRINT"END" : END
89Ø PRINT CHR$(147) : FOR X=
    1 TO 5 : PRINT : NEXT
9ØØ LB=BA-INT(BA/256)*256 :
    HB=INT(BA/256)
91Ø INPUT "ENTER FILE NAME";
    NW$:NF$=NW$:NF$="Ø:"+NF$
    +STR$(BA)+",P,W"
92Ø OPEN2,8,2,NF$
93Ø PRINT#2,CHR$(LB)+CHR$(HB
    );
94Ø FOR X=BA TO SA-1: OC=PEE
    K(X)
95Ø PRINT#2,CHR$(OC);
96Ø NEXT X
97Ø CLOSE2
98Ø NF$=""
99Ø NF$="Ø:" + NW$+",S,W"
1ØØØ OPEN 9,8,9,NF$
1Ø1Ø FOR V=Ø TO N-1
1Ø2Ø PRINT#9,AD(V),S$(V),C$(
     V)
1Ø3Ø NEXT V
1Ø4Ø CLOSE9
1Ø5Ø GOTO 84Ø
```

Save to tape only:

```
76Ø REM **************
77Ø REM ENDING ROUTINE
78Ø REM **************
79Ø NB = SA-BA
8ØØ PRINT CHR$(147)
81Ø FOR X=1 TO 5 : PRINT : N
    EXT
82Ø INPUT"SAVE PROGRAM(Y/N)"
    ;AN$
83Ø IF AN$="Y" THEN 89Ø
84Ø PRINT : PRINT : PRINT "P
    ROGRAM IS";NB;"BYTES LON
    G"
85Ø PRINT "TO EXECUTE 'SYS'"
    ;BA : PRINT
86Ø INPUT "(B)EGIN AGAIN OR
    (E)ND";DE$
87Ø IF DE$="B" THEN{2 SPACEs
    }12Ø
88Ø PRINT : PRINT"END" : END
89Ø PRINT CHR$(147) : FOR X=
    1 TO 5 : PRINT : NEXT
9ØØ REM *** TAPE SAVE ***
91Ø INPUT "ENTER FILE NAME";
    NW$:NF$=NW$
92Ø OPEN21,1,1,NF$
93Ø PRINT#21,BA
94Ø FOR X=BA TO SA-1: OC=PEE
    K(X)
95Ø PRINT#21,OC
96Ø NEXT X
97Ø CLOSE21
98Ø NF$=""
99Ø NF$=NW$+".S"
1ØØØ OPEN22,1,1,NF$
1Ø1Ø FOR V=Ø TO N-1
1Ø2Ø PRINT#22,AD(V),S$(V),C$
     (V)
1Ø3Ø NEXT V
1Ø4Ø CLOSE22
1Ø5Ø GOTO 84Ø
```

Now you come to the opcode data. Be careful here, since there are a lot of meaningless values for you to trip over. They are arranged in numeric order, and each Data statement uses a single line.

The first value is the decimal machine opcode. The second element is the mnemonic opcode for the machine code. Third is the number of bytes, which can only be 1, 2 or 3. Just think of the three data elements as: data machine opcode, mnemonic opcode and number of bytes.

```
1Ø6Ø REM ***********
1Ø7Ø REM OPCODE DATA
1Ø8Ø REM ***********
1Ø9Ø DATA 24,CLC,1
11ØØ DATA 32,JSR,3
111Ø DATA 56,SEC,1
112Ø DATA 73,EOR#,2
113Ø DATA 76,JMP,3
114Ø DATA 77,EOR,3
115Ø DATA 96,RTS,1
116Ø DATA 1Ø5,ADC#,2
117Ø DATA 1Ø8,(JMP),3
118Ø DATA 1Ø9,ADC,3
119Ø DATA 121,ADC-Y,3
12ØØ DATA 125,ADC-X,3
121Ø DATA 129,(STA-X),2
122Ø DATA 133,STA-Z,2
123Ø DATA 134,STX-Z,2
124Ø DATA 136,DEY,1
125Ø DATA 138,TXA,1
126Ø DATA 14Ø,STY,3
127Ø DATA 141,STA,3
128Ø DATA 142,STX,3
129Ø DATA 145,(STA-Y),2
13ØØ DATA 148,STY-X,2
131Ø DATA 152,TYA,1
132Ø DATA 157,STA-X,3
133Ø DATA 153,STA-Y,3
134Ø DATA 154,TXS,1
135Ø DATA 16Ø,LDY#,2
136Ø DATA 161,(LDA-X),2
137Ø DATA 162,LDX#,2
138Ø DATA 164,LDY-Z,2
139Ø DATA 165,LDA-Z,2
14ØØ DATA 166,LDX-Z,2
141Ø DATA 168,TAY,1
142Ø DATA 169,LDA#,2
143Ø DATA 17Ø,TAX,1
144Ø DATA 172,LDY,3
145Ø DATA 173,LDA,3
146Ø DATA 174,LDX,3
147Ø DATA 177,(LDA-Y),2
148Ø DATA 185,LDA-Y,3
149Ø DATA 186,TSX,1
15ØØ DATA 188,LDA-Y,3
151Ø DATA 189,LDA-X,3
152Ø DATA 19Ø,LDX-Y,3
153Ø DATA 192,CPY#,2
154Ø DATA 193,(CMP-X),2
155Ø DATA 196,CPY-Z,2
156Ø DATA 197,CMP-Z,2
157Ø DATA 198,DEC-Z,2
158Ø DATA 2ØØ,INY,1
159Ø DATA 2Ø1,CMP#,2
16ØØ DATA 2Ø2,DEX,1
161Ø DATA 2Ø4,CPY,3
162Ø DATA 2Ø5,CMP,3
163Ø DATA 2Ø6,DEC,3
164Ø DATA 2Ø8,BNE,2
165Ø DATA 221,CMP-X,3
166Ø DATA 222,DEC-X,3
167Ø DATA 224,CPX#,2
168Ø DATA 23Ø,INC-Z,2
169Ø DATA 232,INX,1
17ØØ DATA 233,SBC#,2
171Ø DATA 234,NOP,1
172Ø DATA 236,CPX,3
173Ø DATA 237,SBC,3
174Ø DATA 238,INC,3
175Ø DATA 24Ø,BEQ,2
176Ø DATA 249,SBC-Y,3
177Ø DATA 253,SBC-X,3
178Ø DATA 254,INC-X,3
179Ø REM ********************
     *****
18ØØ REM ADD ADDITIONAL DATA
      HERE
181Ø REM ********************
     *****
182Ø DATA 255
```

Finally, you come to the header. This just gives you something to look at while the program is loading the data into a giant array. You can make it more interesting by adding your name and some fancy stuff if you like. By having it here at the top of the program, it is one less thing the program has to search through while it's running.

```
4ØØØ REM ******
4Ø1Ø REM HEADER
4Ø2Ø REM ******
4Ø3Ø PRINT CHR$(147)
4Ø4Ø LD$="LOADING ARRAY" : F
     OR X=1 TO 1Ø : PRINT :
     NEXT : H=2Ø-LEN(LD$)/2
4Ø5Ø PRINT TAB(H);CHR$(18);L
     D$
4Ø6Ø RETURN
```

If you entered everything correctly, your assembler should work fine. However, before you start writing assembly language programs, you need to do one more thing—make a tape-loading program. The program first looks at the starting address stored in the variable BA. Then it Pokes in the program code from the starting address to the end of the program.

Load from tape:

```
1Ø PRINT CHR$(147) : X=Ø
2Ø INPUT "NAME OF FILE ";NF$
3Ø OPEN21,1,Ø,NF$
4Ø INPUT#21,BA
5Ø INPUT#21,OC
6Ø POKE BA+X,OC
7Ø PRINT BA+X,OC
```

```
8Ø X=X+1
9Ø IF ST=Ø THEN 5Ø
1ØØ CLOSE 21
```

Using the Simple Assembler

This simple assembler has the prime advantage of being simple to use, and it does have some elementary error trapping. However, the more you do assembly language programming, the more you're going to want a professionally produced assembler. For now, let's see how it works.

First, put a copy of your assembler onto a separate disk, so that you'll have a backup copy. Then, to get going, load and run the assembler. As soon as it's ready, you'll see the following heading:

```
ADRS        OPCODE      OPERAND
PRESS <RETURN> TO DEFAULT TO
49152
STARTING ADDR?
```

Just press the return key to get 49152 as a starting address. (If you have a VIC-20, use 38912 as your starting address. Enter 38912 and press the return key.) You will then be presented with an address and question-mark prompt. Enter LDA# and press the return key. You'll get a second question-mark prompt. Enter 2 and hit the return key. Your screen will look as follows:

```
ADRS        OPCODE      OPERAND
PRESS <RETURN> TO DEFAULT TO
49152
STARTING ADDR?
49152       ?LDA#       ?2
49154       ?
```

All you've done is to load the accumulator with the value 2. The opcode used only one byte (address 49152) and the operand used one byte (address 49153), so your next available address should be 49154, and that's what pops up on the screen.

Now we'll store that 2 somewhere that will show you something on your screen. Let's stick it in the background color register located at $D021. To do that, enter STA <RETURN> and $D021 <RETURN>. Finally, to get out and back to Basic, enter RTS <RETURN> and then Q for quit and <RETURN>.

```
ADRS        OPCODE      OPERAND
PRESS <RETURN> TO DEFAULT TO
49152
STARTING ADDR?
49152       ?LDA#       ?2
49154       ?STA        ?$D021
49157       ?RTS
49158       ?Q
```

The final opcode entry, Q, is not compiled into machine language, but everything else is. When you press the return key after Q, you will be asked if you want to save the program and, if you do, to enter a filename. Enter the name TEST to see if everything works.

The file TEST should be saved to your disk as a PRG file, TEST 49152, and as a SEQ file, TEST. The PRG file can be loaded and executed. Simply enter LOAD "TEST 49152",8,1 and SYS 49152. Your background color should turn red. For load from tape, use the Tape Loading program.

To load and read your source code, you will need the following program.

Source Code Reader—disk:

```
1Ø PRINTCHR$(147)
2Ø INPUT "FILENAME ";NF$
3Ø NF$="Ø:"+ NF$ +",S,R"
4Ø OPEN9,8,9,NF$
5Ø INPUT#9,A$
6Ø PRINT A$
7Ø IF ST=Ø THEN 5Ø
8Ø CLOSE9
```

Source Code Reader—tape:

```
1Ø PRINT CHR$(147) : X=Ø
2Ø INPUT "NAME OF SOURCE
   FILE ";NF$:NF$=NF$+".S
   "
3Ø OPEN22,1,Ø,NF$
4Ø INPUT#22,A$,B$,C$
5Ø PRINT A$,B$,C$
6Ø A$="":B$="":C$=""
7Ø IF ST=Ø THEN 4Ø
8Ø CLOSE22
```

You won't be using your source code reader much at first, since its only function is to save the source code for you to read. It cannot be reloaded into your assembler for editing. However, as you get into more complicated programming, you'll be going over the source code for debugging. It would be an excellent idea to include a routine to print out your source to a printer.

Next month, we'll really start programming in assembly language, so get your assembler warmed up and ready to go. If you're thinking about purchasing an assembler, here's another Assembler of the Month.

Assembler of the Month

DEVELOP-64

(French Silk, PO Box 7096, Minneapolis, MN 55407, 1-800-328-0145. Suggested retail price: $69.95.)

This assembler package includes a full-screen coresident editor with replacement, move, search, several pseudo opcodes, macro capabilities, printer output, built-in disk wedge, debugger, decoder and disassembler. The instruction manual, *Inside the Commodore 64*, has extensive memory maps, technical information and programming tips in 13 chapters and six appendices.

Questions and Answers

Q: Can assembly language source code and object code created with one assembler be edited with another assembler of a different manufacture?

A: For the most part, when you create source code with an assembler, you have to use the same assembler to edit it. Object code usually is not edited with an assembler; it's easier to use a monitor, but this again depends on the assembler package. Some editor/assemblers, such as Commodore 64 Macro Development System, save object code in SEQ files. Others, such as Merlin 64 and the simple assembler we just entered, save object code as PRG files.

Q: Are there any situations where it is faster to write programs in Basic instead of in assembly language?

A: In just about all circumstances, it is faster to write programs in Basic. They just don't *run* as fast. Writing assembly code takes a lot longer than Basic code, but less time to execute. Often, programmers will write subroutines in assembly language and then execute them from a Basic program.

Q: I really like the tips in Magic. Could you have a similar set of tips for assembly language?

A: The Magic column accepts all sorts of tips for the Commodore computers, including ones for assembly language. The Peeks and Pokes can be translated into LDAs and STAs in assembly language. R

Address all author correspondence to William B. Sanders (8982 Stimson Court, San Diego, CA 92129), author of Assembly Language for Kids: Commodore 64.

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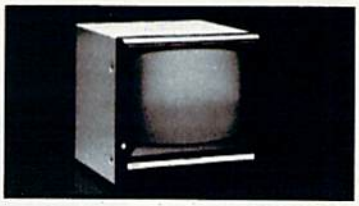
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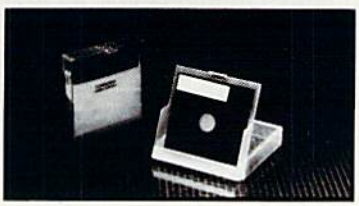
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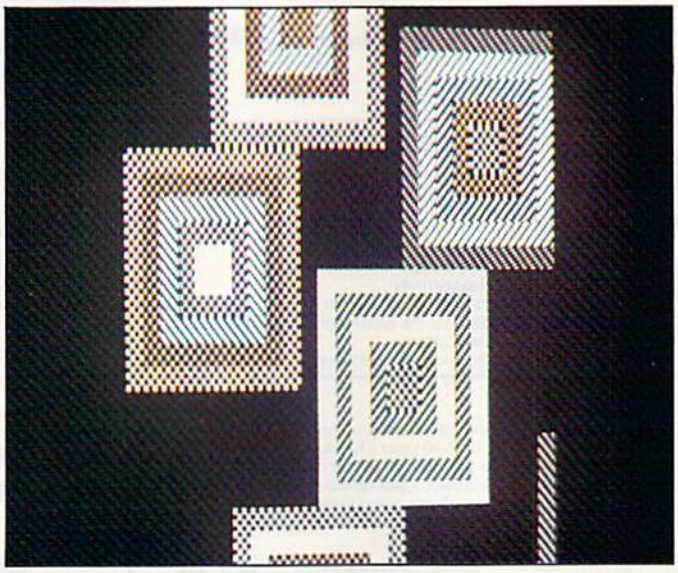
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Byte-Size Compiler

Don't let your Basic programs slow you down. This short little compiler adds unbelievable execution speed to your programs, and it's easy to use.

By VICTOR H. CORTES



Micro Compiler is an integer Basic compiler for the Commodore 64. A compiler converts a high-level language program, such as one written in Basic, into a machine language program. It allows you to take advantage of machine language speeds without knowing machine language.

Micro Compiler compiles a subset of the regular Commodore Basic, which I call Micro Basic, into machine language. Since it is a subset of the regular Commodore Basic, you can develop, test and save programs using the regular Basic interpreter.

To begin, enter and save Listing 1, the Micro Compiler program. When the compiler is run, it first asks for the name of the Micro Basic program, or source program, to be compiled. Then it asks for the address at which to start placing the machine language, or object, code. If no address is entered, the compiler defaults to 49152. The source program is read directly from disk and is listed line by line.

A special technique is used to convert the command tokens on disk to their expanded form and to print them. If any errors are encountered, a message is printed under the line in question. Since it is assumed that the source was tested with the regular Basic interpreter, a minimum of error checking is done. If an error is found, it is usually because of an invalid Micro Basic command. Once the program is compiled, you have the option of saving the code, executing the code, compiling another program or just terminating.

When saving the machine language code, the compiler will ask for the name of it. If no name is entered, the compiler defaults to the source name plus ".ML". After the compiled code is saved, you can load it with a regular Basic program, using the statement: LOAD "program name",8,1. The code can be executed from Basic with the SYS command to the starting address of the code (usually SYS 49152). This can be done in Direct mode or in Program Run mode.

Since a full Basic compiler would be a very large program, this compiler was written to handle a subset of Basic. This subset has a number of limitations. No nesting of If or For statements is allowed, and string variables and variable arrays are not supported.

There are, however, many ways to get around these limitations. For example, instead of using a variable array to hold numeric values, you can Poke these numbers into an area in memory. You can accomplish essentially the same task by changing

```
FOR I = 1TO5: A(I) = I: NEXT
```

to

```
FOR I = 1TO5: POKE 828 + I,I: NEXT
```

Usually, you'll just compile a Basic subroutine that needs speeding up. Then, instead of performing the subroutine with a Gosub statement, you can call the compiled routine with a SYS statement. You can also write and compile for execution a program written only with Micro Basic statements.

The following is a list of the Micro Basic commands the compiler can process:

RUN It Right

C-64; C-128 (in C-64 mode)
Disk drive

1. {LET} V = Expr
2. PRINT {Expr} {CHR$(Expr)} {"string"} {;}
3. IF Expr Cmpr Expr THEN {statements or line#}
4. FOR V = Expr TO Expr {STEP Expr}
5. NEXT
6. POKE Expr,Expr
7. SYS Expr
8. GOTO N
9. GOSUB N
10. RETURN
11. END or STOP
12. REM {remarks}

{} indicate an optional item.

V is used to represent a variable name. The first character in the name must be unique (A–Z). These variables use memory locations 680 to 731.

N is used to represent a numeric integer literal. Its value can be from 0 to 65535.

X is used to represent a variable or a numeric integer (V or N).

Expr is a numeric expression beginning with X or PEEK(X) and optionally followed by any number of the following: {+ X}{– X}{* X}{/X}{AND X}{OR X}.

Cmpr is a type of comparison and can be one of the following: = (equals), > (greater than), < > (not equal to) or < (less than).

The following are examples of valid statements:

```
R = PEEK(A) * 100 / M
IF Y*40+X > 2023 THEN
  PRINT CHR$(147);
FOR I = 1 TO X + A : PRINT I
  + 64 : NEXT
SYS B+1024 : RETURN
GOSUB 500 : PRINT "TOTAL";T
GOTO 20
POKE A-I, J AND 15 : END
```

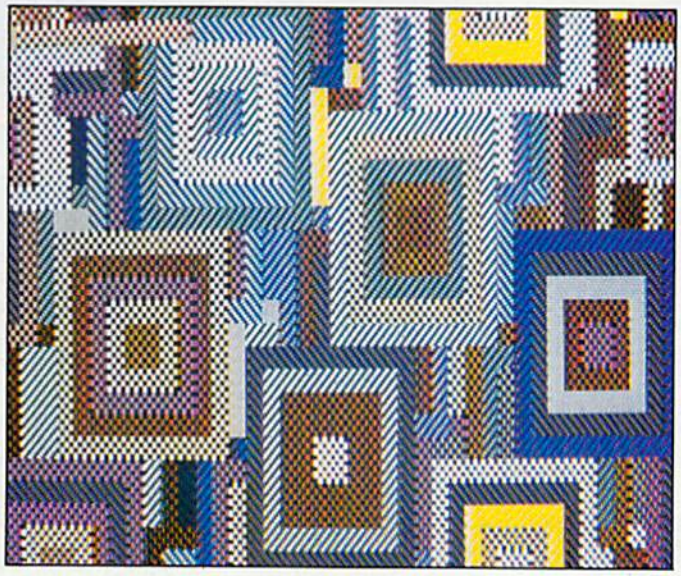
The following are examples of invalid statements:

```
R = COS(B)
PRINT TI$
GET X$(I)
OPEN 15,8,15
```

Like regular Basic, the "LET" is optional in the Let command. It is used to assign an expression to a variable. An expression must begin with a variable, a number or the Peek function of a variable or number. It can be followed by other variables or numbers, as long as they are separated by +, –, *, /, AND or OR.

The expression is evaluated from left to right, with no operator precedence and no parentheses. Because of this, you must place the multiplication and division operators first, the addition and subtraction operators next and the and/or operators last. This will ensure correct evaluation of an expression by the compiled program.

The print command can be used to print a numeric variable, a PET ASCII character (CHR$) or a string. The optional semicolon, if used, will prevent a carriage return after the Print statement. The semicolon can also be used to print any combination of these. Only the Print command allows literal strings.



In the If...Then statement, Then can be followed by a line number or any other Micro Basic statement. Multiple statements can be put on one line as long as they're separated by colons. However, it's easier to correct errors if each command is on a separate line.

All the string-manipulation commands (LEFT$, MID$,...) are omitted because Micro Basic does not handle string variables. It can only handle numeric integer variables or literals in the range of 0 to 65535 (two bytes).

Some commands can be simulated; for instance, instead of the Get command, you can use PEEK(197) to read the keyboard. The value returned by a PEEK(197) can even be converted to its PET ASCII equivalent by using the internal ROM tables (see the TEST.COMP program). Most of these restrictions were necessary to keep the compiler program to a reasonable size.

Listing 2, TEST.COMP, should be entered and saved after you have saved the MICRO.COMPILER program. TEST.COMP's main function is to test whether the compiler is working correctly. The program first clears the screen and prints TEST.COMP. It then positions the cursor to the tenth line and prints TEST. Next, it prints numbers from 1 to 5, then reads the keyboard and prints the character that was entered.

It then identifies the character as being equal to, greater or less than the character A. It also changes the screen border to green if the character entered is equal to an A, and to red if it is not. The program will terminate when the f7 key is pressed.

You can then load the compiler and run it. When prompted by the compiler for the source name, enter TEST.COMP. Press the return key when prompted for the address to default to 49152. After the compilation is done, the compiler will display the address range (starting and ending addresses) required by the compiled code and also the number of errors encountered. It will then display the following options:

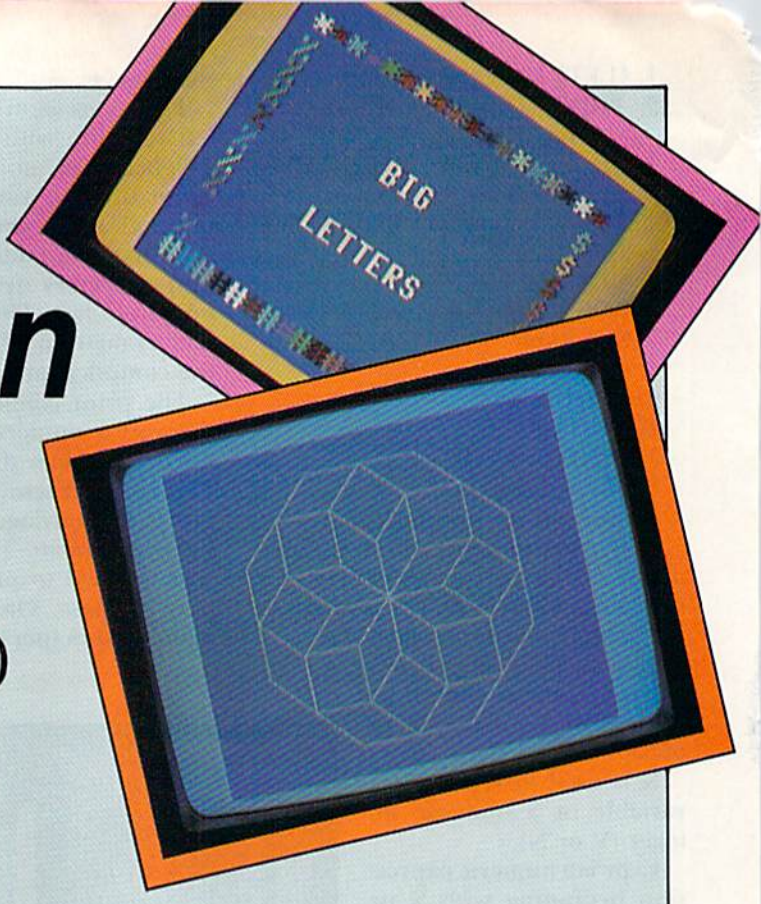
1. Save—use to save the machine language code.
2. Execute—will execute the machine language code.
3. Compile—will allow you to compile another program.
4. Quit—will send you back to Basic.

Enter option 2 to execute the program. The results should be similar to TEST.COMP, except for the speed of the compiled version.

Listing 3, the Colors program, demonstrates the difference in speed between an uncompiled program versus a compiled program. This program fills the screen with various color designs. First, type in the program, then save it as COLORS, and

Continued on p. 67.

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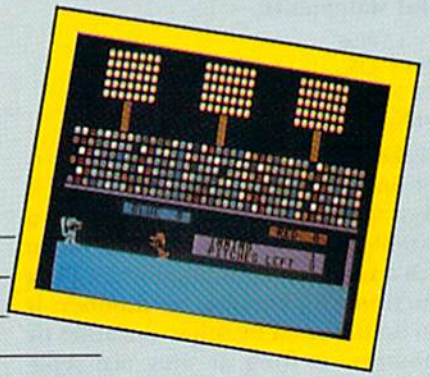
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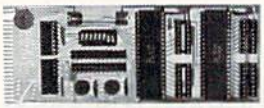
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	LDX b+1	LDX b+1	STX 98	STX 98
		STA $22	LDA c	LDA c
	LET a	STX $23	LDX c+1	LDX c+1
		LDX #0	CLC	SEC
	STA a	LDY #0	JSR muldiv	JSR muldiv
	STX a+1	LDA(22),Y		
	+ c	**− c**	**AND c**	**OR c**
	CLC	SEC		
	ADC c	SBC c	AND c	ORA c
	TAY	TAY	TAY	TAY
	TXA	TXA	TXA	TXA
	ADC c+1	SBC c+1	AND c+1	ORA c+1
	TAX	TAX	TAX	TAX
	TYA	TYA	TYA	TYA
IF	**a = b**	**a > b**	**a < b**	**a < > b**
	LDA a	LDA a	LDA a	LDA a
	LDX a+1	LDX a+1	LDX a+1	LDX a+1
	STA 34	STA 34	STA 34	STA 34
	STX 35	STX 35	STX 35	STX 35
	LDA b	LDA b	LDA b	LDA b
	LDX b+1	LDX b+1	LDX b+1	LDX b+1
	CPX 35	CPX 35	CPX 35	CPX 35
	BEQ +4	BEQ +4	BEQ +4	BEQ +4
	BNE endif	BCS endif	BCC endif	BEQ endif
	BNE +6	BCC +6	BCS +6	BNE +6
	CPA 34	CPA 34	CPA 34	CPA 34
	BNE endif	BCS endif	BCC endif	BEQ endif
	BNE endif	BEQ endif	BEQ endif	BEQ endif

PRINT	**a**	**CHR$(a)**	**"string"**
	LDA a	LDA a	LDA #<string
	LDX a+1	LDX a+1	LDY #>string
	STA 34	JSR basout	JSR prtstr
	TAX		CLC
	LDA 34		BCC endstr+1
	JSR prtint		string ASC"string"
	LDA #13		endstr BRK
	JSR basout		
SYS	**a**		**FOR a = b TO c STEP d**
	LDA a		LDA b
	LDX a+1		LDX b+1
	STA 20		JMP start
	STX 21		loop LDA a
	JSR sysin		LDX a+1
			STA 34
			STX 35
POKE	**a,b**		LDA c
			LDX c+1
	LDA b		CPX 35
	LDX b+1		BEQ +4
	STA 34		BCS contu
	STX 35		BCC +6
	LDA a		CPA 34
	LDX a+1		BEQ +2
	LDY #0		BCS# contu
	STA(34),Y		JMP next+3
			contu LDA d
other			LDX d+1
			CLC
GOTO	JMP n		ADC a
GOSUB	JSR n		TAY TXA
RETURN	RTS		ADC a+1
END	RTS		TAX TYA
STOP	RTS		start STA a
REM	none		STX a+1
			NEXT
			next JMP loop

addresses used:

start	$C000 (default)	prtint	$BDCD
muldiv	$C003 (default)	prtstr	$AB1E
basout	$FFD2	sysin	$E136

Table 1. *Machine language code generated by the compiler for each Basic statement.*

From p. 63.

run it, noting how long it takes to fill the screen with color patterns. Now load and run the compiler. When prompted for the source name, enter COLORS. When COLORS has been compiled, enter option 4 to terminate the compiler.

Now enter SYS 49152 to execute the compiled machine language code. The screen should fill instantly, compared to the minute or more required for the Basic version. This should convince you of one of the advantages of using a compiler program. The compiled versions of Basic programs are so fast that you'll often have to add a For...Next loop to hold a program down to controllable speeds.

With this compiler, you'll be able to develop programs using a high-level language (a subset of Basic) that will give you, as a final product, a program in the machine's own language, helping you take advantage of the computer's full capabilities.

Generated Machine Language Code

I have included Table 1 for those of you who may be interested in the machine language code generated by the compiler for each Basic statement. In most cases, the accumulator is used to hold the low byte of an integer, while the X register is used to hold the high byte. The variable addresses are derived from the variable name (A through Z).

A special routine to handle multiplication and division is added to the program only if these operators are used in an expression. The first two instructions of every program are jumps. These tables represent the general code generated by simple expressions. More complicated expressions generate combinations of these. Ⓡ

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Listing 1. *MICRO COMPILER program.*

```
10 PRINT"{COMD 6}MICRO COMPILER"
15 REM BY VIC CORTES
20 GOSUB1780:GOTO5900
30 REM .. FIRST VAR
40 GOSUB4000:POKEA,169:POKEA+1,L:K=2
50 IFVTHENPOKEA,173:POKEA+2,H:K=3
60 A=A+K:POKEA,174:POKEA+1,C:POKEA+2,H
70 IFV=0THENPOKEA,162:POKEA+1,H
80 A=A+K:RETURN
90 REM .. EXPR
100 P=0:IFPEEK(U)=194THENU=U+2:P=1
110 GOSUB40
120 IFU>912THENPRINT"OVERFLOW2":RETURN
130 O=0:B=PEEK(U):IFB=173THEN280
140 IFB=172THEN280
150 IFB=170THENO=109:POKEA,24:A=A+1
160 IFB=171THENO=237:POKEA,56:A=A+1
170 IFB=175THENO=45
180 IFB=176THENO=13
190 IFO=0THEN320
200 U=U+1:GOSUB4000:POKEA,O-4:POKEA+1,L:K=2
210 IFVTHENPOKEA,O:POKEA+2,H:K=3
220 A=A+K:POKEA,168:POKEA+1,138:A=A+2
230 POKEA,O:POKEA+1,C:POKEA+2,H
240 IFV=0THENPOKEA,O-4:POKEA+1,H
250 A=A+K:POKEA,170:POKEA+1,152:A=A+2
260 GOTO120
270 REM .. MUL/DIV
280 POKEA,133:POKEA+1,97:POKEA+2,134:POKEA+
    3,98:A=A+4:U=U+1:GOSUB40
290 G=1:POKEA,24:IFB=173THENPOKEA,56
300 D=S+3:GOSUB570:POKEA+1,32:POKEA+2,L:POK
    EA+3,H:A=A+4:GOTO120
310 REM .. PEEK(EXPR)
320 IFP=0THENRETURN
330 POKEA,133:POKEA+1,34
340 POKEA+2,134:POKEA+3,35
350 POKEA+4,162:POKEA+5,0
360 POKEA+6,160:POKEA+7,0
370 POKEA+8,177:POKEA+9,34
380 A=A+10:U=U+1:P=0:GOTO120
390 REM .. FIND
400 N=0:V=0:IFPEEK(U)<65THEN420
410 IFPEEK(U)<91THEN490
420 T=0:IFPEEK(U)=170THENU=U+1:GOTO450
430 IFPEEK(U)=171THENU=U+1:T=1
440 IFPEEK(U)<48ORPEEK(U)>57THENPRINT"**ERR
    OR AT POS";U-827;PEEK(U)
450 IFPEEK(U)>47ANDPEEK(U)<58THENN=N*10+PEE
    K(U)-48:U=U+1:GOTO450
460 IFT=0THEND=N:GOTO570
470 D=65536-N:GOTO570
480 REM .. H/L
490 V=PEEK(U):D=V
500 U=U+1:T=PEEK(U):IFT>90THEN560
510 IFT<32THEN560
520 IFT=59THEN560
530 IFT=44THEN560
540 IFT=41THEN560
550 IFT>35THEN5000
560 D=D-65:D=D+D+680
570 H%=D/256:H=H%:L=D-H*256:C=(L+1)AND255:R
    ETURN
580 REM .. READ SOURCE
590 GET#2,A1$,A2$:TI$="000000"
600 GET#2,L1$,L2$:T=ASC(L1$+Z$)+ASC(L2$+Z$)
    :IFT=0THEN1920
610 GET#2,S1$,S2$:T=ASC(S1$+Z$)+ASC(S2$+Z$)
    *256
620 S(M)=T:L(M)=A:M=M+1:PRINT"{CRSR LF}";T;
630 IFFTHENT=A-F:POKEF+1,T-2:POKEF+7,T-8:PO
    KEF+9,T-10:F=0
640 J=828:IFPEEK(653)THEN640
650 GET#2,B$:IFSTTHEN1920
660 B=ASC(B$+Z$):POKEJ,B:IFQORB<>32THENJ=J+
    1
670 IFB=34THENQ=NOTQ
680 IFB<128ORQTHENPRINTB$;
690 POKE780,B:POKE15,0
700 IFB>127ANDB<204ANDQ=0THENPOKE782,255:PO
    KE768,185:SYS42775
710 POKE768,139:IFQTHEN650
720 IFB<32THENPRINT:GOSUB770:GOTO600
730 IFB=167THENGOSUB770:GOTO640
740 IFB=58THENJ=J-1:GOSUB770:GOTO640
750 GOTO650
760 REM .. PROCESS
770 B=PEEK(828):U=829:POKEJ,0:POKEJ+1,0
780 IFB=136THEN940
790 IFB=128ORB=142ORB=144THENPOKEA,96:A=A+1
    :RETURN
800 IFB=158THEN1680
810 IFB=139THEN1040
820 IFB=153THEN1170
830 IFB=151THEN1720
840 IFB=129THEN1510
850 IFB=130THEN1650
860 IFB=143THENRETURN
870 IFB=137THENO=76:GOTO1480
880 IFB=141THENO=32:GOTO1480
```

Listing 1 continued

```
89Ø IFB<48ORB>9ØTHEN92Ø
9ØØ IFB>64THEN95Ø
91Ø IFB<58THENU=828:O=76:GOTO148Ø
92Ø PRINT"ERROR";U-827:ER=ER+1:RETURN
93Ø REM .. V=EXPR
94Ø FORI=828TO842:POKEI,PEEK(I+1):NEXT
95Ø U=828:IFPEEK(U)<65THEN92Ø
96Ø IFPEEK(U)>9ØTHEN92Ø
97Ø U=U+1:IFPEEK(U)<>178THEN92Ø
98Ø U=U+1:GOSUB1ØØ:D=PEEK(828)
99Ø GOSUB56Ø
1ØØØ POKEA,141:POKEA+1,L:POKEA+2,H
1Ø1Ø POKEA+3,142:POKEA+4,C:POKEA+5,H
1Ø2Ø A=A+6:RETURN
1Ø3Ø REM .. IF/THEN
1Ø4Ø GOSUB1ØØ:W=PEEK(U):IFW<177THEN92Ø
1Ø5Ø IFW>179THEN92Ø
1Ø6Ø POKEA+Ø,133:POKEA+1,34:POKEA+2,134:POK
    EA+3,35:A=A+4:U=U+1
1Ø7Ø IFW=179ANDPEEK(U)=177THENW=18Ø:U=U+1
1Ø8Ø IFW=177ANDPEEK(U)=179THENW=18Ø:U=U+
1Ø9Ø GOSUB1ØØ:POKEA,228:POKEA+1,35:POKEA+2,
    24Ø:POKEA+3,4:A=A+4:F=A
11ØØ POKEA+3,6:POKEA+4,197:POKEA+5,34
111Ø POKEA,24Ø:POKEA+2,2Ø8:POKEA+8,24Ø
112Ø IFW=178THENPOKEA,2Ø8:POKEA+8,2Ø8
113Ø IFW=179THENPOKEA,144:POKEA+2,176
114Ø IFW=177THENPOKEA,176:POKEA+2,144
115Ø POKEA+6,PEEK(A):A=A+1Ø:RETURN
116Ø REM .. PRINT
117Ø W=PEEK(U):IFW<32THEN145Ø
118Ø IFW=59ANDPEEK(U+1)<32THENRETURN
119Ø IFW=59THENU=U+1:GOTO117Ø
12ØØ IFW=199THEN13ØØ:REM CHR$
121Ø IFW=34THEN134Ø:REM"STRING"
122Ø REM .. PRINT EXPR
123Ø POKEA,169:POKEA+1,29:POKEA+2,32
124Ø POKEA+3,21Ø:POKEA+4,255:A=A+5
125Ø GOSUB1ØØ:POKEA,134:POKEA+1,34
126Ø POKEA+2,17Ø:POKEA+3,165:POKEA+4,34
127Ø POKEA+5,32:POKEA+6,2Ø5:POKEA+7,189
128Ø A=A+8:GOTO117Ø
129Ø REM .. PRINT CHR$(EXPR)
13ØØ U=U+1:IFPEEK(U)<>4ØTHEN92Ø
131Ø U=U+1:GOSUB1ØØ:POKEA,32:POKEA+1,21Ø
132Ø POKEA+2,255:A=A+3:U=U+1:GOTO117Ø
133Ø REM .. PRINT "STR"
134Ø D=A+1Ø:GOSUB57Ø:POKEA,169
135Ø POKEA+1,L:POKEA+2,16Ø:POKEA+3,H
136Ø POKEA+4,32:POKEA+5,3Ø:POKEA+6,171
137Ø POKEA+7,24:POKEA+8,144:POKEA+9,Ø
138Ø W=A+9:A=A+1Ø:I=Ø
139Ø I=I+1:U=U+1:IFU>912THEN143Ø
14ØØ IFPEEK(U)=34THEN143Ø
141Ø IFPEEK(U)=ØTHEN143Ø
142Ø POKEA,PEEK(U):A=A+1:GOTO139Ø
143Ø POKEW,I:POKEA,Ø:A=A+1
144Ø U=U+1:GOTO117Ø
145Ø POKEA,169:POKEA+1,13:POKEA+2,32
146Ø POKEA+3,21Ø:POKEA+4,255:A=A+5:RETURN
147Ø REM .. GOSUB/GOTO
148Ø POKEA,O:POKEA+1,Ø:POKEA+2,Ø:GOSUB4ØØ
149Ø R=R+1:N(R)=N:A(R)=A:A=A+3:RETURN
15ØØ REM .. FOR
151Ø U=831:GOSUB1ØØ
152Ø LP=A:POKEA,76:A=A+3
153Ø HU=U:U=829:GOSUB4Ø:U=HU+1
154Ø POKEA,133:POKEA+1,34:POKEA+2,134:POKEA
    +3,35:A=A+4
155Ø HF=F:W=177:GOSUB19Ø:F=HF
156Ø POKEA-1,3:POKEA-3,2:POKEA-9,11
157Ø POKEA-2,176:POKEA-4,24Ø
158Ø XA=A:POKEA,76:A=A+3
159Ø IFPEEK(U)<>169THENPOKEA,169:POKEA+1,1:
    POKEA+2,162:POKEA+3,Ø:A=A+4:GOTO161Ø
16ØØ U=U+1:GOSUB1ØØ
161Ø U=828:B=17Ø:GOSUB15Ø
162Ø D=A:GOSUB57Ø:POKELP+1,L:POKELP+2,H
163Ø D=PEEK(829):GOSUB99Ø:RETURN
164Ø REM .. NEXT
165Ø D=LP+3:GOSUB57Ø:POKEA,76:POKEA+1,L:POK
    EA+2,H:A=A+3:D=A:GOSUB57Ø
166Ø POKEXA+1,L:POKEXA+2,H:RETURN
167Ø REM .. SYS
168Ø GOSUB1ØØ:POKEA,133:POKEA+1,2Ø
169Ø POKEA+2,134:POKEA+3,21
17ØØ POKEA+4,32:POKEA+5,54:POKEA+6,225:A=A+
    7:RETURN
171Ø REM .. POKE
172Ø GOSUB1ØØ:POKEA,133:POKEA+1,34
173Ø POKEA+2,134:POKEA+3,35:A=A+4
174Ø IFPEEK(U)<>44THEN92Ø
175Ø U=U+1:GOSUB1ØØ:POKEA,16Ø:POKEA+1,Ø
176Ø POKEA+2,145:POKEA+3,34:A=A+4:RETURN
177Ø REM .. INIT
178Ø DIMN(63),A(63),S(255),L(255),T$(75)
179Ø A=Ø:B=Ø:U=Ø:I=Ø:J=Ø:K=Ø:V=Ø:D=Ø
18ØØ C=Ø:H=Ø:L=Ø:W=Ø
181Ø POKE53281,Ø:POKE5328Ø,Ø:POKE646,15
182Ø S$="TEST.FOR":S=49152:Z$=CHR$(Ø)
183Ø INPUT"SOURCE NAME";S$
184Ø RESTORE:IFS$="*"THENEND
185Ø INPUT"STARTING ADDRESS";S:A=S+6
186Ø D=A:GOSUB57Ø:POKES,76:POKES+1,L:POKES+
    2,H
187Ø POKES+3,76:POKES+4,116:POKES+5,164
188Ø OPEN15,8,15:OPEN2,8,2,"Ø:"+S$
189Ø INPUT#15,E1,E2$,E3,E4:IFE1=ØTHENRETURN
19ØØ PRINTE1;E2$;E3;E4
191Ø REM .. FINISH
192Ø CLOSE2:CLOSE15
193Ø IFR=ØTHEN198Ø
194Ø FORI=1TOR:N=N(I):W=A(I):D=Ø
195Ø FORT=ØTOM:IFS(T)=NTHEND=L(T):T=M
196Ø NEXTT:GOSUB57Ø:POKEW+1,L
197Ø POKEW+2,H:NEXTI
198Ø IFG=ØTHEN2Ø3Ø
199Ø D=A:GOSUB57Ø:POKES+4,L:POKES+5,H
2ØØØ READD:IFD<ØTHEN2Ø3Ø
2Ø1Ø POKEA,D:A=A+1
2Ø2Ø GOTO2ØØØ
2Ø3Ø POKEA,Ø:E=A+1
2Ø4Ø PRINT"ERRORS";ER
2Ø5Ø PRINT"ADDRESS RANGE";S;"{CRSR LF}";E*-
    1
2Ø6Ø PRINTS$;" COMPILED, TIME:";TI$
2Ø7Ø PRINT"1-SAVE 2=EXEC 3=COMP 4=QUIT":POK
    E198,Ø
2Ø8Ø GETX$:IFX$="1"THEN217Ø
2Ø9Ø IFX$="2"THEN214Ø
21ØØ IFX$="3"THENGOSUB182Ø:GOTO59Ø
211Ø IFX$="4"THENEND
213Ø GOTO2Ø8Ø
214Ø FORI=68ØTO731:POKEI,Ø:NEXT
215Ø SYSS:GOTO2Ø7Ø
216Ø REM .. SAVE
217Ø N$=S$+".ML":INPUT"{CRSR DN}NAME";N$
218Ø OPEN15,8,15,"SØ:"+N$:CLOSE15:T$=N$
219Ø D=PEEK(53)+PEEK(54)*256-LEN(T$)
22ØØ POKE782,D/256:POKE781,D-PEEK(782)*256:
    POKE78Ø,LEN(T$):SYS65469:POKE78Ø,1
```


→

Listing 1 continued

```
221Ø POKE781,8:POKE782,1:SYS65466
222Ø POKE254,S/256:POKE253,S-PEEK(254)*256:
     POKE78Ø,253:POKE782,E/256
223Ø POKE781,E-PEEK(782)*256:SYS65496
224Ø IF(PEEK(783)AND1)OR(ST AND191)THENPRIN
     T"DISK ERROR"
225Ø GOTO2Ø7Ø
226Ø REM .. MUL/DIV DATA
227Ø DATA133,99,134,1ØØ,162,Ø,134,1Ø1
228Ø DATA134,1Ø2,16Ø,16,144,34,6,97
229Ø DATA38,98,38,1Ø1,38,1Ø2,56,165
23ØØ DATA1Ø1,229,99,17Ø,165,1Ø2,229,1ØØ
231Ø DATA144,6,134,1Ø1,133,1Ø2,23Ø,97
232Ø DATA136,2Ø8,227,165,97,166,98,96
233Ø DATA7Ø,1Ø2,1Ø2,1Ø1,1Ø2,98,1Ø2,97
234Ø DATA136,48,24Ø,144,243,24,165,1Ø1
235Ø DATA1Ø1,99,133,1Ø1,165,1Ø2,1Ø1,1ØØ
236Ø DATA133,1Ø2,24,144,227,-1
```

Listing 2. *TEST.COMP program.*

```
5 REM TEST COMPILER
1Ø B=1332Ø*4:POKE53281,7:POKE646,6
2Ø PRINT"{SHFT CLR}TEST.COMP"
3Ø POKE781,1Ø:POKE782,1Ø:POKE783,Ø
4Ø SYS6552Ø:PRINT"TEST"
5Ø FORI=1TO5STEP1
6Ø PRINTI:NEXT
7Ø K=PEEK(197):IFK=64THEN7Ø
8Ø IFK=3THENEND:REM F7
9Ø X=PEEK(653)
1ØØ A=K+6Ø354
11Ø IFX=ØTHENA=A-65
12Ø C=PEEK(A):PRINTCHR$(C);
13Ø IFC=65THENGOSUB18Ø
14Ø IFC<65THENPRINTCHR$(6Ø);
15Ø IFC>65THENPRINTCHR$(62);
16Ø IFC<>65THENPOKEB,2
17Ø PRINTCHR$(65):GOTO7Ø
18Ø PRINTCHR$(61);
19Ø POKEB,5
2ØØ RETURN
```

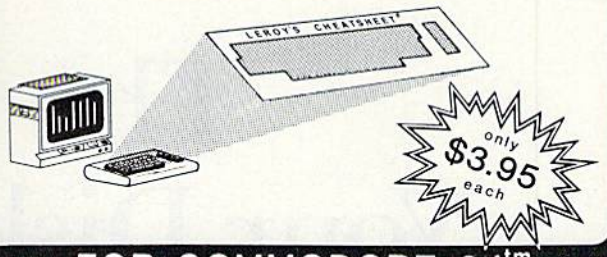
Listing 3. *Colors program.*

```
1Ø REM COLORS DEMO
2Ø GOSUB18Ø:GOTO6Ø
3Ø A=A+V:IFA<1Ø24THENA=A+1ØØ1
4Ø IFA>2Ø23THENA=A-1ØØ1
5Ø POKEA,K:POKEA+D,C:RETURN
6Ø J=J+2:V=Ø-4Ø:GOSUB3Ø
7Ø V=Ø-1:FORI=1TOJ-1STEP1:GOSUB3Ø:NEXT
8Ø V=4Ø:FORI=1TOJ:GOSUB3Ø:NEXT
9Ø V=1:FORI=1TOJ:GOSUB3Ø:NEXT
1ØØ V=Ø-4Ø:FORI=1TOJ:GOSUB3Ø:NEXT
11Ø R=PEEK(56324)+R+A
12Ø IFR>32767THENR=R-32767
13Ø P=RAND7:K=PEEK(828+P)
14Ø C=RAND15:IFC=ØTHENC=7
15Ø IFJ>7THENA=A-199:J=Ø-1
17Ø GOTO6Ø
18Ø POKE5328Ø,Ø:POKE53281,Ø:K=16Ø
19Ø PRINTCHR$(147);:A=1524:D=54272:C=1
2ØØ POKE828,23Ø:POKE829,1Ø2:POKE83Ø,94
21Ø POKE831,95:POKE832,222:POKE833,233
22Ø POKE834,1Ø5:POKE835,16Ø:J=Ø-1
23Ø PRINTCHR$(14);:RETURN
```


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The Key to Your Disk Directory

By ROBIN FRANZEL

Have you ever been running a database program and forgotten a filename when prompted for it? You probably had to perform a number of inconvenient procedures (such as interrupting your program to enter "@$") in order to determine the filename. The accompanying machine language Disk Directory program enables you to display the disk directory simply by pressing a function key, even while your program is running.

Type in and run the Basic Loader program (Listing 1). When you press the f3 key, the directory will appear on the screen in two columns. To return to your previous display, press any key. This will work even when you are executing a Basic or machine language program.

Pressing the run/stop and restore keys will disable the directory utility; to re-enable it, simply enter SYS 49408.

If you want to list the directory using a key other than f3, just Poke in the appropriate key code for location 197. For example, to make the f7 key list the directory, enter POKE 49444,3.

I wanted a program that would use little memory, execute quickly and reside in memory with both the DOS wedge and the Screen Dump utility. (See "Print Your Screen," *RUN*, December 1984.) This program meets all those standards. It works with any program except those that use the same memory space, which is $C100 to $C3DA (49408 to 50138).

With this handy utility, accessing your disk directory is only a function key away, even while your program is running.

It will even work with machine language monitors resident! (No more Formula-too-complex errors.) The program does not require any dedicated memory area outside the boundaries of the program itself, because all zero-page locations are saved and then restored at the end of the directory listing.

How It Works

The program flow is as follows. First, the IRQ vector jump address is changed so that the Disk Directory program checks for the f3 key 60 times a second. If the f3 key is pressed, the first four pages (256-byte segments) of Basic program memory are copied under Basic ROM (location 40960), so no program memory is wasted.

Next, the disk directory file is read in, and the filenames are converted from PET ASCII to the screen Poke codes and then placed in RAM. The screen location is changed (using the screen-swapping technique) to the directory's location, and the directory is instantly displayed!

Now, when you press any other key, the screen is flipped back to your previous display, and Basic ROM is switched out so that the Basic program can be copied back to the proper location. Then the directory routine jumps to the interrupt exit, and all memory is restored.

If you would like the assembly language source listing and a more technical explanation of how the program works, send me a long self-addressed stamped envelope (two stamps should cover it), and I'll send them to you. I'll also be glad to answer any questions you may have about this program as long as you include a stamped, self-addressed envelope.

If you don't want to type in this program, I'll send you a copy if you send me a disk in a self-addressed stamped mailer and $3 to cover my costs.

I keep the Disk Directory program in my computer just about all the time it's turned on! The more you use this program, the more you'll wonder how you ever managed without it. Have fun! R

Address all author correspondence to Robin Franzel, 5521 Harvey Lane, Alexandria, VA 22312.

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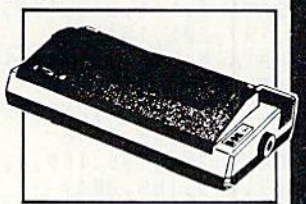
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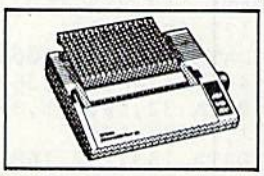
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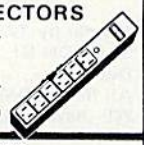
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Listing 1. *Basic Loader for Disk Directory program.*

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   41,212,1413
20 DATA 195,169,33,141,20,3,169,193,141,21,
   3,169,1257
30 DATA 0,141,213,195,141,216,195,88,96,165
   ,197,201,1848
40 DATA 5,208,5,173,213,195,240,3,108,211,1
   95,169,1725
50 DATA 255,141,213,195,56,32,240,255,142,2
   14,195,140,2078
60 DATA 215,195,169,1,133,204,165,251,141,2
   07,195,165,2041
70 DATA 252,141,208,195,165,253,141,209,195
   ,165,254,141,2319
80 DATA 210,195,169,0,133,251,169,8,133,252
   ,169,0,1689
90 DATA 133,253,169,160,133,254,160,0,162,4
   ,177,251,1856
100 DATA 145,253,200,208,249,230,252,230,25
   4,202,208,242,2673
110 DATA 32,90,195,32,135,194,169,52,133,25
   1,169,8,1460
120 DATA 133,252,169,36,141,139,195,162,139
   ,160,195,169,1890
130 DATA 1,32,189,255,169,14,160,96,162,8,3
   2,186,1304
140 DATA 255,32,192,255,169,8,32,180,255,16
   9,96,32,1675
150 DATA 150,255,230,199,160,0,132,144,32,1
   65,255,166,1888
160 DATA 144,208,74,201,34,208,241,32,165,2
   55,166,144,1872
170 DATA 208,63,201,34,240,5,32,52,195,208,
   240,165,1643
180 DATA 199,240,8,198,199,169,122,133,251,
   208,213,24,1964
190 DATA 169,20,101,251,133,251,144,2,230,2
   52,165,251,1969
200 DATA 201,154,208,196,165,252,201,11,208
   ,190,32,234,2052
210 DATA 194,32,108,194,32,90,195,169,42,13
   3,251,169,1609
220 DATA 8,133,252,208,171,169,14,32,195,25
   5,32,171,1640
230 DATA 255,32,161,194,32,135,194,32,234,1
   94,32,108,1603
240 DATA 194,169,54,133,1,169,0,133,251,169
   ,8,133,1414
250 DATA 252,169,0,133,253,169,160,133,254,
   160,0,162,1845
260 DATA 4,177,253,145,251,200,208,249,230,
   252,230,254,2453
270 DATA 202,208,242,169,55,133,1,173,207,1
   95,133,251,1969
280 DATA 173,208,195,133,252,173,209,195,13
   3,253,173,210,2307
290 DATA 195,133,254,32,15,195,169,0,133,20
   4,174,214,1718
300 DATA 195,172,215,195,24,32,240,255,169,
   0,141,213,1851
310 DATA 195,76,188,254,162,24,160,0,24,32,
   240,255,1610
```

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    ,2ØØ,2Ø8,18Ø6
33Ø DATA 245,32,228,255,24Ø,251,96,173,134,
    2,16Ø,Ø,1816
34Ø DATA 153,Ø,216,153,Ø,217,153,Ø,218,136,
    2Ø8,244,1698
35Ø DATA 16Ø,232,153,255,218,136,2Ø8,25Ø,96
    ,169,8,32,1917
36Ø DATA 18Ø,255,169,111,32,15Ø,255,16Ø,Ø,3
    2,165,255,1764
37Ø DATA 153,139,195,2ØØ,192,4Ø,24Ø,4,2Ø1,1
    3,2Ø8,241,1826
38Ø DATA 169,Ø,153,139,195,16Ø,Ø,185,139,19
    5,2Ø1,5Ø,1586
39Ø DATA 144,28,173,216,195,2Ø8,3,32,234,19
    4,16Ø,Ø,1587
4ØØ DATA 162,Ø,24,32,24Ø,255,185,139,195,32
    ,21Ø,255,1729
41Ø DATA 2ØØ,185,139,195,2Ø8,247,32,171,255
    ,96,173,216,2117
42Ø DATA 195,2Ø8,31,169,255,141,216,195,16Ø
    ,25,185,217,1997
43Ø DATA Ø,153,18Ø,195,136,16,247,173,24,2Ø
    8,41,15,1388
44Ø DATA 9,32,141,24,2Ø8,169,8,141,136,2,96
    ,173,1139
45Ø DATA 216,195,24Ø,31,169,Ø,141,216,195,1
    6Ø,25,185,1773
46Ø DATA 18Ø,195,153,217,Ø,136,16,247,173,2
    4,2Ø8,41,159Ø
47Ø DATA 15,9,16,141,24,2Ø8,169,4,141,136,2
    ,96,961
48Ø DATA 41,127,2Ø1,64,144,1Ø,2Ø1,97,176,4,
    41,191,1297
49Ø DATA 144,2,41,223,141,217,195,165,199,2
    4Ø,8,173,1748
5ØØ DATA 217,195,9,128,141,217,195,173,217,
    195,145,251,2Ø83
51Ø DATA 2ØØ,96,169,32,16Ø,Ø,153,Ø,8,153,Ø,
    9,98Ø
52Ø DATA 153,Ø,1Ø,136,2Ø8,244,16Ø,232,153,2
    55,1Ø,136,1697
53Ø DATA 2Ø8,25Ø,96,72,73,84,32,65,78,89,32
    ,75,1154
54Ø DATA 69,89,32,84,79,32,67,79,78,84,73,7
    8,844
55Ø DATA 85,69,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,154
1ØØØ SA=494Ø8:BE=SA:L=1Ø:NL=55
1Ø1Ø PRINT"LOADING...":PRINT
1Ø2Ø FORI=1TONL:CS=Ø
1Ø3Ø FORJ=ØTO11:READK:IFK>255THEN11ØØ
1Ø4Ø POKESA+J,K:CS=CS+K:NEXT
1Ø5Ø READLT:IFLT<>CSTHEN11ØØ
1Ø6Ø SA=SA+12:L=L+1Ø:NEXT
1Ø7Ø PRINTCHR$(17)SPC(6)"COMMODORE 64 DISK
    DIRECTORY"
1Ø8Ø PRINTCHR$(17)SPC(12)"BY ROBIN FRANZEL"
1Ø9Ø SYSBE:NEW
11ØØ PRINT"ERROR IN DATA STATEMENT #";L
```


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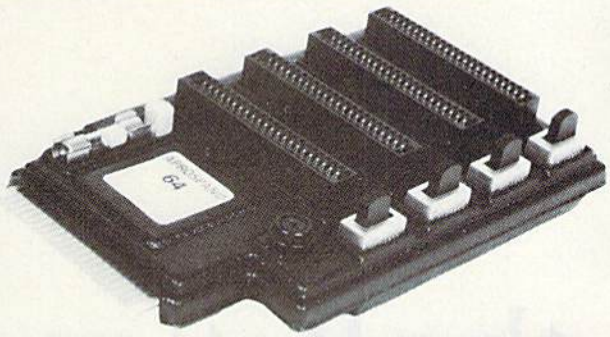
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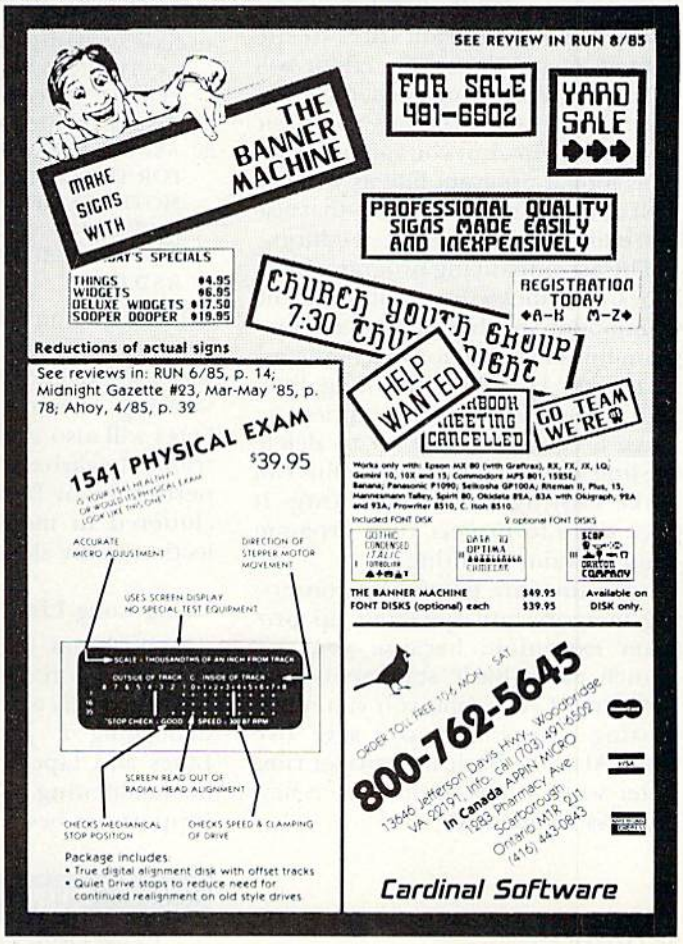
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The Longer, the Better

Here's a line editor that shows you how to save time and memory by circumventing the screen editor and creating program lines up to 255 characters long.

By RONNY ONG

The C-64's built-in screen editor offers simplicity and convenience in programming, but it has a definite shortcoming. While CBM Basic actually allows program lines of unlimited length, the screen editor will not accept more than 80 characters at once. Using abbreviations for Basic keywords helps, but you can never get in as long a program line as you can with some other computers that use line editors instead of screen editors.

The accompanying program, Long Lines, provides a line editor for the Commodore 64 that allows Basic program lines to be up to 255 characters in length. However, the long lines you create cannot be modified; to make a change, you have to delete the line and reenter it. While this can make editing time-consuming, it does serve to protect your program from unwanted editing.

Long lines are helpful for conserving memory and speeding up program execution, because you can crunch more Basic statements into each line. Every time you can avoid starting a new line, you save five bytes. Also, the Basic interpreter runs faster when it has to move to a new line less frequently.

Long lines also come in handy when you want to set a string variable equal to a long string. Normally, you would have to do something like this:

```
10 A$="WE THE PEOPLE OF THE UNITED
   STATES, IN ORDER TO FORM A MORE
   PERFECT UNION, ESTABLISH JUSTICE,
   INSURE DOMESTIC "
20 A$=A$+"TRANQUILITY, PROVIDE
   FOR THE COMMON DEFENSE, PRO
   MOTE THE GENERAL WELFARE, AND
   SECURE THE BLESSINGS OF "
30 A$=A$+"LIBERTY TO OURSELVES
   AND OUR"
```

Lines 20 and 30 waste 26 bytes of program storage space, and, when they are executed, waste 320 bytes of working string space. Those 320 bytes will also stick around and contribute to garbage collection, a chore performed by Basic when strings get cluttered in memory. Garbage collection really slows things down.

Using Long Lines

Long Lines is easy to use and is convenient on a disk-based 64. Long Lines is really an editor/compiler, so debugging a program with Long Lines and tape input/output would be maddening. Consequently, tape support has been omitted, but Long Lines will still run on a tape-based system. Just be sure that any programs entered with it are bug-free!

Before you load and run Long Lines, enter:

```
POKE7168,0:POKE44,28:NEW
```

If you do not include the above line, it will be displayed when you run the program. Once you press the return key, you'll lose the program and have to reload it.

Long Lines prompts for a line or a command with an inverse greater-than symbol. Basically, entry of program lines works as it does with the screen editor. Valid line numbers range from 0 to 63999. Entering a line number without any data deletes any former line with the same number. Entering a line numbered the same as one already in memory replaces the one in memory.

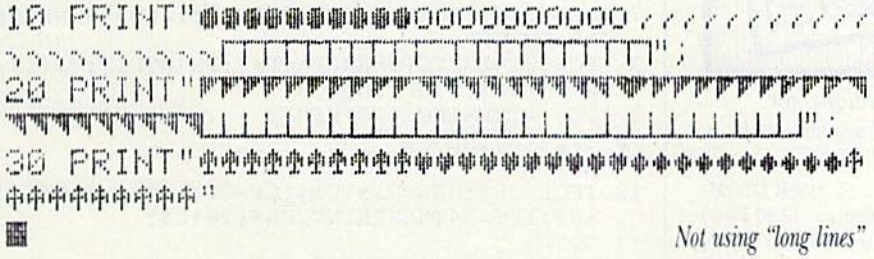
Long Lines does not recognize abbreviations for Basic keywords or keywords added to Basic by a programmer's aid, or wedge. The Quote mode does not exist in the Long Lines editor; use CHR$ instead. All of the graphics characters except the shifted space, CHR$(160), are accessible directly from the keyboard.

RUN It Right

C-64; C-128 (in C-64 mode); disk drive



Using "long lines"



Not using "long lines"

Four Commands

Commands available in Long Lines are Done, List, Save and Load. The Done command ends Long Lines and converts the entered data into a Basic program. If there is no problem with the conversion, Long Lines will be deleted, and your program will return to Basic and be stored in memory.

The conversion may take a while if the program is particularly lengthy. Long Lines keeps you informed of what it is doing during the conversion process.

If it stops with an error message, the Long Lines program has a typo in it. Enter GOTO25 to get back into the editor to save your program before correcting Long Lines. Save Filename. This will be saved as a sequential file.

If the conversion reports a Buffer Overflow error and returns to the editor, there is not enough memory available to convert your program. This should never happen unless your program has a lot of lines that approach the maximum length of 255, or a lot of Data statements and remarks.

The List command displays all the lines in memory. When followed by a line number, it displays that line in memory. Note that the List command in Long Lines does not provide for listing a range of lines as it does in Basic. Also, since the lines are stored in the order of their entry, line 20 may appear before line 10 in a complete list. When the lines are converted by the Done command, line 10 will come before line 20.

For debugging purposes, the Save and Load commands allow you to save your program in text form, its original condition before being converted by Done. The Long Lines' Save and Load commands follow this format:

```
SAVE FILENAME
LOAD FILENAME
```

Don't include the comma 8 after the filename.

Program development with Long Lines consists mainly of typing in the program, saving it in Basic, converting it, testing it, reloading the Basic into Long Lines and correcting errors. The Basic program is for loading into Long Lines only. After Long Lines has done its job, saving and loading the converted Basic program is done in Basic with Basic's own Save and Load commands, which will work for tape or disk. Long Line's Save and Load commands work for disk only.

If you insist on optimum CBM Basic 2.0 and don't need a screen editor, Long Lines may be helpful for you. Long program lines usually violate rules of structured programming, and Commodore's screen editor is better for editing and fixing mistakes, but Long Lines protects your programs from modification and saves you memory and time. R

Address all author correspondence to Ronny Ong, 2301 Avonhill Drive, Arlington, TX 76015.

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Listing 1. *Long Lines program.*

```
1 RUN14
2 T$(.)="":CP=.:CS=.
3 CT=.:CS=NOTCS:PRINTCHR$(32-143*CS)"{CRSR
  LF}";
4 GETC$:IFC$>""THEN7
5 CT=CT+1:IFCT=9THEN3
6 GOTO4
7 C=ASC(C$):PRINT" {CRSR LF}";:IFC=13THENPR
  INT:RETURN
8 IFC=2ØTHENIFCPTHENCP=CP-1:PRINTC$;:T$(.)=
  LEFT$(T$(.),CP):GOTO3
9 IFC>31THENIFC<128THEN12
1Ø IFC>16ØTHEN12
11 GOTO3
12 IFCP<255THENPRINTC$;:CP=CP+1:T$(.)=T$(.)
  +C$:IFC=34THENPRINTCHR$(2Ø)C$;
13 GOTO3
14 IFPEEK(44)=28THEN17
15 PRINT"{SHFT CLR}RESERVE MEMORY FIRST!":P
  RINT"{2 CRSR DNs}POKE7168,.:POKE44,28:NE
  W":PRINT"{3 CRSR UPs}";
16 NEW
17 N=1ØØ:DIMT$(N),B$(75):FORI=.TO75:READB$(
  I):NEXT:X=1
18 DATAEND,FOR,NEXT,DATA,INPUT#,INPUT,DIM,R
  EAD,LET,GOTO,RUN,IF,RESTORE,GOSUB
19 DATARETURN,REM,STOP,ON,WAIT,LOAD,SAVE,VE
  RIFY,DEF,POKE,PRINT#,PRINT,CONT,LIST
2Ø DATACLR,CMD,SYS,OPEN,CLOSE,GET,NEW,TAB(,
  TO,FN,SPC(,THEN,NOT,STEP,+,-,*,/,{UP ARR
  OW}
21 DATAAND,OR,>,=,<,SGN,INT,ABS,USR,FRE,POS
  ,SQR,RND,LOG,EXP,COS,SIN,TAN,ATN
22 DATAPEEK,LEN,STR$,VAL,ASC,CHR$,LEFT$,RIG
  HT$,MID$,GO
23 PRINT"{SHFT CLR}{2 SPACEs}C-64 LONG LINE
  S{3 SPACEs}(C) 1984 RONNY ONG"
24 PRINTTAB(9)"***"N"LINES FREE ***":PRINT
25 PRINT"{CTRL 9}>{CTRL Ø}";:GOSUB2
26 IFLEFT$(T$(.),1)=" "THENT$(.)=MID$(T$(.)
  ,2):GOTO26
27 IFT$(.)=""THEN25
28 A$=LEFT$(T$(.),4):IFA$="DONE"THEN 74
29 IFA$="LIST"THEN46
3Ø IFA$="SAVE"THEN51
31 IFA$="LOAD"THEN56
32 IFASC(A$)<48ORASC(A$)>57THENPRINT"ILLEGA
  L COMMAND":GOTO25
33 K=.:L=.:IFVAL(T$(.))>63999THENPRINT"ILLE
  GAL LINE NUMBER":GOTO25
34 GOSUB81:IFA$>"/"THENIFA$<":"THEN34
35 A$=MID$(T$(.),K):GOSUB72
36 IFX=1THEN4Ø
37 J=.:FORI=1TOX-1:IFVAL(T$(.))=VAL(T$(I))T
  HENJ=I
38 NEXT:IFJTHEN42
39 IFA$=""THEN25
4Ø IFX>NTHENPRINT"FULL":GOTO25
41 T$(X)=T$(.):X=X+1:GOTO25
42 IFA$=""THEN44
43 T$(J)=T$(.):PRINTVAL(T$(.))"REPLACED":GO
  TO25
44 IFJ=X-1THENX=X-1:GOTO25
45 FORI=JTOX-2:T$(I)=T$(I+1):NEXT:X=X-1:GOT
  O25
```

→

Listing 1 continued.

```
46 IFX=1THENPRINT"EMPTY":GOTO25
47 A$=MID$(T$(.),5):IFA$=""THENI=1:J=X-1:GO
   TO5Ø
48 J=VAL(A$):K=.:FORI=1TOX-1:IFVAL(T$(I))=J
   THENK=I
49 NEXT:I=K:J=K:IFK=.THENPRINT"LINE NOT FOU
   ND":GOTO25
5Ø FORL=ITOJ:PRINTT$(L):FORK=.TO(J-I)*9:NEX
   T:NEXT:GOTO25
51 IFX=1THENPRINT"EMPTY":GOTO25
52 GOSUB71:IFA$=""THENA$="NO NAME"
53 PRINT"OPENING FILE...":OPEN15,8,15:OPEN2
   ,8,2,"@Ø:"+A$+",S,W":GOSUB64
54 PRINT"WRITING DATA...":PRINT#2,X:PRINT"S
   AVING TEXT...":FORI=1TOX-1
55 PRINT#2,T$(I):GOSUB64:NEXT:CLOSE2:CLOSE1
   5:GOTO25
56 GOSUB71:IFA$=""THENA$="NO NAME"
57 PRINT"OPENING FILE...":OPEN15,8,15:OPEN2
   ,8,2,"Ø:"+A$+",S,R":GOSUB64
58 PRINT"READING DATA...":INPUT#2,A$:GOSUB6
   4:X=VAL(A$)
59 IFX<1ORX>NTHENPRINT"BAD FILE...LOAD ABOR
   TED":GOTO7Ø
6Ø FORI=1TOX-1:T$(I)=""
61 GET#2,A$:IFA$=CHR$(13)THEN63
62 T$(I)=T$(I)+A$:GOTO61
63 GOSUB64:NEXT:CLOSE2:CLOSE15:PRINTX"LINES
    LOADED":GOTO25
64 INPUT#15,E1,E$,E2,E3:IFE1<2ØTHENRETURN
65 PRINTE1;E$;E2;E3:PRINT"1) CONTINUE":PRIN
   T"2) ABORT TO EDITOR"
66 PRINT"3) ABORT TO BASIC":POKE198,.
67 GETA$:IFA$<"1"ORA$>"3"THEN67
68 IFA$="1"THENRETURN
69 IFA$="2"THEN25
7Ø PRINT"WARNING:FILES ARE OPEN!":STOP
71 A$=MID$(T$(.),5)
72 IFLEFT$(A$,1)=" "THENA$=MID$(A$,2):GOTO7
   2
73 RETURN
74 X=X-1:K=1:PRINT"SORTING..."
75 K=2*K:IFK<XTHEN75
76 K=INT((K-1)/2):IFK=ØTHEN84
77 FORI=1TOX-K:J=I
78 L=J+K
79 IFVAL(T$(L))<VAL(T$(J))THENA$=T$(J):T$(J
   )=T$(L):T$(L)=A$:J=J-K:IFJ>ØTHEN78
8Ø NEXT:GOTO76
81 K=K+1
82 A$=MID$(T$(L),K,1):IFA$=" "THEN81
83 RETURN
84 FORL=1TOX:I=VAL(T$(L)):PRINT"TOKENIZING
   LINE"I:K=.
85 GOSUB81:IFA$<"Ø"ORA$>"9"THEN87
86 GOTO85
87 J=INT(I/256):T$(L)=CHR$(I-J*256)+CHR$(J)
   +MID$(T$(L),K):K=2
88 GOSUB81:IFA$=""THEN1Ø5
89 IFA$<>CHR$(34)THEN93
9Ø GOSUB81:IFA$=CHR$(34)THEN88
91 IFA$=""THEN1Ø5
92 GOTO9Ø
93 J=99:FORI=75TO.STEP-1:IFB$(I)=MID$(T$(L)
   ,K,LEN(B$(I)))THENJ=I
94 NEXT:IFJ=99THEN88
95 T$(L)=LEFT$(T$(L),K-1)+CHR$(J+128)+MID$(
   T$(L),K+LEN(B$(J)))
96 IFJ=15THEN1Ø5
97 IFJ<>3THEN88
98 GOSUB81:IFA$=""THEN1Ø5
99 IFA$<>CHR$(34)THEN1Ø3
1ØØ GOSUB81:IFA$=CHR$(34)THEN98
1Ø1 IFA$=""THEN1Ø5
1Ø2 GOTO1ØØ
1Ø3 IFA$=":"THEN88
1Ø4 GOTO98
1Ø5 NEXT:PRINT"LOADING...":K=2Ø49:FORL=1TOX
   :I=K+LEN(T$(L))+3:J=INT(I/256)
1Ø6 POKEK,I-J*256:K=K+1:POKEK,J:FORJ=1TOLEN
   (T$(L)):K=K+1
1Ø7 IFK>716ØTHENPRINT"BUFFER OVERFLOW":GOTO
   25
1Ø8 POKEK,ASC(MID$(T$(L),J,1)):NEXT:POKEK+1
   ,.:K=K+2:IFK<>ITHENPRINT"ERROR":STOP
1Ø9 NEXT:POKEK,.:POKEK+1,.:K=K+2:J=INT(K/25
   6):I=K-J*256
11Ø PRINT"{SHFT CLR}{2 CRSR DNs}POKE44,8:PO
   KE45,"I":POKE46,"J":CLR:PRINTCHR$(147);
   {HOME}";
111 POKE631,13:POKE198,1:END
```


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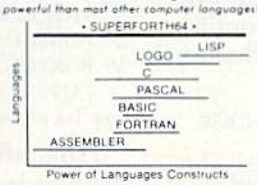
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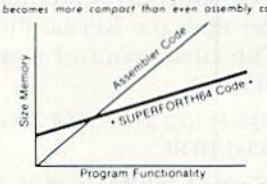
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C-64 Screen Formatter

Did you know there are seven different methods of formatting your Commodore 64's screen? Discover what's fastest, easiest or best for you.

By JAMES G. COOPER

The Commodore 64 supports seven different methods of screen formatting. The data you want to display can be cursor-controlled (up, down, left and right); it can be manipulated by the Tab or Space command; it can be directed by two different methods of Poke printing; it can be commanded by the Kernal Plot routine; and it can be read and Poked onto the screen one character at a time.

For those of you who are not experienced programmers, this wide variety of choice often leads to perplexing dilemmas. This short tutorial, along with the accompanying program (Printing Benchmark test program), points out the advantages and disadvantages of each of the various methods of screen formatting.

Cursor Controls (57 Jiffies)

Using cursor controls embedded within the quotation marks of Print statements is the fastest method of getting data onto the screen. In the Printing Benchmark test program, the cursor-control method was even faster than the Kernal Plot routine.

The cursor-control method works as follows.

```
10 PRINT"{CLR}{5 CRSR DNs}{5 CRSR
   RTs} HERE"
```

The word HERE begins printing at screen memory location 1229. The formula for determining cursor screen position is:

(1024 (screen home) or XXXX (current cursor location) whichever is greatest) + (number of CRSR RTs) + (number of CRSR DNs * 40) − (number of CRSR LFs) − (number of CRSR UPs * 40) = current cursor location.

This, and all of the following screen-formatting methods, requires that you take care to keep all cursor counts between screen memory locations 1024 and 2023. Failure to do so will probably result in a crash.

The major disadvantage of the cursor-control method of screen formatting is the lack of program readability. Debugging and deciphering your own program, let alone someone else's, are the kinds of tasks that keep aspirin manufacturers in business.

Kernal Plot Routine (109 Jiffies)

The Kernal Plot routine is a machine language subroutine that is a part of the 64's ROM. It can easily be called by setting up the following lines.

```
10 PRINT"{CLR}":CU = 679:FORA =
   0TO8:READB
20 POKECU + A,B:NEXT:GOTO40
30 POKECU + 3,X:POKECU + 1,Y:SYS
   CU:RETURN
999 DATA162,0,160,0,24,32,240,255
```

From this point on, screen formatting is a snap. X represents columns 0–39; Y represents rows 0–24. Printing HERE, beginning at screen memory location 1229, can now be accomplished as follows.

```
40 X = 5:Y = 5:GOSUB30:PRINT"HERE"
```

The formula for screen formatting, using the Kernal Plot routine, is

(1024(screen home)) + (number of X's (horizontal location)) + (number of Y's * 40 (vertical location)).

Because the speed of the Kernal Plot routine approximates that of the cursor-control method, and because it is much more readable, the Kernal Plot routine would be a preferred method of screen formatting.

Poke Printing #1 (110 Jiffies)

This method of screen formatting relies on memory locations 211 and 214 for cursor data and performs in much the same way as the Kernal Plot routine.

X (column) is Poked into location 211, and Y (row) is Poked into location 214. Printing HERE at screen memory location 1229 can be accomplished as follows:

```
10 PRINT"{CLR}":GOTO40
20 PRINT"{HOME}";:IFY< >0THENPOKE
   214,Y − 1:PRINT
30 POKE211,X:RETURN
```

The Print command immediately following POKE214,Y brings up the cursor location you call out:

```
40 X = 5:Y = 5:GOSUB30:PRINT"HERE"
```

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The formula for screen formatting is the same as that used by the Kernal Plot routine.

As this method of screen formatting takes only two more seconds than the Kernal Plot routine to run 1000 repetitions, it, too, would be preferable to the cursor-control method.

Poke Printing #2 (118 Jiffies)

Memory locations 209 and 210 are the key to this method of screen formatting. X again represents the cursor's horizontal position and Y its vertical position. But a warning is in order! A non-standard memory map must be used for Poking X and Y (see Table 1).

The following program lines set up this method:

```
10 PRINT"{CLR}":GOTO30
20 PRINT"{HOME}":POKE209,PEEK(209)
   +X:POKE210,PEEK(20)+Y:RETURN
```

Now, for our familiar HERE at screen memory 1229, the following line is used.

```
30 X=165:Y=0:GOSUB20:PRINT"HERE"
```

The saving grace for this method of screen formatting is that the screen is rock steady, regardless of where the Print statement begins, even if screen memory 2023 is Poked. This method of screen formatting is only recommended, and then with hesitation, when a non-scrolling screen is mandatory.

Tab and Space (253 Jiffies)

Speedwise, the Tab and Space commands do not fare very well. Their execution time is nearly five times that of cursor controls. But don't count them out! These commands can easily be admixed with others, and they lend themselves to program manipulation.

Formatting HERE is quite easy. Either of the following commands can be used:

```
10 PRINT"{CLR}";TAB(205)"HERE"
10 PRINT"{CLR}";SPC(205)"HERE"
```

The essential difference between the Tab command and the Space command is that Tab counts from the beginning of the current line, while Space counts from the current cursor location. Either command can be incremented by up to 255 counts.

Read and Poke (508 Jiffies)

Generally speaking, this is a lousy method to use for screen formatting.

SCREEN	X	Y
1024	−40	0
1064	0	0
1104	40	0
1144	80	0
1184	120	0
1224	160	0
1264	200	0
1304	−16	1
1344	24	1
1384	64	1
1424	104	1
1464	144	1
1504	184	1
1544	−32	2
1584	8	2
1624	48	2
1664	88	2
1704	128	2
1744	168	2
1784	208	2
1824	−8	3
1864	32	3
1904	72	3
1944	112	3
1984	152	3

Table 1. *The non-standard memory map you must use for Poking.*

It takes nine times as long as the fastest method to get data onto the screen and twice as long as the next slowest method. HERE begins printing at screen memory 1229 by the following program lines.

```
10 PRINT"{CLR}":A=1229:
   Z=54272:CC=14
20 FORB=0TO3:READC
30 POKEA+B,C:POKEA+B+Z,CC:NEXT
999 DATA8,5,18,5
```

When speed isn't essential, the Read and Poke commands do offer some advantages, especially when like data must frequently be displayed or redisplayed at the same or different screen locations.

There you have it: seven different ways to format the Commodore 64's screen. I hope this article helps you to choose the best method for each of the programs you write. R

Address all author correspondence to James G. Cooper, 1215 E. Market St., New Albany, IN 47150.

Listing 1. *Printing Benchmark test program.*

```
1 REM"PRINTING BENCHMARK"
2 REM"JIM COOPER"
3 REM"1215 EAST MARKET STREET"
4 REM"NEW ALBANY, INDIANA. 4715Ø"
5 PRINT"{SHFT CLR}";TAB(24Ø);TAB(5Ø)"HAVE A
  CUP OF COFFEE."
6 PRINTTAB(2Ø2);"THIS PROGRAM TAKES 15 MINU
  TES TO RUN."
7 FORT=1TO5ØØØ:NEXT:BC=5328Ø
8 DIMTI$(7):F=Ø
9 REM"CURSOR CONTROL METHOD"
1Ø TI$="ØØØØØØ"
2Ø FORA=1TO1ØØØ
3Ø PRINT"{SHFT CLR}"
4Ø PRINT"{11 CRSR DNs}{13 CRSR RTs}SCREEN{2
   SPACEs}CENTER"
5Ø NEXT
6Ø TI$(1)=TI$
7Ø F=F+VAL(TI$):POKEBC,13:TI$="ØØØØØØ"
79 REM"TAB METHOD"
8Ø FORA=1TO1ØØØ
9Ø PRINT"{SHFT CLR}"
1ØØ PRINTTAB(255);TAB(213)"SCREEN{2 SPACEs}
   CENTER"
11Ø NEXT
12Ø TI$(2)=TI$
129 REM"SPACE METHOD"
13Ø F=F+VAL(TI$):POKEBC,1Ø:TI$="ØØØØØØ"
14Ø FORA=1TO1ØØØ
15Ø PRINT"{SHFT CLR}"
16Ø PRINTSPC(255);SPC(198)"SCREEN{2 SPACEs}
   CENTER"
17Ø NEXT
18Ø TI$(3)=TI$
19Ø GOTO21Ø
199 REM"PEEK PRINTING METHOD #1"
2ØØ PRINT"{HOME}":POKE2Ø9,PEEK(2Ø9)+X:POKE2
   1Ø,PEEK(21Ø)+Y:RETURN
21Ø F=F+VAL(TI$):POKEBC,7:TI$="ØØØØØØ"
22Ø FORA=1TO1ØØØ
23Ø PRINT"{SHFT CLR}"
24Ø X=197:Y=1:GOSUB2ØØ:PRINT"SCREEN{2 SPACE
   s}CENTER"
25Ø NEXT
26Ø TI$(4)=TI$
27Ø GOTO29Ø
279 REM"PEEK PRINTING METHOD #2"
28Ø PRINT"{HOME}":POKE214,Y:PRINT:POKE211,X
   :RETURN
29Ø F=F+VAL(TI$):POKEBC,4:TI$="ØØØØØØ"
3ØØ FORA=1TO1ØØØ
31Ø PRINT"{SHFT CLR}"
32Ø X=13:Y=11:GOSUB28Ø:PRINT"SCREEN{2 SPACE
   s}CENTER"
33Ø NEXT
34Ø TI$(5)=TI$
349 REM"KERNAL 'PLOT' METHOD"
35Ø CU=679:POKECU,162:POKECU+1,Ø:POKECU+2,1
   6Ø:POKECU+3,Ø:POKECU+4,24
36Ø POKECU+5,32:POKECU+6,24Ø:POKECU+7,255:P
   OKECU+8,96:GOTO38Ø
37Ø POKECU+3,X:POKECU+1,Y: SYS CU:RETURN
38Ø F=F+VAL(TI$):POKEBC,1:TI$="ØØØØØØ"
39Ø FORA=1TO1ØØØ
4ØØ PRINT"{SHFT CLR}"
41Ø X=13:Y=11:GOSUB28Ø:PRINT"SCREEN{2 SPACE
   s}CENTER"
42Ø NEXT
43Ø TI$(6)=TI$
439 REM"READ AND POKE METHOD"
44Ø S=1517:Z=54272
45Ø F=F+VAL(TI$):POKEBC,Ø:TI$="ØØØØØØ"
46Ø FORA=1TO1ØØØ:RESTORE
47Ø PRINT"{SHFT CLR}"
48Ø FORB=ØTO13:READC:POKES+B,C:POKES+B+Z,14
   :NEXT
49Ø NEXT
5ØØ TI$(7)=TI$:POKEBC,14
51Ø PRINT"{SHFT CLR}":PRINT:PRINTTAB(5)"JIF
   FIES";SPC(5)"FORMAT METHOD"
52Ø PRINT:PRINTTAB(5)TI$(1);SPC(6)"CURSOR C
   ONTROLS"
53Ø PRINT:PRINTTAB(5)TI$(2);SPC(6)"TAB KEY
   METHOD"
54Ø PRINT:PRINTTAB(5)TI$(3);SPC(6)"SPACE KE
   Y METHOD"
55Ø PRINT:PRINTTAB(5)TI$(4);"*";SPC(5)"PEEK
    PRINTING #1"
56Ø PRINT:PRINTTAB(5)TI$(5);"*";SPC(5)"PEEK
    PRINTING #2"
57Ø PRINT:PRINTTAB(5)TI$(6);"%";SPC(5)"KERN
   AL 'PLOT' METHOD"
58Ø PRINT:PRINTTAB(5)TI$(7);SPC(6)"READ & P
   OKE METHOD"
59Ø F=F+VAL(TI$)
6ØØ F$="ØØ"+STR$(F):G$=LEFT$(F$,2)+RIGHT$(F
   $,4)
61Ø PRINT:PRINTTAB(5)G$;SPC(6)"RUN TIME"
62Ø PRINT:PRINTTAB(5)"*{2 SPACEs}DEDUCT 2 J
   IFFIES FOR SUBROUTINE.";
63Ø PRINT"{5 SPACEs}%{2 SPACEs}DEDUCT 3 JIF
   FIES FOR SUBROUTINE.{2 CRSR UPs}"
999 DATA19,3,18,5,5,14,32,32,3,5,14,2Ø,5,18
```


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What's in a Filename?

By DOUG FERGUSON

This article shows you easy techniques for embedding special characters in your disk directory. With them, you can simplify program loading, include program commentary and add filename security.

Wouldn't it be convenient if a disk directory itself could *tell* you how to load programs, or if it had little reminders, like "JOY 2" or "PADL," to say where or what to plug in? Of course it would, as long as it's not too difficult to do.

You can add such messages to your disk directories through embedded special characters, using commands that don't require cumbersome track and sector editors.

To be on the safe side in entering any of the following commands, please use a disk for which you have a backup. Also, don't use any disk wedge program, as it would be useless with this technique.

Suppose you have a game file, named "SHOOT-OUT," that uses a joystick in port 2. The directory listing looks something like this:

```
37  "SHOOT-OUT"      PRG
```

You may want the words "JOY2" to appear in the empty space to the right of the title, outside of the quotation marks. To accomplish this, type the following commands in the Direct mode. (Hit the return key after each of the two lines.)

```
A$=CHR$(160)+CHR$(32)+CHR$(74)+
  CHR$(79)+CHR$(89)+CHR$(50)
OPEN1,8,15,"R:SHOOT-OUT"+A$+
  "=SHOOT-OUT":CLOSE1
```

The disk drive will quickly make the desired change in the directory. To check, enter LOAD"$",8 followed by the List command. The listing line should then read:

```
37  "SHOOT-OUT" JOY 2 PRG
```

The words JOY2 are not necessary when you load the program. LOAD "SHOOT-OUT",8 will work as if the words JOY2 did not exist.

Here's how it works. Normally, when the disk drive's Rename function is used, the command following OPEN1,8,15, is something like "R:NEWNAME=OLDNAME". Like any string variable, the command can be pieced together. This is called concatenation. For example, "R:NEW"+"NAME"+"=OLDNAME" looks the same to the disk drive.

In the "JOY2" experiment, the first line sets A$ equal to several characters: CHR$(160) = shifted space (delineator); CHR$(32) = space (optional); CHR$(74)(79)(89)(50) = the characters J,O,Y,2.

To reverse the above procedure, repeat the command that sets A$ equal to the special characters and then execute the following:

```
OPEN1,8,15,"R:SHOOT-OUT=SHOOT-
  OUT"+A$
```

There are a variety of uses for embedded comments. You could include initials identifying the program's author or provide the program's version number or completion date.

Embedding the Comma

Before you try putting ",8,1" or ",8:" after your programs, you should know that the disk drive, for some reason, will not accept a comma in its standard form, that is, CHR$(44).

Instead, you'll need to use CHR$(172) to get a comma, as in the following steps to put ",8,1" after the filename MONITOR.

```
A$="R:MONITOR"+CHR$(160)+
   CHR$(172)+CHR$(56)+CHR$(172)+
   CHR$(49)+"=MONITOR"
OPEN1,8,15,A$:CLOSE1
```

To get a ",8:" after a file named TEST, make the following change:

```
A$="R:TEST"+CHR$(160)+CHR$(172)+
   CHR$(56)+CHR$(58)+"=TEST"
```

This technique comes in particularly handy when your disks contain program files that are loaded in by other program files. By putting the ",8" after the file that "boots" the other files, you won't have to remember which file to load, nor will you have to make intricate labels on your game disks.

Security for Filenames

The final use for embedded characters in disk directories is for security. To prevent prying eyes from easily listing your directory, some embedded nulls, or zeroes, will do the trick.

Take, for example, the following directory:

```
12      "CHECKBOOK"          PRG
5       "MISCELLANEOUS"      PRG
7       "STUFF"              PRG
3       "TOP SECRET"         PRG
4       "CONFIDENTIAL"       PRG
633 BLOCKS FREE
```

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C-64; C-128 (in C-64 mode); VIC-20; disk drive

If you want to prevent anyone from knowing about the final two files, simply embed three zeroes in the file preceding them.

```
OPEN1,8,15,"R:STUFF" + CHR$(0) +
   CHR$(0) + CHR$(0) + " = STUFF":
   CLOSE1
```

Once you have tried this method, your protected files won't show in the altered directory but will still load (if you remember their names). To reverse the procedure, do this:

```
OPEN1,8,15,"R:STUFF = STUFF" +
   CHR$(0) + CHR$(0) + CHR$(0):CLOSE1
```

Occasionally, the disk drive responds with an error. This can be circumvented by:

```
CLOSE1:OPEN1,8,15,"R:STUFF 1 = STUFF"
   + CHR$(0) + CHR$(0) + CHR$(0):CLOSE1
OPEN1,8,15,"R:STUFF = STUFF 1":CLOSE1
```

This use of interim names is rarely necessary when removing embedded characters.

Another note of interest: This whole security technique works only when the directory is loaded the conventional way (LOAD"$",8). The DOS 5.1 wedge program (provided by Commodore when you first get your drive) will still list the entire directory.

When Things Go Wrong

As stated at the outset, you should not play with this technique without having a backup disk. Here is a helpful technique for reading the error channel when you can't figure out why the disk light is blinking. Just issue the following Direct mode command:

```
OPEN1,8,15:FORI = 1TO30:SYS43906#1,
   A$:?A;:IFST = 0THENNEXT:CLOSE1
```

If you get an error #73, CBM DOS V2.6 1541, then chances are you won't be able to embed anything in the directory, since you're dealing with a DOS-protected commercial disk.

In addition to the interim name method of removing embedded characters, I've found that turning the disk drive off and on before re-trying something that "should have worked but didn't" is sometimes successful.

Bear in mind that a file that seems hopelessly messed up with embedded characters can usually be loaded using pattern matching (LOAD"XX*",8) and resaved under another name or on another disk. R

Address all author correspondence to Doug Ferguson, 8252 Ottawa Road, Elida, OH 45807.



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Basic 4.5 Concluded

By ROBERT ROCKEFELLER

This month, the rest of the Basic 4.5 commands will be covered, beginning with the window commands, so named because they allow manipulation of portions of the screen, or "windows." Windows may be scrolled in four directions, reversed, inversed, flashed, erased or filled with a specified character.

These are not fundamental commands, as is, for example, the Print statement; they're more in the "bell and whistle" category—not really necessary, but nice to have. Windows produce impressive screen displays that you can use for title screens, emphasizing error messages, and the like.

All windowing commands require that at least four parameters be specified, although some require more. Two of the parameters are the x and y coordinates of the top-left corner of the window (x = left-most column; y = top-most row). The other two required parameters specify the window's width and depth. For purposes of mapping, 0,0 indicates the top-left corner of the screen (the home position), and 39,24 signifies the bottom-right corner. 0,24 then signifies the bottom-left corner.

Width designates how many columns wide the window will be, and may vary from 1, the minimum, to 40, the full screen width. The sum of the x-coordinate and width must be less than or equal to 40. Depth indicates how many rows deep the window will be. This may vary from 1, the minimum, to 25, the full screen depth. The sum of the y-coordinate and depth must be less than or equal to 25.

This is the last of three installments describing the author's Basic 4.5, which enhances Basic 4.0 with additional commands.

Windowing Commands

FILL screen-code value, color, left-most column (x), top row (y), width, depth—fills the specified window with the character of the specified color. This command is also capable of erasing a window by filling it with the space character. Screen-code value may vary from 0–255. To determine the proper screen-code value corresponding to the character you wish to use, check page 132 of the user's guide that came with your computer. To determine the numeric value corresponding to the color you wish to use, check page 139. Color-value numbers may be from 0–15.

Examples:

FILL 1, 8, 0, 0, 40, 12—fills the upper half of the screen with the orange A character.

FILL 32, 8, 20, 13, 20, 12—erases only the lower-right quadrant of the screen. Fills color memory with the value for orange. Any characters Poked to the lower-right quadrant will be orange.

FLASH number of times, flash rate, left-most column, top row, width, depth—flashes the window the indicated number of times at the indicated speed. The window may be flashed up to 255 times, with the flash rate varying from 1, the slowest, to 255, the fastest. FLASH works by first reversing, then unreversing, the window. (You can obtain the same effect in a program by alternately using the REV and INV commands.)

Example:

FLASH 4, 20, 0, 0, 40, 1—flashes the top row of the screen four times. This command is useful to draw attention to an error message or to issue a warning.

The next two commands are complementary; that is, they will often be used together.

REV left-most column, top row, width, depth—reverses all characters within the defined window. All characters will appear the same as if they had been printed in a string following the RVS-ON character. REV works by going through each screen byte within the window and setting bit 7 of each. That is the signal to the video chip to display that character in reverse field.

RUN It Right

C-64; C-128 (in C-64 mode)

A word of warning is in order here. When the screen is cleared on newer C-64s, color memory is filled with the value of the current screen color, and the screen memory is filled with the value of the space character. Space characters that are the same color as the screen cannot be seen even if reversed, so if your intention is to reverse an entire block—including all space characters—you must erase the window block with the FILL command prior to writing anything into the window. Select the color you wish for the reversed spaces when you use the FILL command. The same warning applies to the INV command, described below.

Examples:

PRINT CHR$(147) : REV 0, 1, 40, 1—clears the screen, then reverses only the second screen row. It will appear as though nothing has happened, because the reversed spaces are the same color as the screen.

FILL 32, 8, 0, 1, 40, 1 : PRINT CHR$(19)CHR$(17)" TEST" : REV 0, 1, 40, 1—erases the second screen row with the FILL command. The color memory used by the second screen row is then filled with the value 8, indicating orange. Assuming the screen is not orange, the second row should be in orange reverse field.

INV left-most column, top row, width, depth.—If the defined window has no reversed characters within it, then the operation of INV is exactly the same as REV. If the window is already reversed, then INV will unreverse it. INV works by toggling bit 7 of each screen byte. If the bit is on, it is turned off; if it's off, it's turned on.

Scrolling and Flashing

The next four are scrolling commands and operate similarly, except that the scrolling is done in four different directions. The direction will be obvious from the name. See the demo programs for examples of use.

RIGHTW left-most column, top row, width, depth—scrolls the text within the window one character to the right. A column of spaces is inserted in the window's left-most column. You should run the demo programs to see exactly how everything works.

LEFTW left-most column, top row, width, depth—scrolls the text within the window one column to the left. A row of spaces is inserted in the right-most column of the window.

UPW left-most column, top row, width, depth—scrolls text within the window up one row. A row of spaces is inserted in the bottom row of the window.

DOWNW top-left column, top row, width, depth—scrolls text within the window down one row. A row of spaces is inserted in the top row of the window.

The next three commands do not operate on windows, but are screen-related.

BFLASH number of times, flash rate, color1, color2—flashes the border in the specified colors. The original border color is saved, then the two specified colors are alternately stored in the border-color register at address 53280. The flash rate determines the speed at which this occurs. After the specified number of flashes, the original border color is restored to the border-color register.

The border may be flashed up to 255 times, and the flash rate may vary from 1 to 255. Again, this can be used to draw attention to an error.

Example:

BFLASH 5, 20, 2, 10—flashes the border five times, alternating between red and pink.

CENTRE <string-expression>—centers the string on the cursor-designated screen row. If LEN(string)>40, then the action is exactly the same as PRINT. CENTRE accepts any string expression usable by PRINT. If more than one string expression follows CENTRE, the command will operate only on the first.

Examples:

CENTRE A$

CENTRE Q5

CENTRE "A STRING"

CENTRE A4;"SECOND";A$

LOCATE x-position, y-position.—This command positions the cursor wherever you wish. Like the windowing commands, 0,0 is the upper-left corner of the screen; 39,24 is the bottom-right corner.

Example:

LOCATE 5,20

The six music commands will be considered next.

VTYPE voice number, waveform [, optional ring] [, optional sync].—This command sets the voice type for one of the three voices. After the voice type is set, it remains unchanged until VTYPE is executed again. NOTE and PLAY both require the voice type to be set before they will operate properly. The voice number may be a number from 1 to 3.

The second parameter, waveform, specifies the one to be used. The SID sound chip in the C-64 allows four different types of waveform: triangle, sawtooth, pulse and noise, and the type is selected by using the first three letters of its name: TRI, SAW, PUL or NOI. If the pulse waveform is selected, a number specifying the duty cycle must follow PUL. This number may be any value from 0 to 2047. See the examples below.

Finally, there are two optional parameters. If RING is included in the parameter string, the voice will be put into Ring-modulation mode. As the name suggests, this is useful for creating bell sounds. SYNC in the parameter string puts the voice into Synchronization mode. The *C-64 Programmer's Reference Guide* uses synchronization to create a mosquito sound. For a fuller explanation of the capabilities of the SID chip, see the 24 pages devoted to it in the guide.

Examples:

VTYPE 1, PUL1000—selects pulse waveform for voice 1.

VTYPE 2, TRI, SYNC—selects triangle waveform and Synchronization mode for voice 2.

VTYPE 3, SAW, RING, SYNC—selects sawtooth waveform, Ring-modulation mode, and Synchronization mode for voice 3.

VTYPE 1, NOI, RING—selects noise waveform and Ring-modulation mode for voice 1.

ENV voice number, attack value, decay-value, sustain value, release value.—This command sets the "envelope" for each voice. The voice-number parameter must be a number from 1 to 3. The other four parameters each require a number from 0 to 15.

Envelope is a term used to describe the way volume varies as a single note is played on different types of instruments. Each note, as far as volume is concerned, consists of four basic parts: Attack, Decay, Sustain and Release. When a note is first struck, it rises from zero to maximum volume.

This is called the Attack, and the rate at which this occurs can be set.

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A value of 0 means volume will rise from zero to its maximum in two milliseconds, whereas a value of 15 means that it will take eight seconds. For intermediate values, as well as the corresponding data for the Decay and Release rates, see the table on p. 198 of the reference guide.

After reaching maximum, the volume falls to some intermediate value. The rate at which this occurs is called the Decay. After Decay comes Sustain. Unlike the other three parameters, the Sustain value does not involve a time span; instead, it indicates the proportion of maximum volume that will be sustained while the "gate bit" is set.

When the gate bit is on, the voice will produce sound. When the bit is cleared, the Release portion of the envelope begins. A value of 15 means that maximum volume will be maintained during the Sustain portion; a value of zero, naturally, indicates zero volume. The Release rate indicates how long it will take volume to fall from its Sustain level to zero.

Example:

ENV 1, 0, 9, 0, 0—sets voice 1 to an envelope, which produces a piano sound; very fast Attack, medium Decay, no Sustain or Release.

VOL volume value—sets the volume, which may vary from 0, none, to 15, maximum.

NOTE voice number, frequency value, duration value [, optional following VTYPE parameter string].—This command will play one note. The voice number (1–3) must be specified, as well as the frequency value (0–65535). The formula to calculate actual frequency in Hertz from the frequency value is

actual frequency = ((frequency value)* .059604645) Hz.

Check the table on p. 152 of the user's guide for the correct values for musical notes.

Examples:

NOTE 1, 4291, 20—plays middle C on voice 1; envelope, volume and voice type must already be set; duration of 20.

NOTE 2, 5103, 20, pul255—plays D# above middle C, using the Pulse waveform with a duty-cycle value of 255.

NOTE 3, 4547, 100, tri, ring—plays C# above middle C, using Triangle waveform and ring modulation.

PLAY voice number, buffer-start address, buffer length.—PLAY would be the command to use when it's necessary to play an entire song. The actual notes would be played by a machine-code routine that's executed only during the 60-times-per-second interrupt. This allows a song to be playing in the background while a program is running.

Voice number must be from 1 to 3. Buffer-start address is that which stores the data PLAY will use. The buffer length is the number of bytes of data at the start address.

The data must be stored in a certain format. The PLAY routine expects two bytes of frequency value, followed by one byte to indicate how long the note should be held. A duration value of 60 means the note will be held for one second, a whole note. A value of 30 indicates a half note, and so on.

A frequency value of 0 is regarded as a special case. When this is encountered, a value of 0 is *not* put into the respective voice's frequency-value register. Instead, the only action taken is to clear the gate bit. Clearing this bit allows the Release portion of the envelope to be heard. This is necessary for certain types of envelopes in which the release is an important part. Among the demo programs, you'll find one that uses the PLAY command to play a popular song.

Example:

PLAY 2, $C000, 300 : REM PLAY FROM BUFFER AT $C000 (49152)

VIBRATO voice number ON or OFF.—The Play routine is capable of playing music in vibrato, which is a very rapid variation in frequency. Often this produces a richer sound, especially when an organ is being simulated. It's accomplished during the PLAY IRQ routine by reading the current value of the voice 3 waveform and adding this to the frequency value for voice 1, 2 or 3.

Using the VIBRATO command requires a little preparation. First, it's desirable, though not necessary, to turn off voice 3 output. This can be done by setting bit 7 of the SID register at address 54296. Set the volume with a Poke, or with VOL; then start voice 3 going with a Poke.

The NOTE command cannot be used to start voice 3 because it automatically clears the gate bit when finished, and the gate bit must be set

in order for output from voice 3 to occur.

Example:

```
POKE 54296, 128+15 : REM SET VOLUME,
  TURN 3'S OUTPUT OFF
NOTE 3, 2000, 1 : REM SET VOICE 3
  FREQUENCY
ENV 3,0,0,15,0 : REM SET VOICE 3 ENVELOPE
POKE $D412, $41 : REM VOICE 3 ON-
  TRIANGLE WAVEFORM
VIBRATO 1 ON
PLAY 1, $C000, 200 : REM PLAY SONG
```

Accompanying this article are several programs demonstrating the use of windowing and music commands. Careful study of these should clear up any foggy areas that are due to the author's foggy writing.

Also at the end of the article are the Basic loaders for the various music and windowing commands. If you're typing in the windowing commands, the loader containing the miscellaneous windowing routines REV and BFLASH must be loaded *first*, since it contains code used in common by all the windowing commands. Likewise, if you're typing in the music commands, the loader containing the miscellaneous music routines must first be loaded.

If you want to avoid typing, a copy of Basic 4.5, including all demo programs, is available from me for a copying charge of $5. Just send me a self-addressed envelope, a disk and the fee. R

Address all author correspondence to Robert Rockefeller, RR #4, Langton, Ontario, Canada N0E 1G0.

Listing 1. *Loader for miscellaneous music routines. Must be loaded and run before any music commands.*

```
10 REM LOADER FOR MISCELLANEOUS MUSIC ROUTI
   NES
15 REM THIS MUST BE LOADED BEFORE ANY MUSIC
    COMMANDS CAN BE LOADED
20 :
30 FOR LOOP=37811 TO 37831
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
70 FOR LOOP=37986 TO 38084
80 READ BYTE : POKE LOOP,BYTE
90 NEXT LOOP
100 :
37811 DATA 132,151,32,147,130,164,151,165,2
      0,32
37821 DATA 98,148,200,165,21,32,98,148,76,1
      21
37831 DATA 0
37986 DATA 145,193,145,195,145,195,96,32,17
      6,148
37996 DATA 138,32,124,148,133,151,32,253,17
      4,32
38006 DATA 176,148,138,5,151,96,10,10,10,10
38016 DATA 96,32,158,183,138,41,3,170,133,2
      47
38026 DATA 202,169,0,202,48,5,24,105,7,208
38036 DATA 248,133,195,24,105,189,133,193,1
      69,151
38046 DATA 105,0,133,194,169,212,133,196,16
      6,247
38056 DATA 208,3,76,72,178,76,121,0,32,158
38066 DATA 183,138,41,15,170,76,121,0,32,12
      1
38076 DATA 0,208,3,104,104,96,76,253,174
```

Listing 2. *Loader for Play and Vibrato commands.*

```
10 REM LOADER FOR PLAY, VIBRATO
20 :
30 FOR LOOP=38085 TO 38176
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
38085 DATA 201,253,208,19,169,0,160,28,153,
      0
38095 DATA 212,153,189,151,153,165,151,136,
      16,244
38105 DATA 76,115,0,32,129,148,32,253,174,3
      2
38115 DATA 147,130,166,247,165,20,157,173,1
      51,165
38125 DATA 21,157,176,151,32,253,174,32,147
      ,130
38135 DATA 166,247,165,20,157,167,151,165,2
      1,157
38145 DATA 170,151,169,128,157,164,151,96,3
      2,129
38155 DATA 148,201,253,240,13,201,145,240,3
      ,76
38165 DATA 8,175,157,185,151,76,115,0,169,0
38175 DATA 240,246
```

Listing 3. *Loader for the Note command.*

```
10 REM LOADER FOR NOTE
20 :
30 FOR LOOP=37751 TO 37810
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
37751 DATA 32,129,148,32,253,174,160,0,32,1
      79
37761 DATA 147,32,253,174,32,158,183,134,15
      1,201
37771 DATA 44,208,3,32,203,147,160,4,177,19
      3
37781 DATA 9,1,32,100,148,164,151,162,0,32
37791 DATA 41,148,32,41,148,202,208,247,136
      ,208
37801 DATA 242,160,4,177,193,41,254,76,98,1
      48
```

Listing 4. *Loader for the VTYPE command, which allows voice manipulation.*

```
10 REM LOADER FOR VTYPE
20 :
30 FOR LOOP=37832 TO 37940
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
37832 DATA 32,129,148,32,253,174,72,169,0,1
      60
37842 DATA 4,32,98,148,32,45,148,104,170,16
      9
37852 DATA 16,224,84,240,34,10,224,83,240,2
      9
37862 DATA 10,224,80,208,11,32,34,148,160,2
37872 DATA 32,179,147,76,6,148,10,224,78,24
      0
37882 DATA 3,76,8,175,72,32,42,148,104,32
37892 DATA 34,148,32,186,148,201,82,208,9,3
      2
37902 DATA 32,148,32,48,148,32,186,148,201,
      83
```

→

Listing 4 continued.

```
37912 DATA 208,225,32,48,148,169,2,44,169,4
37922 DATA 160,4,17,193,32,98,148,96,160,2
37932 DATA 44,160,3,44,160,4,76,251,168
```

Listing 5. *Loader for the VOL (volume) and ENV (envelope) commands.*

```
10 REM LOADER FOR VOL, ENV
20 :
30 FOR LOOP=37941 TO 37985
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
37941 DATA 32,176,148,173,213,151,41,240,14
      2,213
37951 DATA 151,13,213,151,141,213,151,141,2
      4,212
37961 DATA 96,32,129,148,32,253,174,32,105,
      148
37971 DATA 160,5,32,100,148,32,253,174,32,1
      05
37981 DATA 148,160,6,208,2
```

Listing 6. *Loader for the RightW and LeftW commands, which scroll the window text horizontally.*

```
10 REM LOADER FOR RIGHTW, LEFTW
20 :
30 FOR LOOP=36910 TO 36978
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
36910 DATA 32,237,143,32,106,145,164,173,19
      2,2
36920 DATA 144,243,136,136,16,10,200,169,32
      ,145
36930 DATA 20,32,125,145,144,236,177,20,200
      ,145
36940 DATA 20,76,58,144,32,237,143,32,106,1
      45
36950 DATA 165,173,201,2,144,207,160,1,177,
      20
36960 DATA 136,145,20,200,200,196,173,144,2
      45,169
36970 DATA 32,136,145,20,32,125,145,144,233
```

Listing 7. *Loader for the UpW and DownW commands, which scroll the window text vertically.*

```
10 REM LOADER FOR UPW, DOWNW
20 :
30 FOR LOOP=36979 TO 37110
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
36979 DATA 32,237,143,198,172,240,110,32,10
      6,145
36989 DATA 162,1,32,108,145,32,92,145,164,1
      73
36999 DATA 136,48,7,177,20,145,34,76,135,14
      4
37009 DATA 230,176,165,176,197,172,144,12,1
      64,173
37019 DATA 136,48,74,169,32,145,20,76,155,1
      44
37029 DATA 165,20,133,34,165,21,133,35,162,
      1
37039 DATA 32,108,145,76,133,144,32,237,143
      ,198
37049 DATA 172,208,1,96,32,106,145,166,172,
      32
37059 DATA 108,145,32,92,145,164,173,136,48
      ,7
37069 DATA 177,34,145,20,76,202,144,230,176
      ,165
37079 DATA 176,197,172,144,13,164,173,169,3
      2,136
37089 DATA 48,5,145,34,76,224,144,96,165,34
37099 DATA 133,20,165,35,133,21,32,92,145,7
      6
37109 DATA 200,144
```

Listing 8. *Loader for the Centre, Inverse, Flash and Fill commands.*

```
10 REM LOADER FOR CENTRE, INV, FLASH, FILL
20 :
30 FOR LOOP=37111 TO 37211
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
37111 DATA 32,158,173,32,163,182,201,40,144
      ,3
37121 DATA 76,154,170,133,151,169,40,56,229
      ,151
37131 DATA 74,166,214,168,24,32,240,255,165
      ,151
37141 DATA 76,154,170,169,128,133,189,76,17
      5,143
37151 DATA 32,186,145,32,24,145,32,51,145,3
      2
37161 DATA 2,144,32,178,143,198,191,208,243
      ,96
37171 DATA 164,190,200,162,0,32,68,145,32,6
      8
37181 DATA 145,202,208,247,136,208,242,96,3
      2,158
37191 DATA 183,134,177,32,253,174,32,158,18
      3,134
37201 DATA 166,169,64,133,189,32,253,174,76
      ,175
37211 DATA 143
```

Listing 9. *Miscellaneous window loader. This must be loaded before all other window commands.*

```
10 REM LOADER FOR SCREEN SUPPORT ROUTINES,
   REV, BFLASH
15 REM THIS MUST BE LOADED BEFORE ANY WINDO
   WING COMMANDS ARE LOADED
20 :
30 FOR LOOP=36779 TO 36909
40 READ BYTE : POKE LOOP,BYTE
50 NEXT LOOP
60 :
70 FOR LOOP=37171 TO 37188
80 READ BYTE : POKE LOOP,BYTE
90 NEXT LOOP
100 :
110 FOR LOOP=37212 TO 37324
120 READ BYTE : POKE LOOP,BYTE
130 NEXT LOOP
140 :
36779 DATA 162,0,134,189,32,237,143,32,106,
      145
36789 DATA 164,173,136,16,5,32,125,145,144,
      246
```


→

Listing 9 continued.

```
36799 DATA 165,177,36,189,112,12,169,128,36
      ,189
368Ø9 DATA 16,4,81,2Ø,16,2,17,2Ø,145,2Ø
36819 DATA 36,189,112,3,76,183,143,165,2Ø,1
      33
36829 DATA 36,165,21,41,3,9,216,133,37,165
36839 DATA 166,145,36,76,183,143,16Ø,3,132,
      187
36849 DATA 32,158,183,164,187,15Ø,172,198,1
      87,48
36859 DATA 6,32,253,174,76,241,143,169,Ø,13
      3
36869 DATA 176,173,136,2,133,21,165,175,133
      ,2Ø
36879 DATA 24,1Ø1,173,176,4,2Ø1,41,144,3,76
36889 DATA 72,178,165,172,24Ø,12,1Ø1,174,17
      6,245
36899 DATA 2Ø1,26,176,241,165,173,2Ø8,2,1Ø4
      ,1Ø4
369Ø9 DATA 96
37171 DATA 164,19Ø,2ØØ,162,Ø,32,68,145,32,6
      8
37181 DATA 145,2Ø2,2Ø8,247,136,2Ø8,242,96
37212 DATA 165,2Ø,56,233,4Ø,133,34,165,21,2
      33
37222 DATA Ø,133,35,96,166,174,2Ø2,48,13,16
      5
37232 DATA 2Ø,24,1Ø5,4Ø,133,2Ø,144,2,23Ø,21
37242 DATA 2Ø8,24Ø,96,162,1,32,1Ø8,145,23Ø,
      176
37252 DATA 165,176,197,172,144,2,1Ø4,1Ø4,96
      ,32
37262 DATA 186,145,32,158,183,134,53,32,253
      ,174
37272 DATA 32,158,183,134,54,173,32,2Ø8,72,
      165
37282 DATA 53,141,32,2Ø8,32,51,145,165,54,1
      41
37292 DATA 32,2Ø8,32,51,145,198,191,2Ø8,236
      ,1Ø4
373Ø2 DATA 141,32,2Ø8,96,32,158,183,138,9,1
37312 DATA 133,191,32,253,174,32,158,183,13
      4,19Ø
37322 DATA 76,253,174
```

Listing 10. *Loader for the Locate command.*

```
1Ø REM LOADER FOR LOCATE
2Ø :
3Ø FOR LOOP=38275 TO 383Ø2
4Ø READ BYTE : POKE LOOP,BYTE
5Ø NEXT LOOP
6Ø :
38275 DATA 32,158,183,224,4Ø,144,3,76,72,17
      8
38285 DATA 134,187,32,253,174,32,158,183,22
      4,25
38295 DATA 176,241,164,187,24,76,24Ø,255
```

Listing 11. *Program demonstrating use of windowing commands.*

```
1Ø ' DEMONSTRATES USE OF WINDOWING COMMANDS
2Ø '
3Ø '
4Ø ' SET UP A STRING TO BE SCROLLED INSIDE
   A WINDOW
5Ø A$="THIS IS A SAMPLE STRING WHICH WILL B
   E SCROLLED ACROSS THE SCREEN. "
6Ø A$=A$+"THE STRING CAN BE DISPLAYED IN NO
   RMAL TYPE OR REVERSED. "
7Ø A$=A$+"ALSO, A BORDER IS POSSIBLE AS DEM
   ONSTRATED. "
8Ø A$=A$+"THE WINDOW BEING SCROLLED CAN BE
   FLASHED WITH THE INV COMMAND. "
9Ø '
95 '
1ØØ PRINTCHR$(147)
11Ø ' FILL AN AREA OF SCREEN WITH A COLOR O
   THER THAN THE SCREEN COLOR
12Ø FILL 32,1, 2,1, 36,3
13Ø '
135 '
136 ' DISPLAY IN NORMAL TYPE
14Ø FOR LOOP=1 TO 5Ø
15Ø LOCATE 36,2 : PRINTMID$(A$,LOOP,1)
155 GOSUB 1ØØØ : CLOSE 3,2, 34,1 : ' SCROLL
    LEFTW
16Ø NEXT LOOP
17Ø '
18Ø '
19Ø ' DISPLAY IN REVERSE
2ØØ FOR LOOP=51 TO 1ØØ
21Ø LOCATE 36,2 : PRINTMID$(A$,LOOP,1)
22Ø GOSUB 1ØØØ : LEFTW 3,2, 34,1 : REV 3,2,
    34,1 : ' REVERSE TYPE
23Ø NEXT LOOP
24Ø '
25Ø '
251 ' DISPLAY A BORDER
252 REV 2,1, 36,3 : INV 3,2, 34,1 : ' CREAT
   E A BORDER AROUND NORMAL TYPE
27Ø FOR LOOP=1Ø1 TO 15Ø
28Ø LOCATE 36,2 : PRINTMID$(A$,LOOP,1)
29Ø GOSUB 1ØØØ : LEFTW 3,2, 34,1
3ØØ NEXT LOOP
31Ø '
32Ø '
33Ø ' REVERSE INNER WINDOW
34Ø REV 2,1, 36,3
35Ø FOR LOOP=151 TO 19Ø
36Ø LOCATE 36,2 : PRINTMID$(A$,LOOP,1)
37Ø GOSUB 1ØØØ : LEFTW 3,2, 34,1 : REV 2,1,
    36,3
39Ø NEXT LOOP
4ØØ '
41Ø '
42Ø 'FLASH INNER WINDOW
43Ø FOR LOOP=191 TO LEN(A$)
44Ø LOCATE 36,2 : PRINTMID$(A$,LOOP,1)
45Ø REV 3,2, 34,1 : INV 3,2, 34,1
46Ø GOSUB 2ØØØ : LEFTW 3,2, 34,1
47Ø INV 3,2, 34,1 : GOSUB 2ØØØ
49Ø NEXT LOOP
5ØØ '
51Ø '
52Ø '
53Ø PRINTCHR$(147);
99Ø END
1ØØØ FOR PAUSE=1 TO 5Ø : NEXT PAUSE : RETUR
     N
2ØØØ FOR PAUSE=1 TO 3Ø : NEXT PAUSE : RETUR
     N
```

Listing 12. *Program demonstrating scrolling the entire screen.*

```
1Ø ' DEMONSTRATES SCROLLING THE ENTIRE SCRE
   EN
2Ø '
3Ø '
4Ø WID=4Ø : DEP=25
5Ø DIMA$(94) : PRINT"FILLING ARRAY, ONE MIN
   UTE PLEASE ..."
6Ø '
```

→

Listing 12 continued.

```
7Ø ' FILL ARRAY WITH STRINGS 4Ø CHARACTERS
   LONG
8Ø ' COULD JUST AS EASILY BE USER-DEFINED C
   HARACTERS
9Ø ' WHICH CREATE A BACKGROUND FOR A SCROLL
   ING ARCADE GAME
95 '
1ØØ FOR ARRAY=1 TO 94
11Ø FOR LOOP=1 TO 4Ø
12Ø A$(ARRAY)=A$(ARRAY)+CHR$(ARRAY+161)
13Ø NEXT LOOP, ARRAY
14Ø '
15Ø '
16Ø FILL 32,1, Ø,Ø, 4Ø,25
17Ø FOR NUM=1 TO 4 : FOR LOOP=1 TO 94
18Ø PRINT"{HOME}";A$(LOOP);
19Ø DOWN .,., WID,DEP
2ØØ NEXT LOOP, NUM
```

Listing 13. *Program demonstrating the sounds created by the music commands.*

```
1Ø ' DEMONSTRATION OF PLAY COMMAND
2Ø '
3Ø '
4Ø ' SET VOLUME
5Ø PLAY OFF: STEP 15
6Ø '
7Ø '
8Ø ' READ MUSIC DATA, POKE TO BUFFER WITH N
   O REST FOR RELEASE
9Ø FOR LOOP=Ø TO 5Ø STEP 3
1ØØ READ FR
11Ø HFR=INT(FR/256) : LFR=FRAND255
12Ø POKE $CØØØ+LOOP,LFR
13Ø POKE $CØØØ+LOOP+1,HFR
14Ø READ DUR : POKE $CØØØ+LOOP+2,DUR
15Ø NEXT LOOP
16Ø '
17Ø '
18Ø ' SELECT VIBRATO OR NO VIBRATO
19Ø PRINTCHR$(147)"{2 CRSR DNs}{CTRL 9} 1 {
   CTRL Ø} PLAY WITH VIBRATO"
2ØØ PRINT"{CRSR DN}{CTRL 9} 2 {CTRL Ø} PLAY
    WITH NO VIBRATO{CRSR DN}"
21Ø INPUT A : IF A<>1 THEN 29Ø
22Ø POKE $D418,$8F : ' VOICE 3 OUTPUT OFF,
   VOLUME=15
23Ø ENV 3, Ø,Ø,15,Ø : ' SET VOICE 3 ENVELOP
   E
24Ø NOTE 3, 2ØØØ, 1 : ' SELECT VOICE 3 FREQ
   UENCY
25Ø POKE $D412,$11 : ' START VOICE 3 OSCILL
   ATOR, TRIANGLE WAVEFORM
26Ø '
27Ø '
28Ø ' SELECT ENVELOPE
29Ø ENV 1, Ø,Ø,15,Ø
3ØØ ' SELECT VOICE TYPE
31Ø VTYPE 1, TRI
32Ø '
33Ø 'PLAY SONG
34Ø PLAY 1, $CØØØ, 51
35Ø '
36Ø PRINT"{2 CRSR DNs}THIS WILL SIMULATE AN
    ORGAN."
37Ø INPUT"DO YOU WISH TO HEAR THIS AGAIN";A
   $
38Ø IF A$="Y" THEN 19Ø
381 '
382 '
383 ' SIMULATE A GUITAR WITH A REST AFTER E
   ACH NOTE TO HEAR THE RELEASE
384 RESTORE : FOR LOOP=Ø TO 1ØØ STEP 6
385 READ FR
386 HFR=INT(FR/256) : LFR=FRAND255
387 POKE $CØØØ+LOOP,LFR : POKE $CØØØ+LOOP+3
   ,Ø
389 POKE $CØØØ+LOOP+1,HFR : POKE $CØØØ+LOOP
   +4,Ø
39Ø READ DUR : POKE $CØØØ+LOOP+2,DUR/2{2 SP
   ACEs}: POKE $CØØØ+LOOP+5,DUR/2
391 NEXT LOOP
392 '
393 '
394 ENV 1, Ø,9,Ø,Ø : ' SET ENVELOPE TO SIMU
   LATE ELECTRIC GUITAR
395 VTYPE 1, PUL255
396 PLAY 1, $CØØØ, 1Ø2
397 PRINT"{2 CRSR DNs}THIS WILL SIMULATE AN
    ELECTRIC GUITAR"
398 '
399 '
4ØØ DATA 4817,8, 51Ø3,8, 54Ø7,8
41Ø DATA 8583,15, 54Ø7,8, 8583,15
42Ø DATA 54Ø7,15, 8583,45, 9634,8
43Ø DATA 1Ø2Ø7,8, 1Ø814,8, 8583,8
44Ø DATA 9634,15, 1Ø814,8, 8583,8
45Ø DATA 9634,15, 8583,45
```


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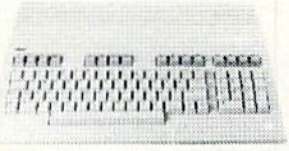
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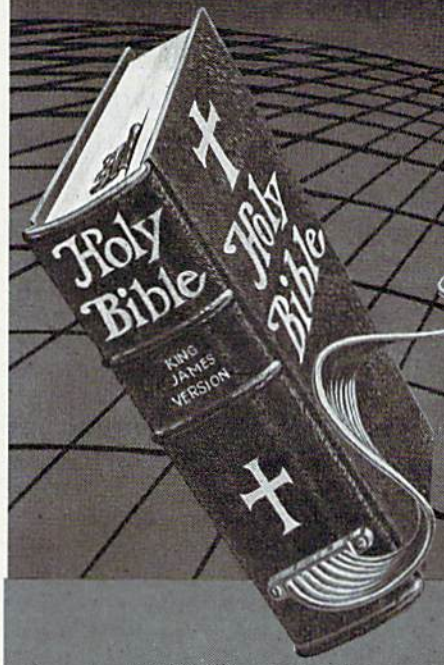
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Pep Up Your Programs

By JOHN KULA

Compilers will give you a new lease on life by letting you speed up your Basic programs without having to learn assembly language. What follows is a lucid discussion of compilers and a comparative review of three that are available for the C-64.

For the programmer who hasn't been able to learn machine language and who dreads the day when a newly written Basic program just won't run fast enough to be useful, there's a last resort: the compiler. A compiler is the Fountain of Youth to the old dog who can't learn new tricks. And just like that fountain, compilers are surrounded by many misconceptions, which I'll discuss in this article.

Assemblers, Interpreters and Compilers

First, let's make a clear differentiation between assemblers, interpreters and compilers,

Assemblers are programs that translate assembly language into executable machine language.

Interpreters are programs that translate high-level language programs one instruction at a time and execute each instruction immediately.

Compilers are programs that, in a general sense, translate programs from one format to another. (Note: If the different formats are a consequence of using different computers, the translating programs are more accurately called cross compilers. This article is concerned only with those compilers that are intended to translate a high-level language into executable machine language for the same computer.)

Before expanding and clarifying these definitions, let's consider the reasons for the development of the higher-level languages that gave rise to the need for translating into machine language.

The central processing unit (CPU) of a computer understands only binary code, which requires only two digits, the numbers 1 and 0, signifying the on or off condition of an electrical switch. In the beginning, all programs were written in binary code. While this was fine for the computer, it was more than a trifle tedious for the programmer.

So, a new code was adopted, the hexadecimal (base 16) number system, which uses 16 alphanumeric characters (the ten numbers, 0 to 9, and the first six letters of the alphabet, A to F). Each character represents four bits, or binary digits, and is much more readable than long groups of 1s and 0s. Although the precise definition of machine language refers only to binary code, it has become common for the term to include hexadecimal code as well.

The novelty of not having to program in binary code soon wore off. Programmers began to realize that hexadecimal code was also nothing to write home about. So, they developed a code that consisted of mnemonic symbols, or abbreviations, for each of the CPU's instructions (e.g., LDA for LoaD the Accumulator with the value from memory). They added a few "bells and whistles" and called it assembly language. A program (called an assembler) was then developed to translate the code into executable machine language.

It wasn't long before assembly language also proved too clumsy, and various high-level languages were developed for specific tasks. Basic (Beginner's All-purpose Symbolic In-

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struction Code) was developed as a general-purpose language. Its prime advantage was that it was easy to learn because it looked very much like real, albeit slightly stilted, English.

The biggest problem was that it was now far removed from machine language, and programs to translate it into executable machine language became very complex. Two fundamental methods were then developed for translation.

One method involved translating and executing the instructions one at a time. The programs that did this were called interpreters.

The other method involved translating the entire high-level language program (the source program) at once, and then executing the translation (the object program). This process was called compiling.

Compilers: Advantages and Disadvantages

It might be helpful to compare translating a computer program to translating a foreign language. When the translation is done by an interpreter, it is instantaneous, but it has to be translated all over again if you need to review it. On the other hand, a translation by a compiler takes a bit longer, but it lets you review it immediately at any later time.

The biggest advantage compiling has over interpreting is speed of execution. An interpreter must fetch each instruction, parse and analyze it, check for errors, evaluate any functions, expressions and variables and then execute it. This is done for each instruction every time it is executed, even when the instruction is merely repeated because of a For. . . Next loop.

On the other hand, compilers parse, analyze, check for errors and evaluate only once—during compilation. In addition, a well-designed compiler can improve execution speed by optimizing variable storage (putting the most commonly used variables first in the storage area), utilizing true integer arithmetic (rather than converting from floating-point, as is done by Basic) and optimizing the code.

The biggest disadvantage of compiling is the inability to edit a compiled (object) program interactively. If you discover any bugs or logical errors after compiling, you have to correct them in the original (source) program, which you must then recompile. Most compilers provide some form of assistance in locating errors that may occur, but you wouldn't want to debug a complicated program this way.

Another potential disadvantage is that the object program will be larger whenever the source program is approximately 20K (80 blocks) or less. This occurs because of the way a typical Basic compiler does its translation. Very few compilers translate directly into machine language; most generate an intermediary code, called P-code. The use of P-code requires a library of subroutines to be appended to the source program, and these libraries can be up to 8K in size.

Finally, the process of compilation itself takes a certain amount of time, depending on the length of the source program.

A Comparative Look

So, it should start to be apparent that compilers aren't the perfect answer. There are penalties to be paid. More will become evident as we look at three specific Basic compilers available for the C-64: PETSpeed, DTL-Basic (also known as Insta-Speed) and Blitz.

I have assumed that most programmers would buy a compiler for the primary purpose of improving the execution speed of their Basic programs, so I'll be placing most of the emphasis on run-times. Nevertheless, I'll also be comparing compilation time, object code size and compatibility.

See Table 1 for a comparison of some of the features of the three compilers. It's interesting to note that the more recent the compiler (the farther to the right on the table), the smaller the programs. Otherwise, the compilers appear to be virtually identical, and it would be difficult to choose one based solely on this information. However, you'll shortly see that the three are vastly different in operation.

Before I describe the tests I made and their results, let me say that the comparisons themselves were accurate as far as they went, but it would not be correct to draw inferences about how well the compilers might work on types of programs that were not included in the tests. I chose three different programs, with the intention of testing the compilers under conditions that would be encountered in actual use rather than in a laboratory.

Timing was done within the programs themselves using the TI$ timer, to minimize the possibility of operator error. Compilation time was determined from the moment the compilers were run and did not include the time it took to load the main programs (although both PETSpeed and DTL-Basic load other programs from the main program, and this load time is included in the compilation time).

The first test involved creating 2600 random, five-character strings, tabulating the alphabetic occurrence of each string and then calculating the root mean square (RMS) as an indication of relative randomness. Each compiler was tested with three versions of the program:

- a long version (5 blocks), where each instruction occupied one line and spaces were placed between commands,
- a short version (4 blocks), where the instructions were packed onto 80-character lines and all spaces were removed,
- a compact version (2 blocks), where the instructions were packed onto 240-character lines.

This program was intended to test raw string-handling, as well as arithmetic, capabilities. The results are summarized in Table 2. (All times are given in seconds, and a lower RMS indicates a more even distribution of random elements.)

There are some interesting observations, including the fact that the string-creation time for the uncompiled version is 29–35% faster than the run-time for the version compiled with Blitz. There goes misconception number 1: Not all compiled programs run faster; it all depends on whether the compiler has been optimized for a particular function. It would appear that Blitz has not been optimized to handle strings.

On the other hand, PETSpeed, which has the longest compilation time and produces the largest object program, also has the fastest run-times: 335% faster than the uncompiled version and 23% faster than the next-fastest compiled version.

As might be expected, version B (short) has a marginally better performance. The shorter code just takes less time to interpret or to compile. But version C (compacted) seems to be anomalous.

In the first place, DTL-Basic could not compile it, and PETSpeed claimed to have compiled it, but the object program wouldn't run. In the second place, the run-times were longer than for the long version. Misconception number 2 is laid to rest: Just because it will run in Basic

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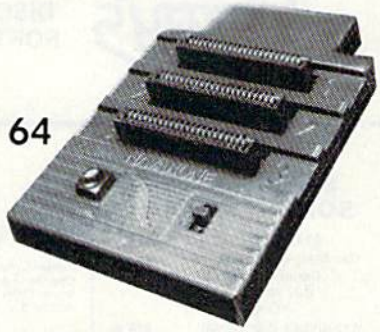
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doesn't mean that it can be compiled.

The second program used in the test was a hybrid disk-manager program containing some machine language subroutines. This program would appear at first glance to be unsuitable for compiling, as it consists primarily of direct disk-access commands, with a machine language sort and some very minor string manipulation and arithmetic calculation. However, it's a real and useful utility, which I use frequently. The results of the test are summarized in Table 3.

And now another surprise! Blitz is clearly the fastest compiler, by 210% over the uncompiled version. PETSpeed is close, at 151%, but requires well over twice as much time to compile, and produces object code that is one-third again as long. Again, DTL-Basic's only advantage is its short object program; but this is deceiving. When running DTL-Basic's object program, a separate 33-block run-time library is loaded as well. This has not been added to the block count in any of the tables.

The final test was also a program of practical use, but at the other end of the spectrum. It was a wargame simulation program of 108 blocks, with no machine language, but lots of arithmetic calculations. The results of the test are summarized in Table 4.

PETSpeed simply couldn't handle this test, as the source program was too long. When the compilation process crashed near the end of Pass 2, PETSpeed had created two intermediate programs of 44 blocks and 267 blocks, respectively, and had simply run out of disk space. While there had been a warning that programs longer than 80 blocks might require a dual disk drive (specifically, the 4040), I suspect that very few people own one, and thus, for all practical purposes, PETSpeed had reached its limit.

Analyzing the Results

In the last test, we have finally reached a point where the object programs are shorter than the source program (bearing in mind DTL-Basic's 33-block overhead), and the runtimes are appreciably faster. DTL-Basic is "only" 162% faster; Blitz is 246% faster! Compare this outcome with the results of the first test.

Despite initial appearances, the differences between the three compilers are pronounced and signifi-

	PETSPEED	DTL-BASIC	BLITZ
Country of origin	England	England	Germany
Number of sub-programs	9	4	1
Program size (blocks)	262	139	72
Compiler type	P-code	Run-Time Library	P-code
Number of passes	4	2	2
Type of protection	Dongle (joystick)	Dongle (cassette)	Disk
Suggested retail	$99	$99	$99
Manufacturer	Commodore	Cimmarron	Skyles

Table 1. *Physical features of PETSpeed, DTL-Basic and Blitz compilers compared.*

	BASIC	BLITZ	DTL	PETSPEED
Version A (long)				
Compilation time	n/a	120	55	330
Object program size (blocks)	5	28	3	65
String creation time	575	743	165	133
Calculation time	43	10	17	4
RMS	2.842	2.774	2.774	2.774
Version B (short)				
Compilation time	n/a	120	51	327
Object program size (blocks)	4	28	2	65
String creation time	555	737	160	131
Calculation time	42	10	16	4
RMS	2.896	2.631	2.631	2.631
Version C (compact)				
Compilation time	n/a	90	n/a	314
Object program size (blocks)	2	25	n/a	64
String creation time	562	759	n/a	n/a
Calculation time	42	10	n/a	n/a
RMS	2.787	2.9488	n/a	n/a

Table 2. *A comparison of the three compilers' raw string-handling and arithmetical capabilities. All times are given in seconds, and a lower root mean square (RMS) indicates a more even distribution of random elements.*

	BASIC	BLITZ	DTL	PETSPEED
Compilation time	n/a	240	317	641
Object program size (blocks)	19	37	17	50
Run time	93	30	50	37

Table 3. *A comparison of the three compilers and Basic using a hybrid disk-manager program.*

	BASIC	BLITZ	DTL	PETSPEED
Compilation time	n/a	1134	1863	n/a
Object program size (blocks)	108	101	93	n/a
Run time	506	146	193	n/a

Table 4. *A comparison of the three compilers and Basic using a 108-block program with many arithmetic calculations.*

cant. Not one of the three performed satisfactorily on all tests, but if you discount the test on the compacted program, then DTL-Basic seems to offer the best all-around performance—not the fastest, but not the slowest, either.

PETSpeed is the oldest of the three, and, as such, is no longer state-of-the-art. On the other hand, there are more articles and books available and more people experienced in its idiosyncracies.

Typically, it had the longest compilation times and produced the largest object programs. Its run-times were always near to being the best, but the limitations on program size are a definite detriment. The PETSpeed available now is version 2, suggesting that some bugs have been removed.

DTL-Basic is middle-aged and generally in the middle of performance. Its one (untested) advantage over PETSpeed is its ability to compile programs containing Basic extensions, such as Simons' Basic. It does this by passing through such commands as literals; the disadvantage is that an unnoticed misspelling of a Basic keyword could end up being passed through as well.

One of DTL-Basic's two capabilities that are unavailable in the others is a version that provides protection against copying; the other is a version (albeit not as fully featured) for cassette.

DTL-Basic also supports a number of compiler directives, which are specific commands to the compiler. These include the ability to specify integer arithmetic operations, to relocate variable tables for chaining, to disable the run/stop key and to allow for automatic adjustment of Peeks and Pokes. If actual object-program size is an important consideration, then DTL-Basic is the answer, as its run-time library is separate.

With the exception of string creation, Blitz produced object programs with the fastest run-times. It handled all programs in the test, including compacted programs, and is also capable of compiling programs containing Basic extensions (with the same proviso mentioned for DTL-Basic). Blitz was the most versatile and easiest to use of the three. R

Address all author correspondence to John Kula, 2522 Belmont Ave., Victoria, B.C., Canada V8R 4A4.

From p. 10.

Double-strike mode to get the best copies and have been well-pleased with the results of my word processor/computer printer combination.

Ed Schutz
Utica, MI

$230 Making spirit masters—Spirit masters are used on the so-called "ditto" machines, found in countless schools, clubs and churches. Use your printer to make the master, and you've got a very low-cost, time-efficient duplicating system. You'll have to make a few trial runs to optimize reproduction quality, since the printer must strike the paper with enough force to transfer the spirit ink onto the master.

Other printers may produce different results, but my Gemini 10X works best in Emphasize mode; Double-strike mode transfers too much ink, which results in filled-in letters. After printing, each of my masters makes about 75 copies. If I need more, I just print more masters!

Ed Schutz
Utica, MI

$231 Printer lockup fix—If a program locks up while it is trying to communicate with the printer, don't panic. Turn the printer off, then back on, and you'll probably clear the lockup.

Michael P. Rogalski
Monrovia, CA

$232 1526 secrets—The mechanism in this printer is the same as that in the Mannesmann Tally Spirit-80; Spirit-80 ribbons work perfectly in the 1526. The lever at the right of the platen is to adjust for paper thickness. Normal position is toward the platen; if you are doing envelopes or three-part forms, or if your print is smudging, move it toward the front of the machine.

Quinze Vingtetsix
West Chester, PA

$233 PaperClip and the DPS1101—Commodore's nice daisywheel printer can easily be used with the PaperClip word processor, *if* you know the secret. First, you *must* switch DIP switch #3. Then use the DAISY-A-NLF printer file. This will handle 5-pitch, 10-pitch, 12-pitch, 15-pitch, boldface, underline and sub/superscripts.

If you want to use shadow printing as well, you must run the printer setup program. When it asks you to load your previous file, load the DAISY-A-NLF file. For "italics on," use codes 27, then 87. For "italics off," use 27, then 38. Please realize that you can't get italics with a daisywheel—you get shadow printing instead.

Thomas F. Trocco
New York, NY

$234 Printer special features—Many non-Commodore printers have wonderful special features that can be used with commercial programs. To enable these features, one must often send several commands to the printer prior to loading the program. A good way to handle this without having to remember the commands is to include them in a small loader program that sends them, then loads the main program using dynamic keyboard techniques (see $23A).

For example, I use the following program to set my Epson to Double-strike mode with a five-line skip over perforations, after which it loads the PractiCalc program.

```
10 Q$ = CHR$(34) : OPEN 4,4
20 PRINT#4,CHR$(27)"G"
30 PRINT#4,CHR$(27)"N"CHR$(5)
40 PRINT
50 PRINT"LOAD" Q$ "PRACTICALC" Q$ ",8,1{2 CRSR UPs}";
60 POKE 631,13 : POKE 198,1 : END
```

Donald D. Fick
Muscatine, IA

$235 Plotter as printer—Commodore's slick little plotter can double as an 80-column word processing printer. Before loading your word processor, run the following driver program.

```
100 OPEN 6,6,6 : PRINT#6,1 : REM UPPER/LOWERCASE
200 OPEN 3,6,3 : PRINT#3,0 : REM 80 CHAR/LINE
300 OPEN 2,6,2 : PRINT#2,0 : REM BLACK INK
```

You must then set your word processor to send its text to device #6, rather than the usual 4 or 5. If you have PaperClip, run the MERGE PRTFIL-D program and merge PaperClip with the 1525-P-ALF printer file. Then run the PRINTER SETUP-D program and set the printer device to #6. Save this newly modified PaperClip program. When you run it, your printer device will automatically be set to 6.

We like to use the 1520 as a portable printer, and its small size more than makes up for its tiny little letters.

Thomas F. Trocco
New York, NY

$236 Easy Script Oki-magic—If you have used the Okimate 10 with Easy Script, you may have been dismayed to find that the gaps for page-skipping are twice as wide as they should be and that the error increases with every printed page. The trouble is that both Okimate and Easy Script have an automatic page-skip feature. The solution is to disable the Okimate's automatic perf-skip by executing the following line before loading Easy Script.

```
OPEN 1,4,0 : PRINT#1,CHR$(27);"B"
```

Charles L. Baker
Topeka, KS

$237 Olivetti PR2300 ink—Thousands of Commodore owners also own this printer, and most of them have run out of dry ink ampules. I searched for ampules for almost a year and finally gave up trying to find them. Out of desperation, I tried refilling my old ones with the extra-fine graphite power sold as a lubricant at hardware stores. It really works great and has given me no trouble.

Jim R. Williamson
Carrollton, TX

$238 Simple cursor for GET—The various methods of establishing a flashing cursor to use with the Get statement are sometimes unsatisfactory for reasons of complexity or their tendency to leave white squares on the screen. This easy way uses a non-blinking cursor and is perfectly fine for my purposes. Perhaps you will like it, too.

```
100 PRINT "{RVS ON}{SPACE}{RVS OFF}{CRSR LF}";
110 GET A$ : IF A$="" THEN 110
120 IF A$=CHR$(13) THEN PRINT "{SPACE}"; CHR$(20) :
    GOTO 150
130 PRINT A$;
140 GOTO 100
150 Rest of program goes here
```

Osp Viggosdottir
Reykjavik, Iceland

$239 Line tack—When you're debugging a program and get a Syntax error in a line that appears correct, try listing the line by itself. (Example: LIST 120.) If you get two lines instead of one, you have what I call *line tack*. It's caused when you type a line exactly 40 characters long, then type another line below it, without first pressing the return key.

The computer interprets this as one long line and executes it correctly until it encounters the second line number, which causes the error. The cure is to type both lines again, being careful to press the return key at the end of the first one. If you're skillful with the screen editor, you can list the offending line twice, then edit both listings to achieve the desired effect.

Rickey Bartlett
Plumerville, AR

$23A Dynamic keyboard explained—It's easy to make a program simulate keypresses, with truly magical effect. The technique has been around at least since 1978 and is commonly called *dynamic keyboard*. The basic idea is to have your program Poke the CHR$ 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 act like 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. For the Plus/4 and C-16, the buffer runs from 1319–1328, and the counter is in 239. Run this little program to see the principle in action:

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

The Plus/4 version is:

```
10 FORI=1TO10:POKE 1398+I,65:NEXT:POKE 239,10:END
```

You should get the Ready prompt, followed by a series of ten As (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. 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.

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.

R.E. Peat
Pittsburgh, PA

$23B Disk labels—To give my disks individuality and character, I remove the manufacturer's label from the upper-left corner, then hunt through magazines and other literature for suitable material to cut out and paste in its place. It's amazing what can be found to make your disks distinctive and easy to find in a file.

Ken Williams
Wahroonga, NSW
Australia

$23C VIC Super-expander disable—Due to its many added commands, this popular plug-in restricts the variable names you can use in your programs. Moreover, programs that use the function keys will not run properly, if at all. You can deactivate the Super-expander's extra features, leaving its 3K of RAM expansion intact, by entering SYS64818 after a reset or after turning on the computer. The technique also works if additional RAM expansion has been installed, but, of course, the 3K is not then available to Basic.

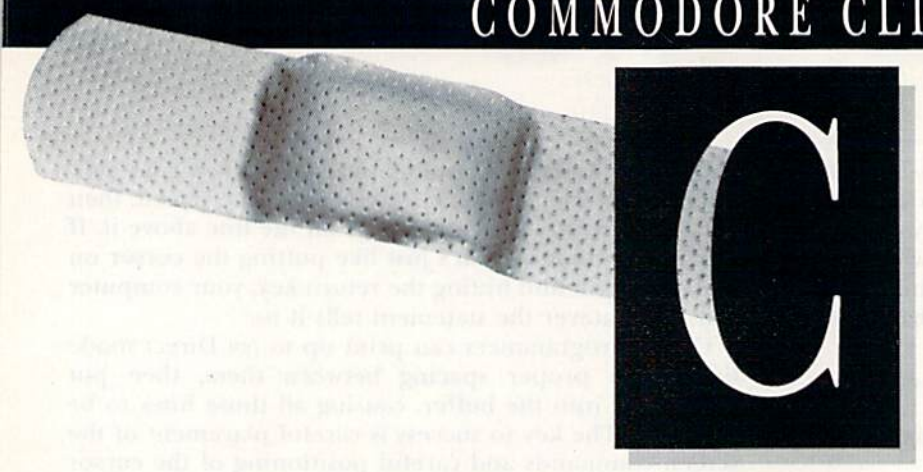
Daniel L. Scheftner
Iwakuni, Japan

$23D Short-wave computing—Hams and SWLs can find a Commodore User's Net on Saturdays at 1500 Eastern Time on 7.228 MHz, lower sideband. All licensed hams are invited to participate.

Warren Flynn, WB4ZOJ
Temple, GA

$23E Batteries excluded—If you're tempted to buy rechargeable ni-cads for all those battery-powered items around the computer room, you might want to think again. While they're great for powering toys, and so on, ni-cads don't hold a charge very long, which makes them a liability in seldom-used items like flashlights. And they have a disturbing tendency to fail completely after a year or so, leaving you with an incomplete set of batteries. Did you ever try to buy *one* AA-size ni-cad?

L.F.S.



C

JIM STRASMA

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UPDATE

Update: In your April column, you ran a letter in which readers were referred to me for my replacement character-generator ROM with true descenders for the MPS 801 printer. I suddenly started getting heaps of letters from all over the place. The response has been nothing short of amazing.

To save me heaps of postage, perhaps you could advise your American and Canadian readers interested in my product to contact:

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I also have a 1525 printer ROM and will do something about that if folks want. Anyone out there interested?

Paul Blair
Holder Act
Australia

A: I hope you're getting that 1525 chip ready now, Paul. I expect you're in for another load of mail requesting it. Now for the big one—how about a revised ROM for the 1526 that is fully compatible with high-resolution graphics on the 1525 and 801?

REPAIRS

Q: **I recently lost the ability to move right with the joystick on my C-64. This condition exists on all my programs that use joysticks. I tried checking my joystick, but with no success. Is there any hope short of sending my C-64 in for repair?**

Greg Ankrom
Bolivar, MO

A: This is a popular question. When your joystick stops working, you should first borrow another and see if the problem persists. Some joysticks are easily broken, especially the wires in the cable that connect them to your computer. If the problem is not in the joystick, it is probably in the 6526 chip at U1. This CIA chip is responsible for both joystick ports and is extremely sensitive to damage from static shock or an accidental short. If you replace it, be sure to seat the new chip in a socket to prevent it from happening again.

It has also been suggested that such problems can be minimized in the future by inserting a thin piece of conductive foam (such as is sold by Radio Shack) into the joystick port. The joystick will push the foam to the rear of the port opening; that way, you can forget about it, but the foam will still be there to trap static shocks. Unfortunately, the foam will also interfere with game paddles, but very few programs use them.

Q: **I own a C-64 and a 1541 drive. My problem is that every other key on the top row of the keyboard locks up every once in a while.**

George Rebuck
Somerville, NJ

A: Most likely, you, too, need to replace your C-64's CIA chip at U1. Decoding the keyboard is another of its many chores. But first get a continuity tester, or ohmmeter, and test to make sure all the wires from the computer to the keyboard are still intact. A loose wire can also cause keyboard failure.

Q: **My C-64 keyboard is beginning to suffer from key bounce. Do any companies (Commodore included) offer replacement keyboards?**

Laura Thompson
Alexandria, VA

A: Gregory Kundert, of Detroit Lakes, MN, recently wrote to suggest one solution—swapping a keyboard

from a VIC. With VICs widely available on the used market, this is probably a good solution. You can also have your dealer order a replacement keyboard from Commodore.

However, let me make one other suggestion. When key bounce becomes a problem on Commodore keyboards, it's usually limited to one or two keys. If you are mechanically inclined, you can disassemble the keyboard with a #0 Phillips screwdriver and swap the offending key contacts with those of a rarely used key; clean the keyboard contacts with a pencil eraser, and you'll have a usable keyboard again at no charge other than your labor.

PROGRAMMING

Q: Is there a function, such as CLOSE 15, that will close all the files previously opened?

Dennis Lancaster
Gaylord, MI

A: Yes, there is, and you've just given it. Assuming you've previously opened a command channel to the disk (with OPEN 15,8,15), the channel and all open disk files are closed simultaneously by the single command CLOSE 15. To cover all possibilities, you could give it twice, as follows:

```
970 CLOSE 15
980 OPEN 15,8,15
990 CLOSE 15
```

The extra Close statement takes care of situations in which file 15 was already open unexpectedly, and the Open statement takes care of times when you forgot to open file 15 earlier.

Q: How can I run a program without clearing existing variables?

Chad Jones
San Gabriel, CA

A: Simply list the program and jot down its first line number. Then, instead of typing RUN, use the Goto command to access that line number. Thus, if 100 were your first line number, you would type GOTO 100.

Q: Why would a random number come up with an Out of Memory error? After I have entered a small routine to establish a new random number—perhaps 15 times as I play a game—it comes up with the above error.

William Schutt
Smyrna, TN

A: Your problem isn't your random number command; it's how you return from the subroutine that generates it. There are two ways to run out of memory. The most common is by using up all your Basic work space. However, it is also possible to run out of stack memory by using the Gosub command without matching Return statements. If this is the case, ? FRE(0) will return a sizable non-zero value.

The simple rule that will prevent such errors is this: Every Gosub needs a Return, and every For needs a Next. This will be easiest to enforce if you plan your programs so each subroutine has only one entrance and only one exit. (Gosubs within a subroutine don't count, since they, too, must return from whence they came.) If you avoid all Goto and If...Then statements that exit a subroutine prematurely, you shouldn't see that error message again.

Q: Recently, a colleague mentioned that the TRS-80 has a memory location that can be Poked to increase the speed of the CPU. Can you recommend anything to speed up computations in the C-64?

Mark Janus
Panama City Beach, FL

A: The only speed-up Poke I've heard of on the 64 is POKE 53265,11. It turns off the VIC-II chip and eliminates its interruptions of the 6510 processor, giving about a 25% increase in speed. The catch is that the Poke also turns off the screen. When you need the screen again, POKE 53265,27 turns it back on.

If you need further speed increases, you may want to upgrade to the new C-128, which has a faster processor and a better way of handling garbage collection (reclaiming the memory space used by no-longer-needed strings), plus a disk drive expected to be much faster than those previously available.

Q: A short time ago, I found a program for formatting a new disk. It would header a disk and then ask, "Do you want to format another Y/N?" Could you furnish me with a program like this?

Robert Smith
Ennis, TX

A: Here's a simple one:

```
100 REM HEADER JFS
110 OPEN 15,8,15
120 ?"INSERT A NEW OR REUSABLE"
130 ?"DISK. THEN ENTER A DISK"
140 ?"NAME OF 1-16 CHARACTERS."
150 INPUT N$
160 ?"NOW ENTER A UNIQUE 1-2"
170 ?"CHARACTER DISKETTE ID."
180 INPUT ID$
190 ?"WORKING. PLEASE WAIT."
200 PRINT#15,"N0:"+N$+","+ID$
210 INPUT#15,EN,EM$,ET,ES
220 IF EN=0 THEN 250
230 ?"ERROR:";EN;EM$;ET;ES
240 ?"UNABLE TO HEADER THIS DISK."
250 ?"PRESS 'Y' TO FORMAT NEXT"
260 ?"DISKETTE, OR 'N' TO QUIT."
270 GET A$
280 IF A$="N" THEN CLOSE 15:END
290 IF A$="Y" THEN 120
300 GOTO 270
```

If you want to use the program on a second disk unit, change the 8 in line 110 to the correct device number for that disk. Similarly, to use it on drive 1 of a dual disk drive, change the 0 in line 200 to a 1.

Q: I have been using your fine book, *CBM Professional Computer Guide*, from Osborne/McGraw-Hill, to write many programs for my company. Now, I have had several requests for a very large relative record program, consisting of 48 fields and a record length of 600 bytes. Is it possible to write such a long record?

David Runnion
Ashtabula, OH

A: To go beyond 254 characters per record, simply separate your logical records within the program from the physical records on disk. Instead of cramming all 48 fields into a single disk record, limited to 254 characters, let each disk record be a single field in your logical file and think of each multiple of 48 disk records as a new logical record. The disk record length for this file will be the length of your longest field, and the number of disk records needed will be 48 times the number of logical records wanted.

The only problem you are likely to encounter is the need for a larger disk drive. If that happens, be sure to get one with DOS 2.7 or higher. Early 8050 disk drives need a DOS upgrade to work properly with relative files that fill the entire disk.

HARDWARE

Q: **I recently purchased a B-128. Is there any way to run programs written on the B-128 in 4.0 Basic on the 64?**

Richard Wiedl
Seymour, CT

A: The Basic used by the B-128 is not the same as the Basic 4.0 used in Commodore's 4016, 4032 and 8032. Thus, programs written on the B-128 may not be usable even on Basic 4.0 machines, especially if they use its added features, such as the Print Using command. On the other hand, if you avoid such commands, limiting yourself to those commands available on the 8032, you may be able to run B-128 programs on the 64 by buying Basic 4.0 for your C-64. It is included in two products from Batteries Included (the Bus Card and the BI-80), in Richvale Telecommunications' C-64 Link and the Skyles Electric Works' VIC Tree.

Q: **I have an SX-64 and want to install a second disk drive. Where can I purchase one with directions for installing it?**

Bob Millwood
5032 Hillwood Court
Matthews, NC

A: At last summer's MARCA computer fair, a proud hobbyist showed me a dual drive SX-64. At the time, I thought it a good piece of work. Having since spent some time making adjustments inside my own SX-64, I am now amazed that he managed to cram everything in. He did so, as I understand, by fitting the internal pieces of a regular 1541 drive into the empty slot in the SX. This will *not* be easy, but it *has* been done. I've included your address in case anyone has detailed instructions for you.

Q: **I have considered purchasing the MSD SD-2 disk drive. Will my C-64 programs work on this drive, and will it work with the new C-128?**

Ernest Briggs
Tahlequah, OK

A: Most C-64 owners are very happy with the MSD SD-2, as I am with mine. However, like all compatibles, the MSD cannot run a few programs that work on the 1541, usually those using elaborate copy-protection schemes based on precise memory locations inside the 1541. In such cases, I have always been able to find equally good competing programs that *do* work with the MSD.

If you are seriously thinking about buying a C-128, your best choice of a drive may be to wait for Commodore's new 1571 single or 1572 dual drive. These are expected to give C-128 owners added storage, fast access and CP/M compatibility. However, if you don't need those features, our MSD SD-2 works very well with the C-128.

Q: **I have a C-64, 1541 drive and a 1702 monitor. If I purchase the new C-128, will there be any reason I can't use my present drive and monitor? And what about my existing software—will all existing software be compatible?**

Doug Mlodzinski
Canandaigua, NY

A: The C-128 is almost 100% compatible with all programs written for the 64. Though it includes many new features, when the 128 is in C-64 mode, it's a 64—all features intact. Even when first turned on or reset, it runs nearly all 64 cartridges and other programs correctly, even 1541 disk-based programs that are heavily protected against copying. Similarly, all programs for the 64 should work normally with your 1702 monitor when using the new C-128 computer.

What will make you want to upgrade your disk drive and monitor later is the C-128's added features. For instance, you'll probably need the new 1571 disk drive to use the C-128's 80-column CP/M mode. Similarly, to use the C-128's 80-column color displays, you'll want Commodore's new 1902 RGB-I monitor, or a similar one offered by other makers; any monitor compatible with the IBM PC should do for the 80-column color displays. However, most other monitors don't include chrominance and luminance connectors like the 1702 and 1902, so you may want to keep your 1702, too, if you buy a non-Commodore RGB monitor.

SOFTWARE

Q: **Are the programs listed in books and magazines public domain, and can I copy them to sell?**

Steave Trelut
Greeley, CO

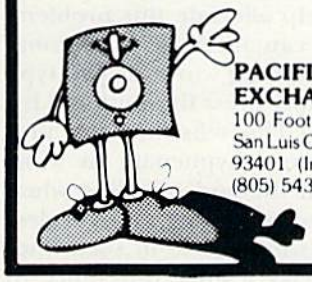
A: No, programs in books and magazines are not usually in the public domain, and you very definitely may *not* sell them, even for a small copying fee. Most magazines do this for the protection of their authors, rather than their own profit. I got my own start as an author on the profits from selling copies of my first published program, with the full approval of my publisher.

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Q: I work as a sports writer at a newspaper and use a portable computer to send stories back to the office computer. Sometimes I use portables at my house, too, but I feel I can use my 64 just as well, except I'm not sure what equipment I need. The computer at the office receives at 300 baud. What kind of modem do I need, and what about a word processing program? I'm using Easy Script, but find it very limiting.

John Alred
Gadsden, AL

A: Since you use portable computers in addition to the office computer, you might do best to get an RS-232 interface for your 64, such as the VIC 1011-A, and a Hayes-compatible RS-232 modem. Though this combination will cost a good deal more than the 1650 modem most 64 owners use, it will allow you to connect your 64 to a portable directly via a null modem adapter, as well as to call the office computer.

I suggest Hayes compatibility because its commands have become standard in office computers. Although your office now uses 300 baud, I suggest getting a 300/1200-baud modem, since the industry is headed that way. (Commodore announced one at the Winter 1985 Consumer Electronics Show.)

As for a word processor to work with this equipment, Easy Script is actually one of your better choices. It is able to save its documents as sequential datafiles, which is the main requirement for being able to send them to your office computer via a terminal program. To suggest another, I'd have to know what you find limiting about Easy Script.

Q: I am planning to buy Word Pro 64, but I find this problem with word processors: they sometimes leave too much space between words when you justify the margins, making words look too spread apart in the line. How can I avoid this, so text looks more compact?

Jose A. Alvarez
St. Croix, VI

A: WordPro 64 offers two features to help alleviate this problem. First, you can insert a conditional hyphen into long words as you type them. (Simply press the shift and hyphen keys.) This tells the word processor where to hyphenate the word if it falls at the end of a line when displayed or printed. This leaves less unwanted white space in such lines and can make a huge difference in the neatness of printouts from many popular word processors.

The other way WordPro 64 fights excess white space is by providing true proportional spacing in final printouts. This means that instead of inserting the extra spaces needed to justify margins only between words, much smaller spaces are added between each letter in the printout (called microjustification), and more space is allotted to wide letters like "w" than to narrow ones like "i." This is an advanced feature and requires an equally advanced printer to work properly.

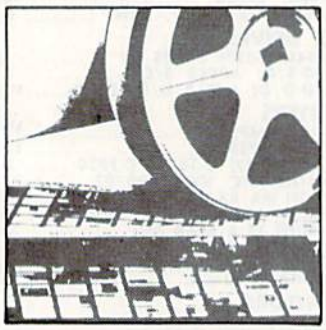
Q: Where can I purchase a tutorial cartridge for the Plus/4?

Michael Sohaski
1433 E. Highway 89A
Cottonwood, AZ 86326

A: I'm not aware of a tutorial cartridge for the Plus/4, or even a book about it, but I've included your address, so anyone who has one can contact you.

Meanwhile, you can find much of the help you need in most standard college textbooks on Basic programming. Many of the new commands used in the Plus/4 are common in other larger computers and well-described in textbooks on Microsoft Basic programming. Also, Basic 7.0 on the new C-128 is largely compatible with the Plus/4, including its file-handling, sound and graphics commands. This means you may be able to use some programs written specifically for that model in addition to those written for your own. R

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Local service is now available to Commodore computer owners through the creation of a national network of service centers. This is the second of three sections of the state-by-state service center list provided to RUN *by Commodore. For addresses in Alabama through Iowa, see the July issue. A call to the toll-free Commodore support hot line (800-247-9000) will give you the most up-to-date information about service and dealer locations.*

Attention, dealers: If we haven't included you, send in the name, address and telephone number of your store to RUN, *80 Pine St., Peterborough, NH 03458. We'll update the list in subsequent issues.*

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E. Detroit, MI 48021
313-778-1200

RCA Service Co.
2945 Madison Ave. S.E.
Grand Rapids, MI 49508
616-241-2629

RCA Service Co.
11805 Mayfield
Livonia, MI 48150
313-522-4800

Repair America
1550 Lake Drive S.E.
Grand Rapids, MI 49506
616-456-8460

Skory TV
901 Cleveland St.
Lansing, MI 48906
517-485-9551

Sterling Electronics
1477 Dix
Lincoln Park, MI 48146
313-382-1111

Vor-Tech
1109 Joslyn
Pontiac, MI 48053
313-334-4048

MINNESOTA

Duo Sonic
1525 E. Lake St.
Minneapolis, MN 55407
612-721-6668

Duo Sonic
779 E. 7th St.
St. Paul, MN 55106
612-774-1075

ESC, Inc.
8420 Sunset Road N.E.
Spring Lake Park, MN 55432
612-786-8940

H&H TV & Electronics
2625 Louisiana Ave. S.
Minneapolis, MN 55426
612-929-1721

RCA Service Co.
633 Hoover St. N.E.
Minneapolis, MN 55413
612-331-8701

West Central Computer
208 N.W. 2nd St.
Ortonville, MN 56278
612-839-2150

MISSOURI

Alpha Audio Labs, Inc.
1411 S. Big Bend Blvd.
St. Louis, MO 63117
314-645-5250

Computer System Consultant
3620 Santiago Drive
Florissant, MO 63033
314-838-7701

Electronic Data
12400 Blue Ridge
Grandview, MO 64030
816-966-0669

Lectroplex
Rt. 2, #9 Countryside Acres
Pacific, MO 63069
314-257-5054

RCA Service Co.
6100 Watson Road
Webster Groves, MO 63114
314-843-4401

RCA Service Co.
8961 Page Ave.
Overland, MO 63114
314-423-0633

Sascoa
7536 Forsyth Blvd.
Clayton, MO 63105
314-726-2772

Systems Plus
5585 Pershing Ave.
St. Louis, MO 63112
314-361-8825

MONTANA

Applegren Enterprises
901 14th St. N.
Great Falls, MT 59401
406-761-5976

Computer Service
3325 W. Central
Missoula, MT 59801
406-728-7252

NEBRASKA

Double E Electronics
12027 Pacific St.
Omaha, NE 68154
402-334-7870

Microserve
1012 S. 74th Plaza
Omaha, NE 68114
402-399-7152

RCA Service Co.
2114 S. 37th St.
Omaha, NE 68105
402-345-9300

NEVADA

Hotel Computer
376 W. Sahara Ave.
Las Vegas, NV 89102
702-384-9440

RCA Service Co.
733 E. Glendale Ave.
Sparks, NV 89431
702-358-1150

RCA Service Co.
1125 S. Maryland Parkway
Las Vegas, NV 89104
702-384-9800

NEW HAMPSHIRE

Dover Electronics
157 Portland Ave.
Dover, NH 03820
603-749-4972

J. Treisman, Inc.
300 Hanover St.
Manchester, NH 03104
603-669-5622

North Country Computer
Village Square, Tenney Mt. Highway
Plymouth, NH 03264
603-536-4163

Wayne Green Enterprises
WGE Center, Rt. 202 N.
Peterborough, NH 03458
603-924-9261

NEW JERSEY

Advanced Electronics
Village Shopping Center, Rt. #206
Flanders, NJ 07836
201-584-1252

Aveco
777 Rt. 17
Paramus, NJ 07652
201-652-9222

ACA TV & Electronics, Inc.
2076 Woodbridge Ave.
Edison, NJ 08817
201-985-7000

Blue Chip Computer
1290 Black Horse Pike
Turnersville, NJ 08012
609-728-9546

Circuit Services
185 Spring St.
Newton, NJ 07860
201-579-1068

Computer Madness, Inc. CMI
297-D Rt. 9
Englishtown, NJ 07726
201-462-9696

Dash Electronics
10 North Second Ave.
Highland Park, NJ 08904
201-247-5124

ESY, Inc.
1000 Springfield Ave.
Irvington, NJ 07111
201-373-3111

Gimm Consultants
190 Rt. 73
Maple Shade, NJ 08052
609-667-6900

Golden Hedge
1334 Brace Road
Cherry Hill, NJ 08034
609-772-0022

Jemini, Inc.
10 White Deer Plaza
Sparta, NJ 07871
201-729-2663

JRM Electronics
PO Box 2135
Vincentown; NJ 08088
609-859-2106

Kita, Inc./Video Connection
900 Easton Ave.
Somerset, NJ 08873
201-545-8733

RCA Service Co.
6110 S. Shore Road U.S. Rt. 9
Marmora, NJ 08223
609-641-7320

RCA Service Co.
375 Crescent Blvd.
Gloucester City, NJ 08030
609-456-7600

RCA Service Co.
1 White Horse Pike/Milford Road
Berlin, NJ 08009
609-767-9000

RCA Service Co.
285 Midland Ave.
Saddle Brook, NJ 07662
201-794-9220

RCA Service Co.
1675 Highway 34
Wall Township, NJ 07719
201-938-4806

RCA Service Co.
Rt. 46
Denville, NJ 07834
201-627-8120

RCA Service Co.
131 Lawrence Road
Trenton, NJ 08638
609-882-9600

RCA Service Co.
34 Commerce Way
Hackensack, NJ 07602
201-343-3900

RCA Service Co.
2520 Randolph Ave.
Avenel, NJ 07001
201-388-6000

Repair Tech, Inc.
185 Spring St.
Newton, NJ 07860
201-579-1068

Software Center
372 Highway 18
E. Brunswick, NJ 08816
201-257-7778

SR Data
2141 Woodbridge Ave.
Edison, NJ 08817
201-985-5017

Telstar Electronics
829 Stone Road
Laurel Springs, NJ 08021
609-783-8500

Test Technology
1149 Marlkress Road
Cherry Hill, NJ 08003
609-424-6570

Z-Tech Corp.
109 Gaither Drive
Mt. Laurel, NJ 08054
609-234-4969

NEW MEXICO

Academy Computers
1720 Juan Tabo N.E.
Albuquerque, NM 87112
505-296-4887

RCA Service Co.
2705A Pan Am Freeway N.E.
Albuquerque, NM 87107
505-345-5462

Technological Concepts
3700 Paradise Lane
Las Cruces, NM 88005
505-526-6029

NEW YORK

Albany Cash Register
224 Central Ave.
Albany, NY 12206
518-434-6331

Albany Microcomputer Service
1494 Solano Ave., Suite #4
Albany, NY 94706
415-527-9619

Blumenthals
234 N. Union
Olean, NY 14760
716-375-4608

Circuit City Service
131 Eileen Way
Syosset, NY 11791
516-921-8300

Compusat
2492 N. Jerusalem Road
North Bellmore, NY 11710
516-785-4938

Computer House
596 Lake Ave.
Rochester, NY 14613
716-458-1790

Computer Palace
465-A Rt. 112
Patchogue, NY 11772
516-654-8573

Computer Service Associates
181-B Rt. 94N
Warwick, NY 10940
914-986-0233

Crazy Eddie
2845 Coney Island Ave.
Brooklyn, NY 11235
212-934-0100

DAC Data Systems
43-65 147th St.
Flushing, NY 11355
718-762-4200

Dale Integrated Service
1530 Walden Ave.
Cheektowaga, NY 14225
716-894-2041

Expert Electronics
63-56 108th St.
Forest Hills, NY 11375
718-897-6101

Green Arrow, Inc.
5801 Sunrise Hwy.
Holbrook, NY 11782
516-567-0716

Honders, Inc.
37 North St.
Middletown, NY 10940
914-343-8740

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Coram, NY 11727
516-736-1001

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Westfield, NY 14878
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212-597-1160

OHM Electronics
609 W. Clinton St.
Ithaca, NY 14850
607-273-8406

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4533 Bailey Ave.
Amherst, NY 14226
716-832-8800

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PO Box 745
Glens Falls, NY 12801
518-792-5848

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518-783-7067

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518-483-3241

Ray Supply Co.
439 Cornelia St.
Plattsburg, NY 12901
518-561-3870

Ray Supply Co.
Bayberry Plaza, Rt. 57
Liverpool, NY 13088
315-622-2551

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East Farmingdale, NY 11735
516-293-9440

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Brooklyn, NY 11203
718-859-8900

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3211 Boston Road
Bronx, NY 10469
212-882-1000

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410 Saw Mill River Road
Elmsford, NY 10523
914-592-5390

RCA Service Co.
72-35 51st Ave.
Woodside, NY 11377
718-507-5250

RCA Service Co.
5420 50th St.
Maspeth, NY 11378
718-937-8383

RCA Service Co.
113 Oakdale Road
Johnson City, NY 13790
607-797-2352

RCA Service Co.
14 Jet View Drive
Rochester, NY 14624
716-436-1820

RCA Service Co.
36766 Old Collamer Road
East Syracuse, NY 13057
800-345-3445

RCA Service Co.
1690 Walden Way
Buffalo, NY 14225
716-896-6200

RCA Service Co.
347 New Karner Road
Albany, NY 12205
518-456-1334

Sascoa
7 Herbert Drive S.
Latham, NY 12110
518-785-5816

Software City
187 Main St.
Mt. Kisco, NY 10549
914-666-6036

Systems Repair Company
61 Maple Ave.
New City, NY 10956
914-634-7596

Terminals Co.
87 Nassau St.
New York, NY 10038
212-233-6356

The Little Computer Shop
51 Modells Shopping Center
Centereach, NY 11720
516-467-4352

The Service Place
150 Main St.
Fishkill, NY 12524
914-896-4761

Video Computer Center
407 W. Liberty St.
Rome, NY 13440
315-336-0266

William Pizer Associates
363 Hamilton St.
Albany, NY 12210
518-436-1190

Copyright B

Compiled by SUSAN TANONA

Programming Your Commodore 64 in Basic

Mario J. Eisenbacher
Prentice-Hall, Inc.
PO Box 819
Englewood Cliffs, NJ 07632
Softcover, 244 pp., $12.95

I have recently examined more than two dozen books that teach beginning Basic programming. Among some very good books, *Programming Your Commodore 64 in Basic* is the best I've seen.

Author Mario Eisenbacher offers several unusual features that make his book outstanding. First, he brings the possibility of making mistakes right out into the open. He discusses probable errors before they come up, and even encourages you to deliberately make mistakes to see the result.

This book is the first that I've seen that successfully combines teaching computer literacy with programming. Many beginning programming books seem to forget that a newcomer may not have a broad general knowledge of computer operations. Eisenbacher devotes an entire chapter to the essentials of putting a computer system together.

Each chapter begins with a brief list of what will be covered. The text itself is easy to skim, as rules, hints and notes are set off from the rest of the text. The index is very weak, so the easy scanning is especially helpful.

The heart of this book is Eisenbacher's exercises, and they are excellent. He provides about 20 per chapter, and they cover the material very well. I teach Basic programming, yet I found that I learned some new things by working with these exercises.

The problems are mostly questions that test your memory of the material in the book, but some also require you to write programs. Eisenbacher provides the answers, including sample program solutions, for every exercise in the book.

By the time you've worked your way through this book, you will be a creditable programmer. You will have experience with the fundamental mechanisms of Basic, as well as an introduction to the mysteries of working with graphics and music on the C-64.

Reading a book is not enough to learn programming. The best books guide you through the practice of a new skill. *Programming Your Commodore 64 in Basic* is an excellent guide.

Annette Hinshaw
Tulsa, OK

Porter's Programs for the Commodore 64

Kent Porter
New American Library
1633 Broadway
New York, NY 10019
Softcover, 152 pp., $6.95

Kent Porter is the author of many books about computers. Both his computer expertise and his exceptional ability to communicate have virtually guaranteed the success of his works. With *Porter's Programs for the Commodore 64*, Mr. Porter has done it again.

This book is a collection of about 65 Basic programs (with some machine language interspersed) in eight major areas. From programs about money, mathematics, weights and measures, sorting and text processing, to programs dealing with time, computer games, sound effects and music, Porter has covered a lot of material, and he's done it very well.

All of the listings are fairly short, concise, uncluttered and well written. Virtually all readers should find some valuable use for the programs.

If you don't want to take the time to type and save the program listings, Porter has provided a coupon that can be used to order a disk containing all of the programs. It is provided for $19.95 ($24.95 for Canadian residents), plus $1 for postage and handling.

I typed, listed, saved and ran 12 programs directly from the book and was very impressed. Although all of the programs that I typed were fairly complex, I found no errors in them. The listings are very sharp and easy to read.

Porter also thoughtfully broke down the numerical data statements into groups of three, making it easier for you to type them without losing your place. Best of all, the programs ran well and did exactly what they were supposed to do.

I recommend this book for any C-64 owner. It contains many high-quality, practical programs that any computer owner would love for his library. Also, if you carefully go over each of the programs line by line, you'll undoubtedly learn a great deal about computer programming.

Porter's Programs for the Commodore

64 is a classic that you should regard as an essential addition to your computer library. It's one that you simply shouldn't do without.

Gerald Gelvin
St. Simons Island, GA

Assembly Language for Kids: Commodore 64

William B. Sanders
Microcomscribe
8982 Stimson Court
San Diego, CA 92129
Softcover, 337 pp., $14.95

Assembly Language for Kids: Commodore 64 is the clearest introduction to assembly language that I've ever seen, and is suitable for beginning programmers of *all* ages.

In case you don't have an assembler, Sanders provides a listing for one that has quite useful, though somewhat limited, applications. You can also order it on disk ($10) from Microcomscribe.

Sanders describes two other assemblers—Merlin 64 and the Commodore 64 Macro Assembler Development System. In addition, he clearly discusses the general characteristics of an assembler so that owners of other assemblers can readily use this book.

Sanders gets you started right away by placing you at your computer, programming and running simple programs in assembly language. The level of difficulty gradually increases as your implicit understanding of computer architecture grows.

Only after the assembly world has become familiar to you, are binary and hexadecimal numbers introduced, as well as registers and flags. Then it's on to simple descriptions of memory and storage and the use of the built-in Kernal subroutines.

Other topics covered include the use of the screen for storage, addressing modes, cover loops and branches, and low-resolution graphics.

The only major inconvenience I encountered in the book was the absence of a complete op-code table. Appendix B is limited to an alphabetical listing of op codes with equivalent machine codes and mnemonics. A more complete table, along with a brief description of the operation performed by each code, would have been helpful.

Aside from a few ambiguities that I discovered in the text, this book presents a very solid introduction to assembly language, and can provide the bridge to assembly-language programming that is so badly needed.

Norman Chaplin
Allentown, PA

New Releases

Commodore 64 Logo: A Learning and Teaching Guide

Peter Goodyear (John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158. Softcover, 201 pp., $14.95.) This introduction to the Logo programming language discusses turtle graphics, how to print and read programs, and how to write and process lists.

Programmer's Desk Reference for Commodore 64 Basic

Mona Rienhardt (Brady Communications Co., Inc., Bowie, MD 20715. Softcover, 166 pp., $14.95.) This book provides insights into programming the C-64. In-depth examples and cross-references are included.

The Book of Commodore Software 1985

(Arrays, Inc./Continental Software, 11223 South Hindry Ave., Los Angeles, CA 90045. Softcover, 421 pp., $19.95.) This directory of software for the C-64, VIC-20 and PET computers contains reviews of nearly 600 programs. Subject matter covered includes entertainment, word processing, education, business, utilities and graphics.

Easy Interfacing Projects for the Commodore 64

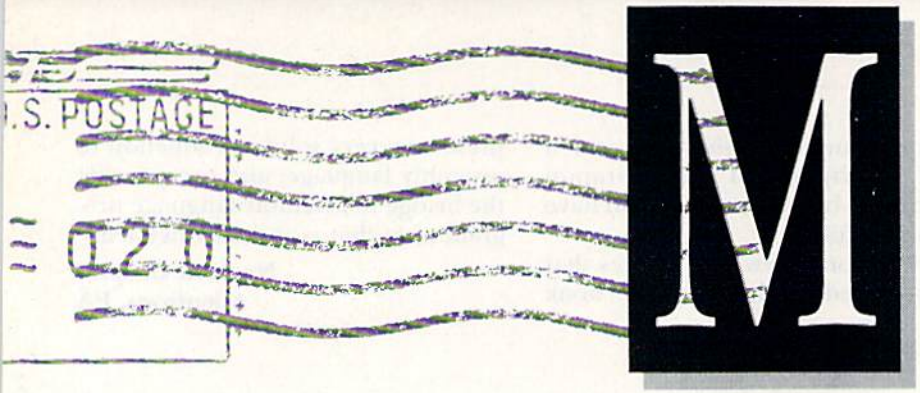
Jim Downey, Don Rindsberg and William Isherwood (Prentice-Hall, Inc., PO Box 819, Englewood Cliffs, NJ 07632. Softcover, $10.95.) A beginner's guide to interfacing the C-64 with the outside world. Projects include a speech synthesizer, a telephone modem and printer interfaces.

The Commodore Plus/4 Book

Sarah C. Meyer (Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, IN 46268. Softcover, $16.95.) This introduction to the Plus/4 presents an overview of its features, available software and peripherals, and discusses the computer's built-in software. Instructions on how to set up your system are included.

Home Applications and Games for the Commodore 64

Timothy P. Banse (Little, Brown and Co., 34 Beacon St., Boston, MA 02106. Softcover, 122 pp., $14.50.) This book features an assortment of 31 programs, including 21 application programs that deal with income taxes, budgeting your money and owning a car. Also included are ten games.



When Calling User's Groups...

Eighteen months ago, I was involved in the formation of BAY-CUG, a user's group in the Baltimore area. Eager to attract interested members, I requested that a club listing be published in *RUN*. Our organization has been listed for about a year, and hardly a week passes without six or eight interesting phone calls from local users. This has resulted in an increase in membership from the original ten to over 80. For your part in helping BAY-CUG become a viable entity, I offer my thanks.

However, this free publicity has also created several annoyances, none of which is attributable to your magazine in any way, but which necessitate my asking you to publish this letter in your Mail RUN section. I am fairly sure the annoyances described below plague every user's group in the nation.

Our user's group exists for the enjoyment of its members and to promote usage and understanding to all C-64 owners or prospective owners. To enable those people interested in increasing their knowledge of the C-64 and computing in general and to find other users with similar interests, we published a local contact number in *RUN*'s October 1984 issue and the *RUN* Special Issue. I don't mind telephone calls. I enjoy helping people solve their computer problems. I have made close friendships with users in Mexico and Alaska as a result of the BAY-CUG listing.

I do, however, object to two types of calls. I have answered the phone on many occasions and have heard the beep tone of the calling computer. If I had a board operating, I would have included this fact in the *RUN* listing. The number published is a voice-only number. If you desire club information from *any* user's group, use voice. It's a lot quicker to dial several numbers than to boot a terminal program.

The second annoyance is perhaps one of personal preference. I receive calls from complete strangers who do not do me the courtesy of identifying themselves and their reason for calling. Instead, I hear, "Do you have any games?" or "My disk drive is broken—can you fix it?" or, the most benign to my ears, "Can you give me information about your group?" I've found callers to be both adults and children, and I'm really appalled at the lack of courtesy exhibited. It doesn't take much to identify yourself when calling for information.

I hope Commodore users reading this letter will consider what I have written before making their calls to a user's group.

Michael Broumberg
Baltimore, MD

A Wise Young Man

I am only 14 years old, but I don't need an adult to speak the words I'm about to speak. *RUN* has to be one of the most informative, interesting, captivating and eye-catching computer magazines I've ever seen.

I've been into computers since I was ten. All Commodore. Back then, all the Commodore computer magazines had something missing. I suppose I was just looking for something a little different, and those other magazines didn't fit my needs.

Now that we've got *RUN*, nothing is missing. I love all my issues. I've been buying straight from the magazine stands since the premiere issue in 1984 was released. Just recently, I subscribed so I wouldn't miss one single issue! Your Magic column is great! I love your program reviews, and your ads aren't the least bit boring. Commodore Clinic is also very informative. Best of all, you have obviously got the best programs I have ever seen. I love your disk-utility programs the most.

Keep up the good work.

David Pies
Tempe, AZ

Teaching with CLAS

Thank you for reviewing our CLAS program (May 1985, pp. 18–19). Ms. Hinshaw hit the nail on the head when she wrote that CLAS was "... a straightforward and useful program with good documentation. Even people with little computer experience can be writing lessons only minutes after reading the manual."

We would like to clarify and correct some of the article's statements. The program *does* provide a record of how the student is doing. Each lesson is automatically followed by a summary screen that shows the student's performance and a review of all questions that were incorrectly answered.

CLAS is copy-protected, but this does not preclude teachers from backing up, saving or copying their lesson

Running Ruminations

From p. 6.

new products for the 128: Scholastic, Inc., Spinnaker Software, Digital Solutions, Inc., Precision Software and Melodian, Inc.

Other 128 products displayed at the show include:

—MIDI Magic, from Q-R-S Music Rolls. An interface that lets 128 owners connect their computers to many electronic musical instruments.

—Covox's Voice Master speech system.

—32K printer buffer from Cardco.

With these new offerings added to the thousands of programs already developed for the C-64 and CP/M systems, C-128 owners will be assured of a wide selection.

In Search of a 1541 Alternative

"Build a better disk drive, and the world will beat a path to your door."

Several manufacturers are trying to do just that, as *RUN*'s technical expert, Guy Wright, reports in this month's lead article on Commodore-compatible drives.

As any 1541 owner will attest, there certainly is a need for a better disk drive. Long-suffering users have had to contend with their share of headaches waiting for the machine to save and load programs.

But despite its problems—lack of speed, overheating, a tendency to slip out of alignment and the poor manual that accompanies it—the 1541 does have some advantages over the contenders: most notably, its low cost and software compatibility. If they are to be successful, third-party manufacturers must incorporate these features into their machines before a 1541 alternative becomes widely accepted.

A handful of new disk-drive offerings are reviewed in this article, which also takes a brief look at new machines being readied for the marketplace. While some of the new disk drives are easier to use, better constructed and faster, with increased storage capacity, they are not necessarily 100 percent software compatible or less expensive than the 1541. So, before you swap your 1541 for one of the new machines, you should carefully consider the trade-offs involved.

You may find an alternative disk drive that is just right for your needs. Or, you may want a second, faster disk drive, used in conjunction with the 1541. Or, if you're not in a hurry, you might just stick with the 1541.

Time Is RUNning Out!

Have you entered *RUN*'s hardware/software contest yet? There's still time, but not much. This month is your last opportunity to win a share in over $30,000 worth of Commodore computing equipment.

On September 3, we will select five winners who will receive an assortment of prizes, including a brand-new Commodore 128 computer. Other prizes include disk drives, musical keyboards and joysticks, plus thousands of dollars' worth of software, books and learning aids from major manufacturers.

Entering the contest couldn't be easier. Just fill out and send in the entry blank on page 57. Enter as many times as you wish, but include only one entry per envelope. We must receive your entry before August 31.

The generous response from the major product manufacturers has made this the largest Commodore giveaway ever held. Can you afford not to enter? **db**

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DEALERS CALL US!

files in editable form. Any Commodore utility can be used to accomplish this. Furthermore, a backup copy of the Author disk can be purchased for just $9.95.

It is true that you "cannot run the [Author] disk with a write-protect tab." This is because teachers are writing their lessons to the disk. The student disk and data disks are write-protected.

Ms. Hinshaw writes that the "program uses methods that are ineffective teaching tools." Granted, CLAS does not incorporate arcade-style graphics. However, CLAS's drill and tutorial formats are highly successful teaching techniques. These proven techniques require students to respond correctly before going on to the next question.

Finally, Ms. Hinshaw writes that it took her "more than 20 minutes to create, test and prepare a seven-line lesson." Your readership is likely aware of the fact that the same lesson would require *four hours* to develop with Pilot.

In summary, as Ms. Hinshaw stated, "What CLAS does, it does nicely." CLAS was specifically designed for the teacher with computer-phobia.

Thomas M. Piszkin
V.P. Product Development
Touch Technologies
Escondido, CA

Program Resuscitation

Thank you for your article, "Your Guide to Troubleshooting," (May 1985). It has been a lifesaver! It, alone, helped me to revive four separate programs that I'd thought were lost.

Louis McNicoll
Mesa, AZ

Come On Board

A few days ago, I hooked into your new telecommunications bulletin board, the *RUN*ning Board. I was not sure what to expect, but was soon rewarded to a short, but efficient, system.

Eugene P. Agin
Emporia, KS

For others interested in calling RUN*'s bulletin board, call 603-924-7632.*

Editors

After reading your March issue, I was surprised and pleased to find your notice of a new *RUN* BBS.

I immediately wanted to run a test using my Commodore 1650 Auto-Modem, currently set to contact CompuServe. I connected on the first try! When asked about need for a line feed, I answered no. This did not give proper readability, so I signed off and logged-on again—this time replying yes to the line-feed request. Then, with my 1701 monitor and C-64, the screen formatting turned out to be perfect.

The data you offered left a good impression about future bulletin-board information. I didn't object to the questions at all. Congratulations on this progressive endeavor to help improve readership and other subscriber-interest in *RUN*.

R.C. Pierrehumbert
Albrightsville, PA

I subscribe to *RUN* and enjoy it immensely. Your articles and programs have taught me many useful programming techniques and have provided me with a lot of information about my C-64. I am looking forward to buying a C-128 when they become available, and I also look forward to your coverage of this exciting computer.

I want to tell you that I also enjoy your *RUN* BBS. It is very interesting to have direct contact with you through it and to be able to see what is coming up in future issues. I hope you decide to add more features to the BBS.

John R. Aloi
Ridgway, PA

Thank you for your comments, John. Yours is one of many such letters we've received from users of our bulletin board. In response to many requests, we will be expanding the RUNning Board to include: selected tricks from RUN*'s Magic column, news about the Commodore industry, corrections and updates to published articles, user-group information, information about the latest* RUN*-related projects and an up-to-date list of selections for ReRUN, as well as sneak previews of upcoming articles and questions for bulletin-board users to answer. Incidentally, the RUNning Board now features a menu format that greatly speeds up its use by letting users select which section of the bulletin board to view.*

Editors

A Few Good Words

Congratulations on "One Little Word After Another," by Bill Gates (*RUN*, March 1985). Word processing can be very confusing to the average person selecting a system, and Bill Gates has covered the most important features in a manner understood by all computer users.

In subscribing to *RUN*, I provided myself with informative articles that have been invaluable to operating my Commodore.

John Tyus
Hanover, VA

I greatly enjoyed Bill Gates' article "One Little Word After Another." I was somewhat disappointed, however, that he did not include a review of Omniwriter/Omnispell (which, incidentally, was reviewed in your October 1984 issue). I am disappointed because I am very enthusiastic about this program.

I have previously used HES Writer (for the VIC-20) and Page Mate and Easy Script for the C-64. Once I learned to use Easy Script, I thought that was almost the ultimate—after all, who really needs column manipulation? Further, when I first started to use Omniwriter, I thought it was rather strange and awkward—after all, it didn't have automatic pagination. The more I used it, however, the more I came to appreciate its unique features. For example, because it doesn't have automatic pagination, I have immediate control of where a page will end, without having to do a preview and then go back and force page.

The most important features, however, are the ease with which whole

paragraphs may be indented and the ease of doing page layouts. For example, I recently did a resume for my daughter that involved a great deal of indentation. If I had tried to do it on any other 40-column-display word processor, I would still be trying to figure out the tabs.

Also, because it scrolls through whatever page width you specify, it's great for merging in spreadsheet sequential files (such as Multiplan). I came upon Omniwriter by accident—I got it at a bargain when it was bundled with Multiplan—but, as you can see, I am certainly glad I did. While it doesn't contain every conceivable "bell and whistle," it seems to me that it contains all the really important ones; and once you get the hang of it, I think it's one of the easiest and most practical of all.

The only significant negative factor I have been able to identify is that it apparently uses the infamous Save with Replace function to save files. As a result, you should always save a backup, because someday your document may not be there.

Gerald B. Zwetzig
Oakland, CA

Rebirth of CP/M?

The market potential of the C-128 as a small-business computer appears to be excellent. It will run any of the large range of compact but remarkably powerful business-oriented programs written for the C-64; these programs are uniquely low in cost because of the large market base this very successful machine has created. Later, the user can introduce more sophisticated CP/M software as his needs dictate. Obviously, in many cases, the small-business owner will opt to maintain a compatible home computer on which he can work in the evenings; this could very well be the C-64.

Therefore, my prediction is that the introduction of the C-128, with its dual processor, will lead to a significant increase in interest in CP/M on the part of both existing and new C-64 users. If Commodore does not quickly overcome the compatibility problem they have encountered with their existing CP/M cartridge and there will be a number of independent suppliers who will develop equivalent products. Now that commercial CP/M software for the C-64 is finally being advertised, it is unlikely that demand for CP/M adapters will die away or that all C-64 owners wanting to use CP/M software will be prepared to buy a new C-128.

Dr. L.D. Brown
Regina, Saskatchewan
Canada

A First-Rate Program

I just received your May issue and am in the process of updating my Datafile (*RUN*, November and December 1984), which I use for a number of purposes. With the additions incorporated in your May issue's "Datafile Update," I will be able to enhance at least a couple of these applications.

One program the caliber of Datafile makes a whole year's subscription worth the price.

Richard M. Jones, W0PZD
Needles, CA

A Tiny Triumph

I thoroughly enjoy your magazine. I own a C-64, but Tim Adcock's spreadsheet program and article, "Mini-Calc" (*RUN*, March 1985), for the VIC-20 is just great. I have tried to adapt it for the C-64, but have been unable to do so; I don't know enough about the VIC. I hope that in some future article you will print the program for the C-64. Although it isn't a large spreadsheet, it is one that can be easily understood. I have held back from buying a spreadsheet due to their complexity. This small spreadsheet would let me see how and if it would be beneficial to purchase a larger one.

L.P. Thomason
Jacksonville, FL

We are pleased to report that Mini-Calc's author is in the process of writing a C-64 version of this spreadsheet. We will be publishing it in one of our future issues.

Editors

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COMMODORE 64

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Compiled by SUSAN TANONA

Coast-to-Coast Challenge

Activision, Inc. (2350 Bayshore Frontage Road, Mountain View, CA 94043) has released The Great American Cross Country Road Race, a driving-simulation game for the C-64.

You are behind the wheel in this coast-to-coast race. At speeds of up to 100 miles per hour, you must deal with changing road conditions and radar speed-traps. Available on disk, retail price is $29.95.

Check Reader Service number 400.

■

Super C

The Super C language compiler is a complete development system for the C-64. The program's editor handles source files of up to 41K, and the library accepts both standard and Commodore-oriented functions.

Available on disk, retail price is $79.95. Abacus Software, PO Box 7211, Grand Rapids, MI 49510.

Check Reader Service number 401.

■

Draw, Partner

Strategic Simulations, Inc. (883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043) has released Six Gun Shootout, a game for the C-64.

This simulation of man-to-man combat in the Old West offers you a choice of ten scenarios (historically accurate or fictional) and 18 weapons. The disk retails for $39.95.

Check Reader Service number 402.



Polish Your Driving Skills

The State Driver's Test Study Guide is designed to prepare students for the motor-vehicle operator's test, and also serves as a review for experienced drivers. The guide covers safety tips, meanings of signs and other rules of the road.

Available on disk for the C-64, retail price is $44.95. Sunset Software, 3527 Oaklawn Ave., Suite 119, Dallas, TX 75219.

Check Reader Service number 403.

■

C-64 Converter

Technical Hardware, Inc. (PO Box 3609, Fullerton, CA 92634) has released the ADL-6412 analog-to-digital converter for the C-64.

This 16-input 12-bit converter connects to the computer through the expansion port. A compatible software package on tape or disk is also available. Retail price for the converter is $189; the software retails for $28.95.

Check Reader Service number 404.

■

Financial Partner

Financial Partner is a bookkeeping system for small-business and personal use. The program helps to balance your checking account, maintain financial records and organize overall finances.

Available on disk for the C-64, retail price is $74.95. Practical Programs, Inc., PO Box 93104, 625 N. Milwaukee St., Milwaukee, WI 53203.

Check Reader Service number 405.

■

Productivity Series

Grolier Electronic Publishing, Inc. (95 Madison Ave., New York, NY 10016) has released a series of productivity software packages for the beginning C-64 user.

The programs, which offer built-in tutorials and practice drills, cover such functions as spreadsheets, databases, graphing and report writing. Available on disk, the programs range in price from $14.95 to $59.95.

Check Reader Service number 406.

■

Master the Mystery

Mystery Master: Felony! provides you with the facts concerning 12 un-

solved crimes. ... and case profiles, you m... pects, search for clues an... ...o solve the mysteries.

Designed for ages ten and older, it is on disk for the C-64. Retail price is $34.95. CBS Software, One Fawcett Place, Greenwich, CT 06836.

Check Reader Service number 407.

■

More for Less

Sight & Sound Music Software (3200 South 166th St., New Berlin, WI 53151) has released an upgraded version of the Music Processor for the C-64.

This version has the added capability of a music printout option, and the price has been reduced to $29.95. If you already own the original Music Processor, you can purchase the new disk for $15.

Check Reader Service number 408.

■

Software in a Bag

Software Resource Group (1095 Airport Road, Minden, NV 89423) has released Brown Bag, an integrated package for the C-64.

The disk contains a word processor and database program. It offers such features as merging of text and data and a search-and-replace option. The database contains seven predefined templates. Retail price is $49.95.

Check Reader Service number 409.

■

Space Tablet

The Space Tablet is an input device that allows you to send to the computer three-dimensional ultrasonic signals from as far as six feet away. The unit can be used with existing graphics packages and is compatible with the C-64 and VIC-20.

The package consists of the pointer, a monitor frame and a connecting plug. Retail price is $150. Soniture, Inc., 2146 Paragon Drive, San Jose, CA 95131.

Check Reader Service number 414.



Modem from GE

The GE 3-8200 modem offers a 300-baud signal rate and a choice of both direct and acoustic connection. The modem can be operated with a nine-volt battery and offers full- and half-duplex operation. A Commodore interface is available.

Retail price is $119.95. General Electric Co., Electronics Park, Syracuse, NY 13221.

Check Reader Service number 412.

■

Database

NM & PP Enterprises (510 Little Creek Road, Lynchburg, VA 24502) has released NB DB, a database program for the C-64 and VIC-20 (16K).

Features include print and screen-dump options, a search capability and variable line spacing. Available on tape or disk, retail price is approximately $25.

Check Reader Service number 413.

■

Competition Pro

Coin Controls, Inc. (2609 Greenleaf Ave., Elk Grove, IL 60007) has released the Competition Pro 200X joystick that is compatible with the VIC-20 and C-64.

Features include a fire-button that is molded into the joystick case and a five-foot cord. Retail price is $8.95.

Check Reader Service number 410.

■

A Logical Advisor

Advisor is an artificial-intelligence development system for the C-64.

Advisor allows you to write programs that are automatically compiled in the Think! language, which permits the computer to replicate logical reasoning and help you solve problems. Available on disk, retail price is $99.50. Ultimate Media, Inc., 275 Magnolia Ave., Larkspur, CA 94939.

Check Reader Service number 411.

■

Telecommunications

Rockney Work Station is a telecommunications package for the C-64. The program is in machine language, can be used with most modems and has an error-checking capability.

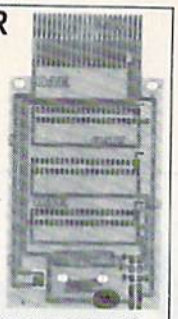
Available on disk, retail price is $49.95. Rockney Software, PO Box 5795, Derwood, MD 20855.

Check Reader Service number 415.

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New Products RUNdown



Electric Ledger

Datamatic Software (4610 Music St., New Orleans, LA 70122) has released The Electric Ledger, designed for home and small-business use.

The program allows you to balance your checking account, record tax deductions and keep track of deposits to your accounts. Monthly and year-to-date summaries can be generated. Available on tape or disk, retail price is $49.95.

Check Reader Service number 416.

■

Ultra

Ultra is the newest addition to the Limited Edition Handicapping Series from Professor Jones (1940 West State St., Boise, ID 83702).

The program is designed to store the results of up to ten races on disk and will automatically reevaluate the factor values and odds. Available for the C-64, retail price is $149.95.

Check Reader Service number 417.

■

Roots and Prefixes

Davidson & Associates, Inc., (6069 Groveoak Place #12, Rancho Palos Verdes, CA 90274) has released Roots and Prefixes, an additional data disk to be used with the company's Word Attack! program.

The disk contains 500 words and introduces Greek and Latin prefixes, roots and words originating from them. Compatible with the C-64, the disk retails for $19.95.

Check Reader Service number 422.

■

Check those Checks

F/22 Press (PO Box 141, Leonia, NJ 07605) has released Clearinghouse, a program designed to detect suspicious checks.

The program puts each check through more than 20 separate tests. Results may be displayed on the screen or printed out. Available on disk for the C-64, retail price is $49.95.

Check Reader Service number 418.

■

Ballblazer

Ballblazer is one of the first releases in the Lucasfilm game series from Epyx, Inc. (1043 Kiel Court, Sunnyvale, CA 94089).

You and your opponent must race across a three-dimensional playing field as you try to gain possession of the fast-moving ball. The game features futuristic graphics and high-speed action. Available on disk for the C-64, retail price is approximately $35.

Check Reader Service number 419.

■

Your Musical C-64

Musical Computer I and II is one release in an entire line of educational software now available for the C-64, from Computer Applications Tomorrow (PO Box 605, Birmingham, MI 48012).

Designed for all ages, Musical Computer I and II introduces the basic fundamentals of music, including reading notes, understanding rhythm and reading signs and symbols. Retail price is $34.95.

Check Reader Service number 421.

RUN AMOK

Item: In Magic trick $1FB (*RUN*, June 1985, p. 8), the first program line was misnumbered, causing a discrepancy between the listing and the text. Renumber the first line (line 1) to line 0, and the text and listing will correspond.

Item: We have had several calls from users who have thought that the listing for Mr. Computer Head (March 1985, p. 60) is incomplete. Not so; it *is* complete, even though the last line (541) is a REM with a row of asterisks.

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).

Our translating program does not designate single spaces between characters. Within quotations, these spaces are often critical to the screen display. Be sure to read the listings closely and include these single spaces as you type in your program.

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're telling the Commodore computer that you're trying to print the variable #4, which is not a legal variable name.

The command PRINT#4 actually means "print to file 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 file 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.

Manuscripts: Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. *RUN* assumes no responsibility for loss or damage to any material. Please enclose a self-addressed, stamped envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions and editorial correspondence (typed and double-spaced, please) should be directed to *RUN* Editorial Offices, 80 Pine Street, Peterborough, NH 03458; telephone: 603-924-9471. **Advertising Inquiries** should be directed to Advertising Offices, CW Communications/Peterborough, Inc., Elm Street, Peterborough, NH 03458; telephone: 800-441-4403. **Subscription problems or address changes:** Call 1-800-645-9559 or write to *RUN*, Subscription Department, PO Box 954, Farmingdale, NY 11737. **Problems with advertisers:** Send a description of the problem and your current address to: *RUN*, Elm Street, Peterborough, NH 03458, ATTN.: Rita B. Rivard, Customer Service Manager, or call 1-800-441-4403.

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September

COMING ATTRACTIONS

Just in time for the opening of school, the September issue of *RUN* promises to be most instructive! *RUN* will take a look at the role of computers in the classroom and as educational tools at home.

***Commodore Interview**—This insightful interview with Pat Walkington, Director of Education at Commodore, will reveal Commodore's plans for the development of educational software.

***SAT Preparation Programs**—We'll review several software packages for SAT preparation.

***Computers in the Classroom**—Will computers ever replace traditional classroom methods of instruction? Two educators at Oklahoma State University take a look at this question and discuss how micros are currently used in education.

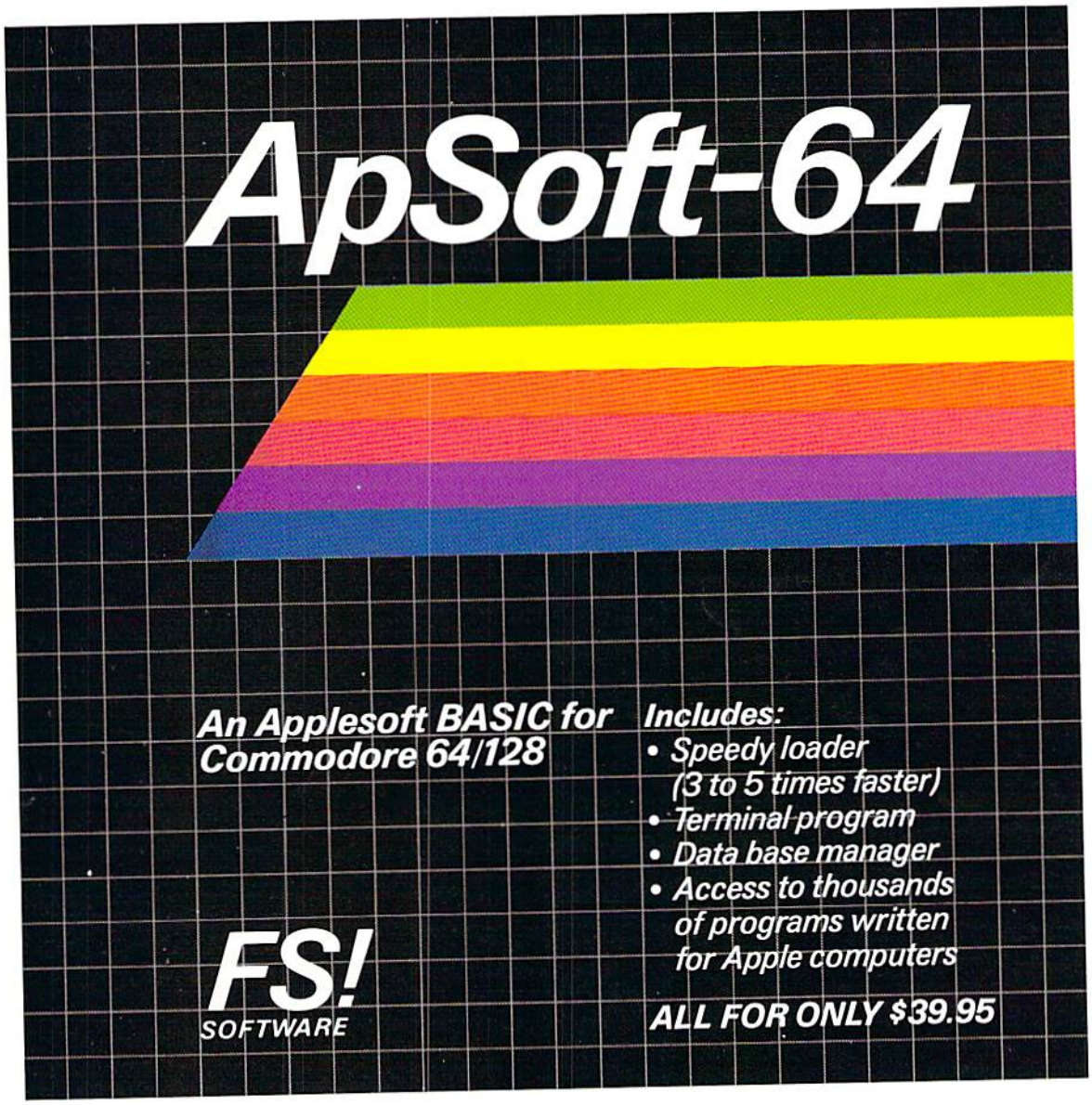
***On-Line Learning**—A look at the wealth of on-line educational information that is available.

The Super Micro—*RUN* readers will get their first comprehensive look at the Amiga, Commodore's high-end "super microcomputer" that has it all—extraordinary sound and graphics capability, ease of use and, best of all, applications that will make their mark in the business, home, educational and professional markets.

Checksum Program—For *RUN* readers who aspire to be perfect typists—or for those who are tired of spending endless hours trying to track down errors made in typing in a program—the long-awaited checksum program, 64 Perfect Typist, is here! This helpful checksum program for the C-64 ensures that the programs you type in from *RUN* will work the first time without errors.

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