

HOT CoCo

A CWC/I PUBLICATION
NOVEMBER 1984
USA \$2.95 CAN \$3.50

THE MAGAZINE FOR TRS-80 COLOR COMPUTER® AND M C 0® USERS.

Personal Money Manager

14 Financial Formulas In One Program

VIP Calc
Worth the Wait?

Inside QType: The Little Word Processor that Could

Showdown
How CoCo Beat IBM



The Basic Beat: Brain Food For Beginners



Knock The Socks Off Your



Beef up Your Color Computer with Radio Shack Accessories

Using somebody else's home computer can be a pretty frustrating thing. Tiny memories, second-rate graphics and limited accessories take all the fun out of programming and video games. That's why serious computer hobbyists enjoy Radio Shack's Color Computer so much. No other color computer expands to do so many things.



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Add a single Radio Shack disk drive to your Color Computer for just \$349.95 and store 156,672 characters on one 5 1/4" diskette. That's 156K of disk storage for \$50 less than last year! After you have your first drive (#26-3029), you can add up to three more for \$279.95 each, for an incredible 624K of disk storage. Installation of your first drive is a snap. Just plug the Color Disk Drive controller Program Pak™ into the Color Computer cartridge port and you're ready for high-speed file creation, storage and retrieval. Each disk drive comes with Radio Shack performance and reliability built in, so your Color Computer will always stay ahead of the times and up with your needs.



Neighbor's Kiddie Computer



Access Computer Networks With a Modem

When you add the Radio Shack Direct-Connect Modem I to your Color Computer, you've given it the ability to communicate with other computers and with a variety of

information retrieval services by phone. The Modem I (#26-1175, \$99.95) plugs directly into a modular telephone outlet and into your Color Computer. It translates electronic impulses that make up computer information into tones that can be sent over telephone lines. It also translates incoming tones into information your Color Computer can store and display. It's an important tool for Color Computer users who want to access computer bulletin boards, keep track of the stock market at home or use your school's mainframe computer.

Choose Radio Shack for Computer Support

The Color Computer and its peripherals are only part of the reason Radio Shack is the choice for serious computer users. Radio Shack offers unmatched support for the Color Computer owner, with exciting accessories like an easy-to-use Color Mouse for video games and color graphics. Video game players have two types of joysticks to choose from, and three memory upgrade kits are available to increase the internal memory of your Color Computer.

Software Selection Available

Disk software for the Color Computer includes SCRIPSIT®, an easy-to-use word processing program that offers optional upper/lower case display and background printing; Cash Budget Management, to keep an accurate record of cash and bank accounts; Spectaculator®, for financial



projections; and Color Graphics, to create and plot color charts and graphs. Radio Shack offers dozens of cassette software options, too. Choose from more than 20 computer programs for educational or household applications. More than 30 popular video games are also available for the Color Computer.

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Start color computing today with a visit to your nearby Radio Shack Computer Center, participating store or dealer. No other computer offers the power and capability of Radio Shack's Color Computer for the price. And no other manufacturer offers Radio Shack's nationwide service and support. So only a Radio Shack Color Computer and accessories will do!

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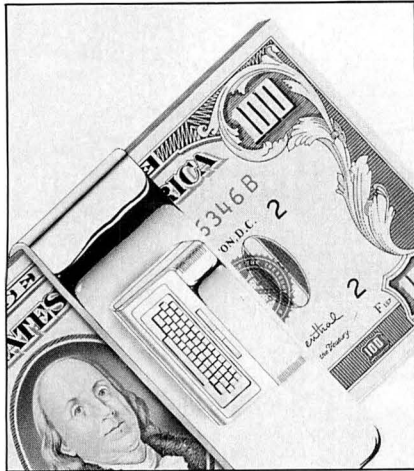
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
This program proves that short is beautiful.
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Be your own banking expert with this easy-to-use program.
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This teaching technique was never like this before.
David Meredith

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With 16 screens and fast action, this game is just awesome.
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Confused by changing measurement standards? Not with this program and a CoCo or MC-10.
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Philip McLaughlin

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Whew! You've made it to the end of our Assembly tutorial. Now you have the complete game as your reward.
Mike Meehan

Cover art by Allen Welkis

 This symbol indicates the program's placement on the Instant CoCo loader, available on cassette. See our Instant CoCo ad for details. TRS-80 is a trademark of Radio Shack, a division of Tandy Corp.



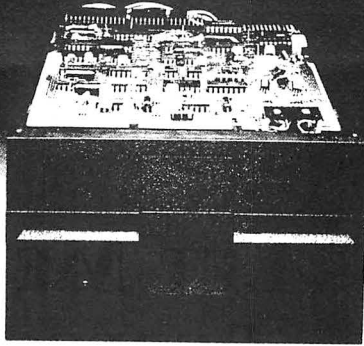
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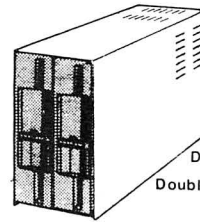
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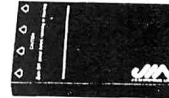
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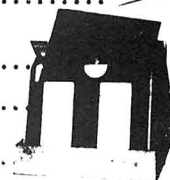
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



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DIGRESSIONS

LET ME MAKE THIS PERFECTLY CLEAR

One of the hardest jobs an editor of a computer magazine has is to make every article clear to every reader. For *HOT CoCo* this means putting all program operating instructions into everyday English and anticipating problems readers might have with a particular article.

What makes this job so hard is that computers have spawned a language of their own, and to make matters worse, many of the words in this new language look like everyday English, but have meanings unique to the use of computers.

For example, how would someone using a computer for the first time interpret the following instructions: "Power up your computer and boot. Before inputting the program, clear enough string space for variables." Some clever novices will figure out that "power up" means "turn on," but not many will get past "boot."

This is clearer: "Turn on your computer and press the reset button. You must reserve some of the computer's memory before you type in this program so it can make some calculations. You do this by typing CLEAR 500." Longer, but there is less chance of misinterpretation.

Basic commands present problems, too. Since many look like English, how do you indicate on the printed page that a word is really a Basic command? Our method is to capitalize all Basic (and Assembly, Pascal, C, and so on) commands and functions. E.g., "The NEXT statement follows the FOR statement" is less confusing than "The next statement follows the for statement."

Some of the Color Computer's keys can be troublesome referred to in text, too. "Hit enter and break" sounds downright violent. "Press the enter key, and then the break key" has a more precise meaning. Few magazines that publish program listings have translated jargon into everyday English consistently, though most try. It is a difficult task that requires knowledge of the material and perseverance on the part of the writers and editors.

We are looking for ways to present *HOT CoCo* articles so that even the most technical piece makes sense to the novice without sacrificing the worth of the piece to the experienced user.

We have some ideas, which you'll see in the coming months. But our mailbox is always open for suggestions. Drop us a line and let us know how we're doing.—*Michael E. Nadeau* ■

HOT CoCo is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes 52 computer publications in 19 major countries. Members of the group include: Argentina's *Computerworld/Argentina*; Australia's *Australia Computerworld*, *Australian Micro Computer Magazine*, *Australian PC World* and *Directories*; Brazil's *DataNews* and *MicroMundo*; China's *China Computerworld*; Denmark's *Computerworld/Danmark* and *MicroVerden*; Finland's *Mikro*; France's *Le Monde Informatique*, *Golden* (Apple) and *OPC* (IBM); Germany's *Computerwoche*, *Microcomputerwelt*, *PC Welt*, *Software Markt*, *CW Edition/Seminar*, *Computer Business* and *Commodore Magazine*; Italy's *Computerworld Italia*; Japan's *Computerworld Japan* and *Perso ComWorld*; Mexico's *Computerworld/Mexico* and *CompuMundo*; Netherland's *CW Benelux* and *Micro/Info*; Norway's *Computerworld Norge* and *MikroData*; Saudi Arabia's *Saudi Computerworld*; Singapore's *The Asian Computerworld*; Spain's *Computerworld/Espana* and *MicroSistemas*; Sweden's *ComputerSweden*, *MikroDatorm* and *Min Hemdator*; the UK's *Computer Management* and *Computer Business Europe*; United States: *Computerworld*, *HOT CoCo*, *inCider*, *InfoWorld, jr*, *MacWorld*, *Micro MarketWorld*, *Microcomputing*, *PC World*, *PC Jr. World*, *RUN*, *73 Magazine* and *80 Micro*.

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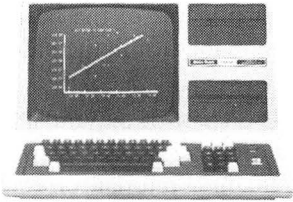
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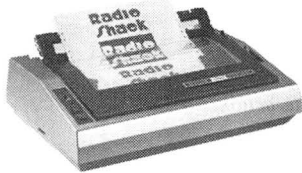
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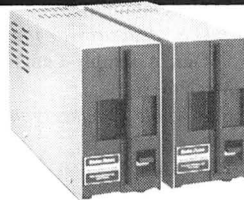
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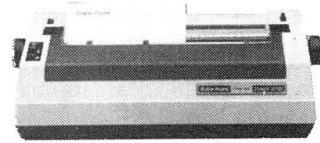
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Back Issues

Yes, back issues of *HOT CoCo* are available for all months. Here's a short list of some of the best of what we've published in the past:

June 1983—The CoCo Word Processor, a serial-to-parallel interface project, and a tutorial on tape reliability

July 1983—How to upgrade your CoCo to 64K

August 1983—Speech synthesis without hardware

September 1983—Disk utilities, character generator

October 1983—Animation techniques, build a biofeedback device

November 1983—Nuclear submarine simulation

December 1983—Education issue

January 1984—Programs for the investor and businessman

February 1984—Simulate Extended Color Basic on Color Basic CoCos

March 1984—How a disk stores information, create your own word-search puzzles

April 1984—Peripherals Buyer's Guide, how to shop for a disk drive

May 1984—OS-9 review, Financial Transactions Tracker program

June 1984—Simulations issue, how to build an Atari joystick interface

July 1984—Build your own lower-case modification

August 1984—Your disk drive as a graphics tool

September 1984—Buyer's Guide to Educational Software

In each back issue, you'll also find our regular features, reviews of popular software and hardware, and dozens of useful programs that are yours for the typing in.

Each back issue costs \$3.50 plus \$1 shipping and handling. On orders of 10 or more back issues, there is a flat \$7.50 shipping and handling fee. Send your orders to *HOT CoCo*, Attn.: Back-Issue Orders, 80 Pine St., Peterborough, NH 03458.

Instant CoCo

This directory lists all programs available on HOT CoCo's Instant CoCo cassette. See our ad on page 80 for more details.

SIDE A	ARTICLE NAME/AUTHOR	PAGE #	SYSTEM
	QType/Cutter <i>A short, yet efficient text processor.</i>	30	16K Ext.
	CoCo vs. IBM: The Great Math Face-Off/Norman <i>Use this program to prove how powerful your CoCo is.</i>	33	16K Ext.
	Personal Money Manager/Reeves <i>Financial planning is easy with this program.</i>	36	16K Ext.
	K-Lock for Privacy/Wuelzer <i>Here's a utility that protects your software from prying eyes.</i>	42	16K Disk
	Flashcards/Meredith <i>Drill your children on math problems.</i>	48	16K Ext.
SIDE B			
	Night Racer/Wood <i>Test your driving skills on this 16-screen course.</i>	52	16K
	Let's Get Metric/Poulin <i>Convert U.S. measures to their metric equivalents.</i>	62	16K Ext.
	Anatomy of an Assembly-Language Game—Part VI/Meehan <i>Here's the whole Croaker game, and it's arcade action at its best.</i>	70	32K Ext.
BONUS PROGRAM:			
	Memory Challenge/Gentry <i>Match the colored numbers in this two-player game.</i>	—	16K Ext.

Tips on Entering Our Programs

Having trouble entering our listings from the magazine? Here are a few tips that might help.

First, we print all our Basic listings in the CoCo's 32-column format. This means that each line should appear the same on the screen as it does in the magazine. If a line on your screen does not match the same line in the magazine, reread what you typed; you might have made an error.

Second, make sure the program is for your computer. Read the System Requirements box. The information in this box represents the minimum system configuration needed to run that particular program. Also, read the article thoroughly before typing in the program. Sometimes the article contains instructions vital to making the typed-in listing work. For instance, some CoCos will not accept the high-speed POKE (POKE 65495,0). The article for a program using this POKE will tell you to change those POKES to 65494,0 if your computer will not work at the faster speed.

Anyone who owns the new CoCos with the

1.2 ROMs, have noticed poor keyboard response in some published programs. To solve this, you can insert this line: FOR Z=1TO4:POKE340+Z,255:NEXT after any line that makes reference to PEEK 338-345. This loop will slow down a Basic program. Another way is to directly insert a POKE xxx,255, where xxx is any keyboard location between 338 and 345. Example: IF PEEK(341)=251 THEN Y=Y-1. Change to: IF PEEK(341)=251 THEN POKE341,255:Y=Y-1.

Assembly listings usually require an editor/assembler to enter them into your CoCo. The two most common editor/assemblers are Radio Shack's EDTASM+ and The Micro Works' SDS80C. An Assembly listing assembled using the SDS80C will probably not run under EDTASM+.

If all the above fails, send us a printout or a detailed description of the problem you experience along with any error messages. We'll try to work it out for you. We cannot help you if you have modified the original program. ■

The up-arrow indicates exponentiation on your Color Computer. However, our printer does not have an up-arrow and prints a caret instead. When entering programs from *HOT CoCo*, please change all carets to up-arrows.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: *HOT CoCo* Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of our writer's guidelines. Payment for accepted articles is made at a rate of approximately \$50 per printed page; all rights are purchased. Authors of reviews should contact the *HOT CoCo* Review Editor, 80 Pine Street, Peterborough, NH 03458.

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There's more to OS-9 than meets the eye.



File Handlers Toolbox \$85.00

The File Handlers Toolbox: a new utility command toolbox specially designed for OS-9 users who do a lot of file manipulation. The package is a collection of twelve OS-9 command programs, including equivalents of some of the most popular UNIX* utilities that are not included in the basic OS-9 command set. Most of the programs are useful as "filters" using the OS-9 pipeline facilities.

Entertainment Pack \$85.00

Entertainment Pack I is a collection of programs written in Basic09 for the OS-9 Operating System. The package consists of games and other interesting programs that are not only entertaining but serve as excellent instructional examples of Basic09 programming techniques. All programs include complete source files and can be easily edited to run on standard alphanumeric or graphics terminals.

CIS Cobol \$400.00

CIS COBOL, which meets the ANSI standard for Level One Cobol plus selected features from Level Two, is ideal for microcomputers. This system lets you run COBOL on your small computer and is a great way to learn Cobol.

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SPELLING BEE I . . . GRADE 1 & 2 SPELLING BEE III . . . GRADE 5 & 6

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Feedback

VIP Terminal Blues

As a dissatisfied user of VIP Terminal, I was most interested in your review of the product in the August issue (*HOT CoCo*, p. 22).

I bought VIP Terminal for its beautiful default 51-by-21 display. In at least three places, the instruction manual recommends that you use the CoCo's standard 32-by-16 screen with baud rates over 300. Please note the operative word, "over." I took that to mean that there would be no problem at 300 baud, but, like Mr. Banta, soon discovered that was not the case.

If a terminal program is unreliable at 300 baud, what good is it? If I wanted to use the CoCo's standard display, I could have chosen one of several programs that are less expensive than VIP Terminal.

Neil Edward Parks
Beachwood, OH

Beefing Up Python

"Python" (*HOT CoCo*, July 1984, p. 63) is one of the best Basic games I've ever seen. I made the following changes to use the arrow keys to control the snake:

```
350 IF C$=CHR$(9) THEN DI=4
360 IF C$=CHR$(8) THEN DI=3
370 IF C$=CHR$(94) THEN DI=1
380 IF C$=CHR$(10) THEN DI=2
```

I also found it a little too quiet while the snake was eating the dots, so I added the following change to line 410:

```
410 IF PE=110 THEN SC=SC+1:SOUND
138,1:IF SC=0B THEN PRINT@P+DV(DI),
P$(PC);:GOTO540
```

These changes give a little more zest to the game.

Bruce Baltzer
Hanover, Ontario

Ham Programs

I would like to see some ham-radio programs that will let me use my Color Computer for DX-CC, beam headings, log book, ham formulas, and Morse code practice at various speeds.

Thanks for a great magazine.

Johnny E. Carr WA4FCC
Rockmart, GA

Did you see "Morse Code Coach," by Robert Yeater, in our February 1984 issue (p. 100)? We have one or two ham-related articles on file. Keep an eye out for them.—eds.

Send your letters to Feedback,
HOT CoCo, 80 Pine St., Peter-
borough, NH 03458.

CoCo Schematic Drawer

I have a 64K disk-based CoCo. As an electrical designer for machine-tool control systems, I'm interested in hearing from anyone who has developed a wiring diagram/schematic program for the Color Computer.

Dick Freeman
Route 1, Box 29BB
Peshtigo, WI 54157

Take a look at Mark Wilson's "Circuit Drawer" (*HOT CoCo*, February 1984, p. 56). It's a program that lets you design solid-state electronics projects, and it just might be what you need.

It might also pay you to look at *Graphicom*, the amazing graphic-design program from Cheshire Cat Computer Creations, P.O. Box 115, Lafayette, CA 94594. We ran a feature review on it in our July 1984 issue (p. 17).—eds.

SPOOLer Downgrade

The following two listings redefine the location and size of the print buffer for my spooler program ("Everyone Into the Spool!," *HOT*

CoCo, October 1984, p. 30). Use Program Listing 1 for a 16K Extended Color Basic system and Program Listing 2 for 32K Disk Basic (1.0 ROM).

The listings also make the necessary changes to the ROM locations for the print function and the IRQ vector. The print buffer for the 16K tape version is 2K, and it's 4K for the 32K disk version.

Frank Tipps
1837 Cartlen Drive
Placentia, CA 92670

Pits Fix

I loved The Pits of Ganymede (Elmer's Arcade, *HOT CoCo*, May 1984, p. 19), although I did find it a little slow. The following changes will speed up the window movement:

```
800 IF PEEK(340)=247 AND X>1 THEN
X=X-1
810 IF PEEK(339)=254 AND X<36 THEN
X=X+1
820 IF PEEK(342)=223 AND V<67 THEN
V=V+1
830 IF PEEK(344)=223 AND V>1 THEN
V=V-1
```

This will repeat the window movement as long as you hold the A, Z, period (.), or comma (,) keys.

Chris Foster
Texarkana, TX

```
1Ø CLEAR 2ØØ, &H374F
2Ø DB$="1A5Ø8E38ØØAF8C1BAF8C1A3Ø
8C58BFØ1ØD3Ø8C13BFØ168C637F7FFØ3
C6Ø1D7961CAF3938ØØ38ØØ3414"
3Ø DC$="D66FC1FE2632AE8CF11A5ØB7
FFDFA78ØB7FFDE1CAF8C4ØØØ26Ø38E38
ØØAC8CDC27FBAF8CD581ØD27Ø8"
4Ø DD$="ØC9CD69CD19B25Ø2ØF9C3514
32623935147E8273AE8CBCAC8CB72733
F6FF2254252DB7FFDFA68ØB7FF"
5Ø DE$="DE8C4ØØØ26Ø38E38ØØAF8C9E
BDA2FB5FBDA2FDC6Ø834Ø45F445958BD
A2FD35Ø45A26F2BDA2FB7E894C"
6Ø AD=&H375Ø
7Ø DA$=DB$:GOSUB13Ø
8Ø DA$=DC$:GOSUB13Ø
9Ø DA$=DD$:GOSUB13Ø
1ØØ DA$=DE$:GOSUB13Ø
11Ø EXEC &H7F5Ø
12Ø END
13Ø I=1
14Ø FOR A=AD TO AD+4Ø
15Ø D=VAL("&H"+MID$(DA$, I, 2))
16Ø POKE A, D
17Ø I=I+2
18Ø NEXT A
19Ø AD=AD+41
2ØØ RETURN
```

Program Listing 1

```
1Ø CLEAR 2ØØ, &H6F4F
2Ø DB$="1A5Ø8E7ØØØAF8C1BAF8C1A3Ø
8C58BFØ1ØD3Ø8C13BFØ168C637F7FFØ3
C6Ø1D7961CAF397ØØØ7ØØØ3414"
3Ø DC$="D66FC1FE2632AE8CF11A5ØB7
FFDFA78ØB7FFDE1CAF8C8ØØØ26Ø38E7Ø
ØØAC8CDC27FBAF8CD581ØD27Ø8"
4Ø DD$="ØC9CD69CD19B25Ø2ØF9C3514
32623935147ECB4AAE8CBCAC8CB72733
F6FF2254252DB7FFDFA68ØB7FF"
5Ø DE$="DE8C8ØØØ26Ø38E7ØØØAF8C9E
BDA2FB5FBDA2FDC6Ø834Ø45F445958BD
A2FD35Ø45A26F2BDA2FB7ED7BC"
6Ø AD=&H6F5Ø
7Ø DA$=DB$:GOSUB13Ø
8Ø DA$=DC$:GOSUB13Ø
9Ø DA$=DD$:GOSUB13Ø
1ØØ DA$=DE$:GOSUB13Ø
11Ø EXEC &H6F5Ø
12Ø END
13Ø I=1
14Ø FOR A=AD TO AD+4Ø
15Ø D=VAL("&H"+MID$(DA$, I, 2))
16Ø POKE A, D
17Ø I=I+2
18Ø NEXT A
19Ø AD=AD+41
2ØØ RETURN
```

Program Listing 2

Oops!

In my review of *Basic-09* (*HOT CoCo*, August 1984, p. 19), I mentioned that in *Color Basic* the name itself defines the variable type. As an example, I said *A%* would define an integer value, when in fact *Color Basic* does not support integer-type variables. *Color Basic* only supports string and floating-point variables.

Guier S. Wright
HOT CoCo staff

Golf Tips

Gene Eggers (*Feedback*, *HOT CoCo*, August 1984, p. 13) would be interested in "Handicapping Your Golf Game," a Basic program published in the March 1984 *Popular Computing*. Lynn Davis' "Golf League Record Keeping" in the March 1984 *Basic Computing* is also an excellent program for a cassette-based, 32K machine and Line Printer VII. Converting it to my own needs has been a real education.

Bill Adams
West Caldwell, NJ

Softlaw Moves to Santa Barbara

Softlaw Corporation, originally of Minneapolis, MN, is moving to the Santa Barbara, CA, area. We will have our phones changed over by mid-August and will have completed the move by September 1.

The new address is as follows:

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132 Aero Camino
Goleta, CA 93117

Our WATS order-line number, 1-800-328-2737, will remain the same. However, the customer service number has been changed to 1-805-968-4364.

Tom Nelson

¿CoCo Se Habla Español?

I've only had my computer a few months, and I'm wondering if anyone has a program that will let me type a letter in English and print it out in Spanish. It's probably much too complicated a thing to program, but I have friends in Mexico, and it sure would be nice.

Harold P. Alford, Jr.
APO San Francisco

I believe the Japanese (and perhaps others) are working in this area of computerized translation, but evidently are far from a workable solution. You could easily come up with a vocabulary program that would translate English words into Spanish, but the grammar of the translated sentence would be all wrong, and the semantics and nuances would be completely lost.

I doubt you'll see such a program in the near future, except perhaps on very sophisticated and specialized equipment, but I could be wrong.—ed.

Venezuelan CoCo

I truly enjoy your magazine and appreciate the honesty in your articles.

I own a 16K Color Computer with an Epson MX-80 printer and the Intelligent Serial Interface. I'd appreciate it if someone out there could tell me how to run such fine programs as Graphically Speaking (*HOT CoCo*, August 1983, p. 134) and the Graphic Dump Routine (*HOT CoCo*, September 1983, p. 34) on my system.

I would also like to communicate with other CoCo owners (both English and Spanish speakers). We are starting a user's group and would like to exchange information with any interested parties.

Carlos A. Merino Z.
Apartado Postal 70655
Los Ruices 1071-A
Caracas, Venezuela

Misshelfed Books

Recent trips through several bookstores have shown me that Color Computer books are consistently misshelfed. It seems that books with Color Computer but not TRS-80 in the title are likely to be lumped in with general computer books.

Both authors and CoCo owners should know that books that seem to be unavailable or selling poorly might simply be misfiled. Publishers should take steps to make their distributors aware of the problem, and those of you who are looking for particular titles should search the computer-book section thoroughly.

D.E. Isom
Marina, CA

Square Roots

Here's a simple program to calculate square roots on a Color Basic computer:

```
10 INPUT A
20 PRINT "Positive Root": PRINT A^(1/2)
30 PRINT "Negative Root": PRINT -A^(1/2)
```

Joan M. Dworetzky
Kansas City, MO

Touchdown Touchup

Joe Krueger's "Ten Seconds to Touchdown" (*HOT CoCo*, May 1984, p. 58) is a great game, but I couldn't land on the far right 3X pad. Therefore, I changed line 540 to IF R<227... and line 560 (for the left 5X pad) to IF R<63....

I also deleted the POKES from lines 90 and 750 to keep the program from crashing my computer.

Timothy D. Fox
Raleigh, NC

Vive le CoCo

You have a great magazine, and the articles often come in handy, as when my daughter took a course in French this semester. I remembered "Vive le CoCo" (*HOT CoCo*, July 1983, p. 104) and typed it in.

The five programs in the article are good, but two need fixing. In Program Listing 3, the variable in line 80 (JW) is the counter for the total number of questions, but the same variable appears in line 210 to represent the number of correct answers. Lines 150 and 170 define the variable, NC, as the counter for correct answers. Therefore, the program only works properly if line 210 begins IF NC=13.

Also, there's a misspelling in line 230—the correct spelling is "congratulations."

In Program Listing 5, G\$ clears the screen. It must be assigned 30 instead of 14 spaces in order for it to work properly.

James M. Zeltinger
Omaha, NE

A Tale of Two Reviews

After reading Guy Wright's *Graphicom* review (*HOT CoCo*, July 1984, p. 17), I was puzzled by the fact that he rated the program's error-handling ability as only a five on a scale of 10. However, he does not explain why he gave such a low rating in this category.

Curiously, a reviewer in the July issue of *Color Micro Journal* gave *Graphicom*'s error handling a top score of 10, because he claims he's never been able to crash the program back to Basic, hard as he's tried.

I would like to know what you think about this difference of opinion on the same subject.

Bob Rosen
President, Spectrum Projects
San Jose, CA

You're right to wonder why I gave Graphicom such a poor error-handling rating in my review. I should have explained my reasons.

Graphicom lets you get involved in some time-consuming projects, and I felt that it was too easy to destroy such elaborate drawings, be they in memory or on disk. While holding down two fire buttons and moving a joystick, I managed to have a finger slip and destroy something I was trying to copy.

I felt that it might be best if Graphicom used keyboard control of disk access and movement of screens. I would much rather have an "Are you sure?" prompt than a blown picture disk.

As to the review in Color Micro Journal, perhaps I'm too idealistic in my assumption that no commercial software should ever crash back into Basic. I wouldn't give extra points because a programmer has achieved this standard feature, as I wouldn't be particularly impressed simply because a program loaded properly.

Guier S. Wright
HOT CoCo staff

Calling Dr. Fine, Dr. Howard...

I am running a CoCo 2 with two Radio Shack drives, a DMP 120 printer, and a Modem 1. I'm looking for a good video buffer so I can add a monitor.

I'm also looking for a BBS that specializes in medical info, like special diets for people with diabetes or low blood sugar, etc.

Paul McKee
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Union City, IN 47390

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Hot CoCo, Jan. '84 "Super Screen represents a quality utility program that fills a definite need for the serious CoCo user. No other programs on the market so far have offered the error-trapping utility of Super Screen."

Color Computer Magazine, May '84 "Super Screen is a worthy addition to anyone's software library. It has become my most used utility and has made programming in BASIC on the Color Computer a joy..."

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Rainbow, Feb. '84 "If you are looking for a program to keep track of your sales and print invoices, then this one will take care of those needs quite well...A good program that would serve the invoicing needs of a small company quite nicely."

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Hot CoCo, June '84 "...a serious, professional accounting program and well worth its price. The programs are complete and simple to use."

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Up to 255 separate accounts may be defined and a single disc system can hold over 1,400 transactions. This system automatically enhances the monitor screen to a 51 character by 24 line display. 32K of memory is required along with an 80-column printer and one or more disc drives.

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The Basic Beat

INKEY\$, JOYSTK, AND CONTROLLING ANIMATION

by James W. Wood

As I promised last month, I'll explore methods of controlling animation and show you how to use keyboard or joysticks to manipulate patterns. So far, this series hasn't explained how you can interact with the computer while some action on the screen continues uninterrupted.

Program Listing 1 draws a blue line across the screen. If you try to use an INPUT command to change the blue line to red, the action stops and a question mark appears on the screen. The colon in line 10 separates different commands on the same line.

Program Listing 2 introduces INKEY\$, which lets the computer keep an eye on the keyboard while doing something else. Listing 2 draws a horizontal blue line across your monitor. A\$ is a string variable, something a little different from the numeric variables with which you are familiar.

Program Listing 3 shows the differences between string and numeric variables. A\$ is set equal to the character typed in the keyboard, thus INKEY\$.

In Listing 2, line 40 sends the program to line 50 if A\$ doesn't equal nothing (if A\$ equals anything). Press any key and line 50 changes the line's color. If the color was number 3, it changes to color 4, otherwise the line becomes color 3.

Line 60 sets the position on the screen. Line 70 prevents a function-call error by allowing the screen posi-

tions to become no larger than 63 across. Line 80's $X = X + 1$ causes the line to grow to the right.

Now, a few of the oddities of string variables: Listing 3 has numeric variables in line 10. A\$ is referred to as "A string," and B\$ as "B string." A\$ does not concern itself with the numeric value given it within quotes. Therefore, Listing 3 joins A\$, a two, to B\$, a three, to give 23. You cannot use math symbols to multiply, divide, or subtract strings.

Program Listing 4 also reveals some of the differences between numeric and string variables. Line 40 prints the value of A plus B plus C. Line 50 prints the contents of A\$ followed by those of B\$. Lines 70-80 use a FOR loop to add the "HOT" six times onto C\$, which starts as an empty string. C + A$$ will print as "HOT HOT HOT HOT HOT COCO."

You can use INKEY\$ to pause a program. Line 30 of Program Listing 5 stops the program until you press a key. Make sure there are no spaces between the quotes. The rest of the listing shows that a sense of humor just might be programmable. You could add "Press any key to continue" before line 30.

INKEY\$ has an advantage over INPUT in this case because INKEY\$ doesn't put a confusing question mark on the screen. Use this method to break long lists of directions into screenfuls of information. Most people hate trying to hit the shift and @

keys to try to stop a runaway scrolling screen.

Program Listing 6 creates a simple arcade game. Lines 1-9 give the instructions. The screen displays a green border, and a green line starts at the center and begins moving to the right. You use the W, A, D, and X keys (up, left, right, and down, respectively) to control the line's movement. The combination is reasonable if you look at the keyboard.

It would make more sense to use the four arrow keys, but see what happens when you try to type a right arrow instead of the D in line 100. I'll show you how to use the arrows later.

Lines 10-20 draw the top and bottom of the border. Lines 30-40 draw the left and right sides. Line 50 starts the line moving right from the center of the screen. Line 80 looks for the direction key you've pressed. If you don't press one (if A = ""$), the A\$ is assigned the value B\$, which is what A\$ was the last time it was pressed. It got this value from line 70.

Lines 90-120 change the appropriate X or Y value. For example, if you press X, the Y coordinate increases by one, making the line move downward. Line 130 tests to see if the line hit anything. POINT(X,Y) returns the color of the SET position X,Y. If it is green (color = 1), then you just crashed a green line.

Line 140 keeps track of how many moves you complete before you hit a colored line, which ends the game. Lines 150-160 flash the collision point on and off so you can see your mistake. Lines 180-190 again use INKEY\$ so you can respond to the "Play again?" prompt without pressing the enter key.

Instead of using the keyboard to

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control action, how about programming joysticks? There are two joysticks, each with three controls. The available readings correspond to moving the stick left and right and pressing the fire button.

Program Listing 7 displays four columns of numbers. The columns scroll upward on the screen, and as you move the joystick, the numbers change. Watch the numbers at the bottom of the screen as you manipulate the controls. They vary from 0-63. To make column 1 a list of zeros, push the right joystick all the way to the left. To make column 2 zeros, push the right joystick forward.

Figure 1 might clarify the joystick movements. Remove line 20 and run Listing 7. You can't change any readings, can you? You must always read JOYSTK(0) before reading any others you want to use.

Program Listing 8 lets you create crude drawings with the right joystick by lighting SET graphics according to the joystick position. JOYSTK(0) ranges from 0-63, and so do the horizontal readings on SET graphics, which is handy. The vertical SET's coordinate can only increase to 31. However, if you divide JOYSTK(1) by two, you won't get anything larger than 31.

The problem with Listing 8 is that it

sets the joystick's position too slowly. If you move the stick quickly across the screen, the program misses a lot of positions.

Program Listing 9 makes it easier to draw. Line 30 determines if you pushed the joystick to the right. If so, then X increases by one. Line 30 then makes sure that X is not larger than 63, which would cause an FC error. Lines 40, 50, and 60 check on the left, up, and down movements. With Listing 9, if you push the joystick rapidly to the top, the line slowly fills in all positions in a line.

How do you program the fire buttons? Run Program Listing 10 and

```
1Ø CLSØ:X=Ø:Y=15
2Ø X=X+1
3Ø SET(X,Y,3)
4Ø IF X=63 THEN GOTO 1Ø
5Ø GOTO2Ø
```

Program Listing 1

```
1Ø C=3
2Ø CLSØ:X=Ø:Y=15
3Ø A$=INKEY$
4Ø IF A$<>" " THEN 5Ø ELSE 6Ø
5Ø IF C=3 THEN C=4 ELSE C=3
6Ø SET(X,Y,C)
7Ø IF X=63 THEN 2Ø
8Ø X=X+1:GOTO 3Ø
```

Program Listing 2

```
1Ø A$="2":B$="3"
2Ø PRINTA$+B$
```

Program Listing 3

```
1Ø CLS
2Ø A=4:B=3:C=5
3Ø A$="HOT ":B$="COCO"
4Ø PRINTA+B+C
5Ø PRINTA$+B$
6Ø PRINT
7Ø FOR A=1 TO 6
8Ø C$=C$+A$:NEXTA
9Ø PRINTC$+B$
```

Program Listing 4

```
1Ø CLS
2Ø PRINT"TYPE"
3Ø A$=INKEY$:IF A$="" THEN 3Ø
4Ø FOR A=1 TO 166
5Ø PRINT"HA ";
6Ø NEXTA
7Ø GOTO1Ø
```

Program Listing 5

```
1 CLSØ
2 PRINT"THESE LETTERS CONTROL LI
NE."
3 PRINT" UP"
4 PRINT" W"
5 PRINT"LEFT A D RIGHT"
6 PRINT" X"
7 PRINT" DOWN"
8 PRINT"GAME ENDS WHEN YOU HIT A
NY"
9 PRINT"COLORED AREA. GOOD LUCK!
":FORA=1TO18ØØ:NEXTA
1Ø CLSØ:FORA=ØTO63
2Ø SET(A,Ø,1):SET(A,31,1):NEXTA
3Ø FORA=ØTO31
4Ø SET(Ø,A,1):SET(63,A,1):NEXTA
5Ø X=32:Y=16:A$="D"
6Ø SET(X,Y,1)
7Ø B$=A$
8Ø A$=INKEY$:IFA$=""THENA$=B$
9Ø IF A$="W"THEN Y=Y-1
1Ø IF A$="D" THEN X=X+1
11Ø IF A$="A" THEN X=X-1
12Ø IF A$="X" THEN Y=Y+1
13Ø IF POINT(X,Y)=1 THEN 15Ø
14Ø C=C+1:GOTO6Ø
15Ø FORA=1TO5Ø:SET(X,Y,1)
16Ø RESET(X,Y):NEXTA
17Ø CLS:PRINTC;"MOVES"
18Ø PRINT"PLAY AGAIN (Y/N)"
19Ø C$=INKEY$:IF C$="Y" THEN RUN
1Ø ELSE IF C$="N" THEN END ELSE
19Ø
```

Program Listing 6

```
1Ø CLS
2Ø PRINTJOYSTK(Ø);
3Ø PRINTJOYSTK(1);
4Ø PRINTJOYSTK(2);
5Ø PRINTJOYSTK(3)
6Ø GOTO2Ø
```

Program Listing 7

```
1Ø CLSØ
2Ø X=JOYSTK(Ø):Y=JOYSTK(1)
3Ø Y=Y/2
4Ø SET(X,Y,8):GOTO2Ø
```

Program Listing 8

```
1Ø CLSØ:X=31:Y=15
2Ø A=JOYSTK(Ø):B=JOYSTK(1)
3Ø IF A>4Ø THEN X=X+1:IF X>63 TH
EN X=63
4Ø IF A<2Ø THEN X=X-1:IF X<Ø THE
N X=Ø
5Ø IF B<2Ø THEN Y=Y-1:IF Y<Ø THE
N Y=Ø
6Ø IF B>4Ø THEN Y=Y+1:IF Y>31 TH
EN Y=31
7Ø SET(X,Y,8):GOTO2Ø
```

Program Listing 9

```
1Ø PRINTPEEK(6528Ø)
2Ø GOTO1Ø
```

Program Listing 10

```
1 CLSØ
2 PRINT"USE THE RIGHT JOYSTICK T
O "
3 PRINT"CONTROL YOUR LINE'S DIRE
CTION."
8 PRINT"GAME ENDS WHEN YOU HIT A
NY"
9 PRINT"COLORED AREA. GOOD LUCK!
":FORA=1TO18ØØ:NEXTA
1Ø CLSØ:FORA=ØTO63
2Ø SET(A,Ø,1):SET(A,31,1):NEXTA
3Ø FORA=ØTO31
4Ø SET(Ø,A,1):SET(63,A,1):NEXTA
5Ø X=32:Y=16
6Ø SET(X,Y,1)
8Ø JØ=JOYSTK(Ø):J1=JOYSTK(1)
9Ø IF JØ<1Ø THEN X=X-1:GOTO13Ø
1Ø IF JØ>5Ø THEN X=X+1:GOTO13Ø
11Ø IF J1<1Ø THEN Y=Y-1:GOTO13Ø
12Ø IF J1>5Ø THEN Y=Y+1:GOTO13Ø
13Ø IF POINT(X,Y)=1 THEN 15Ø
14Ø C=C+1:GOTO6Ø
15Ø FORA=1TO5Ø:SET(X,Y,1)
16Ø RESET(X,Y):NEXTA
17Ø CLS:PRINTC;"MOVES"
18Ø PRINT"PRESS FIRE BUTTON TO R
EPLAY"
19Ø P=PEEK(6528Ø):IF P=126 OR P=
254 THEN 1Ø ELSE 19Ø
```

Program Listing 11

The Basic Beat

press the button. Compare your reading to Fig. 1. The number in the two-hundreds occurs when you push the right joystick to the right. You must remember that you can get two different values when programming.

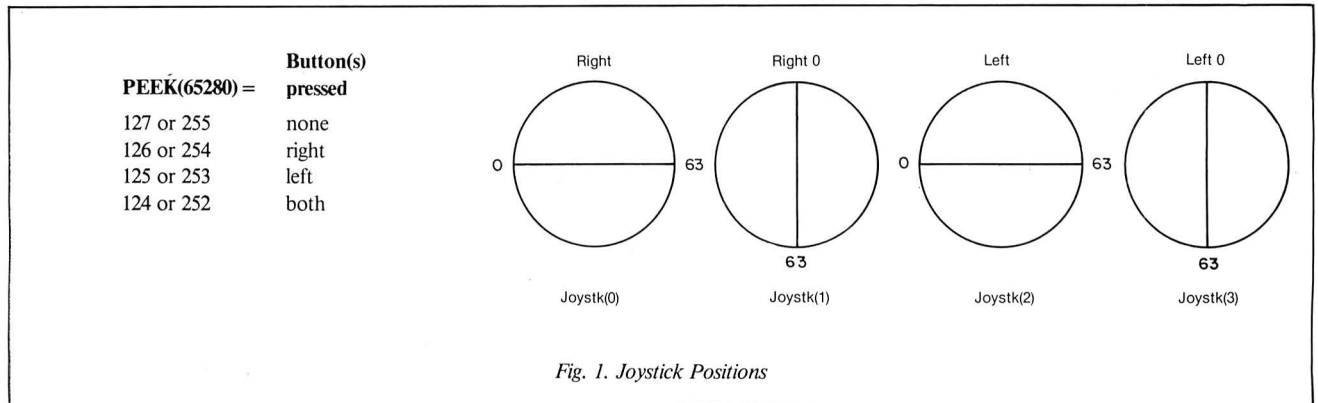
How could you change Listing 9 so that the right fire button will change the line's color? Add $C=1$ to the end of line 10. Change the $X,Y,1$ in line 70 to X,Y,C . Then add the following lines:

```
25 P=PEEK(65280)
26 IF P=126 THEN C=C+1
27 IF P=254 THEN C=C+1
28 IF C=9 THEN C=1
```

Can you convert the game from Listing 6 to work with a joystick? Try it, and then see my solution in Program Listing 11. I like the keyboard version of this game better, but you might enjoy the challenge of the stick. to change direction, rapidly rotate the stick about the outer edge of its movements.

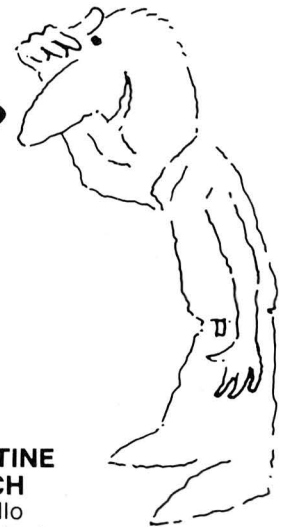
If you don't hold the joystick against the outer edge, you will lose. Be sure you've pushed the stick to an edge when the game begins or it will end immediately. Your program might differ from mine, but that's okay—unless your version is better. Stay tuned for more Basic secrets. ■

Address correspondence to James W. Wood, 424 N. Missouri, Box 507, Atwood, IL 61913.



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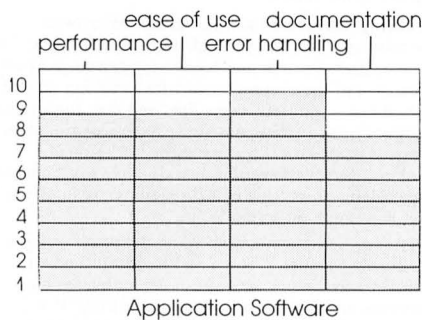
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BY SCOTT L. NORMAN

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VIP Calc is the long-awaited spreadsheet that rounds out Softlaw's VIP Library of applications programs. It offers a good selection of capabilities at a reasonable price, and some of its special features are very welcome indeed. It also fits into the Library as advertised; you can incorporate its output into documents prepared by VIP Writer, for example, and users of other VIP programs will quickly feel at home with the command syntax.

Every complex program represents a series of compromises on the part of the programmer. While VIP Calc has a great deal in common with other spreadsheets, author Kevin Herrboldt has given it a flavor of its own by choosing to em-

phasize certain features. It has a unique capability for establishing multiple video windows and an unusually complete set of options for formatting the printed version of a worksheet.

Some drawbacks are the program's relatively skimpy help screens, the advisability of specifying the size of a given sheet before setting to work, and—most noticeable of all—the operating speed. VIP Calc is significantly slower than some other major CoCo spreadsheets, although techniques exist for minimizing the impact on a working session.

Every prospective user must reach

setting up a rectangular worksheet, carrying out repetitive calculations, and printing reports. Individual cells of the sheet can contain text labels, numbers, or formulas, and you may refer to the pieces of data used in the formulas by the addresses of the cells in which they reside.

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A Sample VIP Calc Screen

his or her own conclusion about the importance of the speed question and other details.

VIP Calc, then, is a program for

The Nitty Gritty

Although VIP Calc will run in a 32K computer, you really need 64K to enjoy all of its features. Otherwise, you must sacrifice the high-density display modes (which I'll describe shortly) and the sort and edit functions. It is not necessary to have Flex or OS-9 on hand, however. VIP Library programs include their own mini DOS for managing file manipulations.

Like VIP Writer, VIP Calc boasts several display formats. The 32K program can only use the conventional 32-by-16 text screen with reverse video for lowercase letters, but the 64K version offers additional

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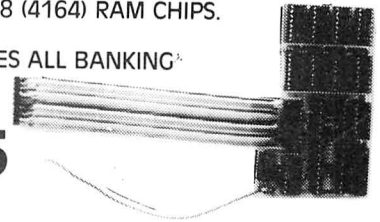
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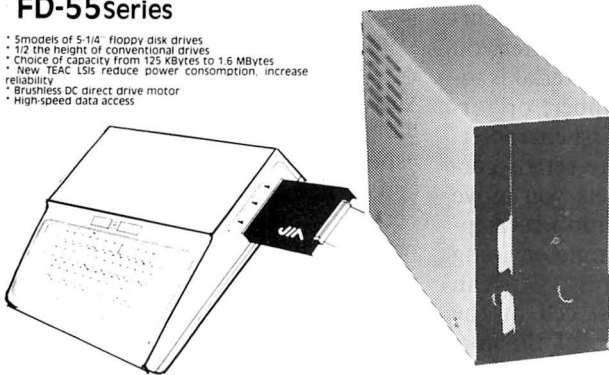
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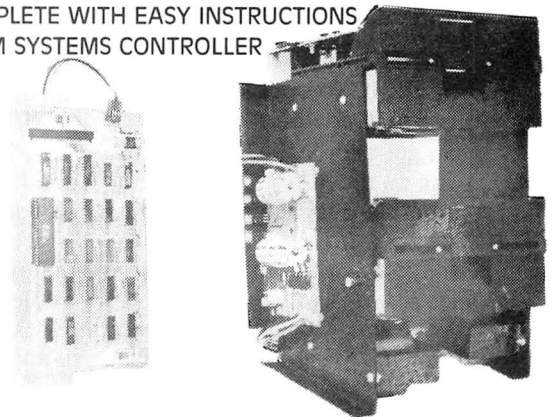


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sets, wide and narrow, in the 64-character mode.

The 64K default display is the 51-by-21 mode, and I found it and the 51-by-24 to be the most legible of the bunch. The 64-character lines were tiring to read, even on a video monitor.

The display is typical of most spreadsheets: a portion of the worksheet itself topped by a data-entry header. The VIP Calc header consists of a command line for prompts about the commands available at any point, a status line showing the coordinates and contents of the current cell, and an entry line on which you enter a label, number, or formula.

Four single-character "flags" that convey additional status information also appear in this area. They indicate when a recalculation is in progress, whether upper- and lowercase versions of letters will be considered identical, and other useful facts.

There are commands for inverting the high-resolution displays to generate light characters on a dark background, and you can toggle the "light" color between green and white (green and orange in the 32-by-16 display).

No discussion of a spreadsheet program can completely avoid the question of size: how much memory is available, how big a worksheet can it handle, and so on. It can be misleading to place too much emphasis on size—convenience and flexibility of operation are more important—but for the record, the 64K edition of VIP Calc offers 22,118 bytes of free RAM when it is first loaded.

You can get another 8,700 bytes or so by giving up the hi-res displays with the program's DUMP command, but that locks you into the 32-by-16 display until you reload the program. Once video RAM is gone, it's gone for good. It is best to wait until you need that extra memory before taking such drastic measures.

The idea of deleting features in order to gain working space is quite common. Dynacalc offers you the opportunity to dump several video pages full of help messages (for Scott Norman's review of Dynacalc, see *HOT CoCo*, October 1984, p. 20). VIP Calc's user memory is somewhat smaller than that of Dynacalc and other spreadsheet programs, but the differences should not be significant in most applications.

What is different is the way the program allocates memory to the work-

sheet. VIP Calc begins with 63 blank columns and 255 rows, and its labeling scheme lets you define sheets up to 512 columns wide or 1,024 rows deep (not at the same time).

There are penalties for not cutting the sheet down to the size you actually need, however. If you enter data into a particular cell, each cell in the columns preceding that location will be allocated 3 bytes of overhead storage, even if you never use them. If your sheet is 10 columns wide and only 10 rows deep, it will still be allotted 255 rows and 10 columns, unless you take action.

This might not be a critical issue for small layouts, but when a worksheet reaches a respectable size, it becomes important to avoid tying up memory for unused cells. You need that storage for cells that actually contain something.

VIP Calc has a unique command, MATRIX, that lets you define the largest number of rows and columns you expect to use in a given application. This isn't much of a hindrance; you can change your mind if the worksheet starts to grow beyond your original estimates, although doing so involves a save-and-reload operation to preserve your data.

Commands and Operating Features

Like other spreadsheets, VIP Calc is normally in the entry mode; whatever you type will be placed in the current cell (the cursor location) after you press the enter key. The material is interpreted as a label, number, or formula, depending on its first character.

An unusually complete set of cursor-control commands lets you move about the sheet. In addition to stepping along one cell at a time or going directly to a given address, you can jump to the first or last cell of the whole sheet, to one edge of the current screen page, or to the next page in any direction. I like to think of this as reflecting the program's close ties to its word-processor relative.

It takes longer to update the display when you move the cursor off screen horizontally than it does for vertical motion—in a hi-res mode, anyway. This has to do with the way the program draws hi-res graphics on the screen.

VIP Calc's screen updates work at a leisurely pace; a rewrite takes more than six seconds. This is about 50 percent longer than Dynacalc requires, and while it's not disastrous, it can be annoying. Unfortunately, the Softlaw

program takes the same length of time after many other display changes: inserting or deleting a row or column, filling a cell with a repeating character for a border, and so on.

Individual cell entries can be up to 255 characters long, and there is a 256-character type-ahead buffer. This can come in handy, because more than three seconds elapse between the time you make an entry and the time the cursor reappears, signaling the program's readiness to accept a new one. If you get the rhythm right, you can make an entry, press enter (or an arrow key), and start to type the next cell's contents; it's a little tricky, though.

Many commands and functions require that you specify a range of cells upon which to operate. Despite the manual's claim, you cannot merely tap enter to signal that the current cell should be used, although you can do so in other spreadsheets. Here, that just brings up a "value out of range" message.

An ellipsis, as in A1. . .B10, usually indicates the range of cells between the start and end points, and the program does cooperate by generating these after you have entered the first cell and a single period. If you want to use the same cell as the start and finish of a range, as it might be if you copy a formula, you can type the cell's address, then a period, and then press enter. VIP Calc will finish up for you.

The program can conveniently replicate a single row or column into an entire rectangular array. Other spreadsheets generally only copy one row into another, and so on. Of course, you have complete freedom to modify the cell references in the copies to keep the algebra straight—the well-known relative-addressing capability.

Although the ellipsis usually denotes a range of cells, there are exceptions. VIP Calc's predefined functions tend to use a colon between the first and last cells in their arguments: @SUM(A1:A100) totals the first 100 elements in the first row, for example. (The leading @ identifies the following character string as the name of a function, a common piece of notation.) This notation switch calls for a little vigilance on your part.

One of the most appealing features of the program is its ability to divide the screen into several independent windows, as shown in the Photo. This lets you view different portions of a large sheet, and therefore, you can

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...I would like to take this opportunity to thank you, our customers, our project development team, and sales staff for making us Canada's largest Color Computer software & peripheral distributor.

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My special thanks to John Kunze, our brilliant systems design analyst for his tireless effort in bringing the Color Computer into the big league with his fixed hard drive system with an exceptional level of price/performance.

To Gabriel Gal, our far sighted electronics engineer to give that extra muscle of a 128K to our Color Computer systems.

The tolerance and forbearance of Karen Graham and Sharron Curley in coordinating our overall Canadian operation, who have turned many mountains into molehills. A sweet smile goes a long way.

We have great confidence in Dan Pluta (MSc.) of University of Philadelphia who has the arduous task of heading up our U.S. operation. His skill and knowledge has impressed us all. We welcome his arrival into our team and pledge our utmost support to him and through him to all of our U.S. customers.

And last, but far from least, to Tony Distefano, lord of CoCo hardware for his brilliant ingenuity in his design of the ROM based cards and color video interface. Also, his tid-bits, criticism and overall general aid which have proved to be invaluable to us.

and as for me, I'm just the president...

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keep track of what effect a change in an input variable will have on outputs in several places—the “what if” game on a grand scale. You can set up as many as eight windows on a 32K computer or 16 on a 64K machine and scroll any two of them simultaneously.

Establishing a window is simple: Put the cursor where you want the top row or left column of the new window to be, and press the control key (clear or /) and then W. The command line immediately displays prompts for a horizontal or vertical split and synchronized or unsynchronized scrolling. Indicate your choice and the screen divides, new row and column coordinates are set up, and there's your window.

Windows are numbered according to the order in which they are created. Identification numbers at the intersections of the row and column labels help you keep track of which window is which, a great help when the screen begins to fill up. Pressing the colon key moves the cursor from window to window in sequential order.

You can use windows to keep row or column titles fixed on the screen while you are entering data in a remote part of a worksheet; there is no separate title-lock command, as there is in some other spreadsheets.

Another of VIP Calc's outstanding features is its comprehensive, word processor-like selection of options for giving a professional look to printed worksheets. You can divide the options into page-formatting functions and printer-control functions. The former include margin settings, number of lines per page, transmission baud rate, and so on, and can be modified by changing the system defaults. The latter, which include print font, boldface, and underline options, are controlled by imbedding printer-control commands in a worksheet.

You can change system-default parameters on the fly when you print a sheet, or imbed the changes in a format string and store them with the worksheet. Format strings are labels inserted in empty cells of the sheet. They consist of the codes for various print parameters, preceded by a special control character generated by pressing the clear/K combination.

There are also a vast number of imbedded printer-control character, most of which produce peculiar video symbols to remind you of their presence. For example, on a hi-res display, a colon composed of two small

circles instead of dots represents the escape character. On a low-resolution screen it's an inverse-video semicolon.

The Question of Speed

If multiple windows and sophisticated print formatting are VIP Calc's strong points, its weakness must surely be operating speed. There is no way of avoiding the conclusion that the program is considerably slower than Dynacalc, for example.

I used two benchmarks for most of this review. The first, taken from the VIP Calc tutorial, was a sample budgeting program. I assigned each of seven expense categories a figure for January and set up the spreadsheet to calculate the numbers for the rest of the months in the year, assuming a

“It is not the most powerful CoCo spreadsheet . . . but it is certainly capable of dealing with important problems in business and other fields at a professional level.”

constant rate of inflation. Subtotals were computed for each category, and these were summed to yield a grand total for the year's budget.

VIP Calc averaged 9.1 seconds for the calculations, exclusive of the time needed to write the screen; Dynacalc averaged 3.7 seconds. You can switch to the 32-by-16 display mode to improve VIP Calc's time a bit, but you only gain .7 seconds.

In the second benchmark, I calculated 100 angles and their sines, using built-in trigonometric functions. Both spreadsheets were set up for radian angular measure. Actually, this is the only system VIP Calc can use.

The results: VIP Calc—31 seconds, Dynacalc—11.6 seconds. When I called up VIP Calc's optional double-precision mode, calculation time jumped to 1 minute, 29 seconds—but the numbers were accurate to 16 digits.

The source of this large a discrepancy in speed is far from clear. What is apparent is the need to use the automatic/manual recalculation switch (part of VIP Calc's global command) to suspend recalculation during data

entry for large worksheets; otherwise, you can spend a lot of time waiting for the program to recompute the entire sheet after you enter every piece of data. A few seconds here and a few seconds there begin to add up after a while. You can always switch back to automatic mode after everything is in place.

Final Thoughts

VIP Calc has many more features than I have space to discuss. Just a few examples: There is a command for sorting all or part of a sheet in ascending or descending order, another for locating a cell according to the text or numerical data it contains, and yet another for saving a worksheet to disk in a format that you can use in a VIP Writer document. You can also convert a column of figures to a coarse horizontal bar graph after proper scaling.

As with any product, there are specific changes I would like to see in future editions. I regret the lack of an IF function that would give me the ability to imbed decision-making properties in a worksheet. Having worked with this construct in other programs, I have gotten used to the flexibility it imparts to complex setups.

I would also like to see the manual undergo a certain amount of revision. While it is one of the better pieces of documentation to come from Softlaw, it offers a tutorial section and a section of detailed command descriptions, which don't always coincide.

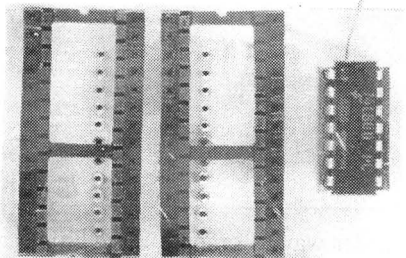
The tutorial makes block repetition and a few other operations more complex than they need be, and seems to be in error in places, especially in its details of some of the multikey commands. It sometimes tells you to press the control key and the command key simultaneously, when in fact you must press and release the control key first.

The section of detailed descriptions is almost always clearer, but perhaps Softlaw has already remedied this discrepancy between the two sections.

None of this can change the fact that the program offers a great deal of power at a reasonable price. It is not the most powerful CoCo spreadsheet—that title belongs to Dynacalc—but it is certainly capable of dealing with important problems in business and other fields at a professional level. While it is possible to quibble about individual features, the bottom line is that VIP Calc is a very respectable product. ■

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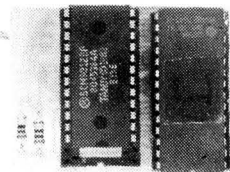
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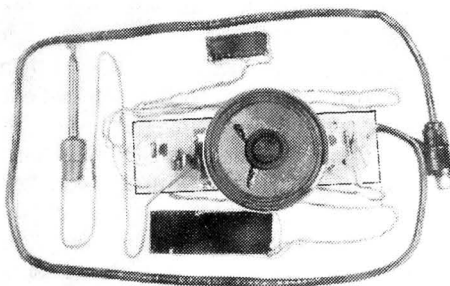


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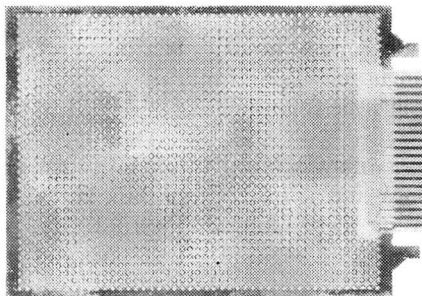
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The Color Disk EDTASM is a software development package for both the amateur and professional machine-language programmer. It and a good 6809 Assembly-language text are all you'll need to write and debug machine-code software.

If you've never written machine-language programs but want to learn, this is probably the best editor/assembler for you, but plan on spending many hours learning this difficult language.

The single disk contains the following files:

- EDTASM—An editor with which you write source-code listings and a macro assembler, which converts these listings

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Application Software

to machine-language (binary) object code.

- ZBug—a machine-language monitor, debugger, and disassembler that lets you run your object-code program, halting at every or any instruction, and pausing to let you examine the effect that the last few instructions had on the computer's memory and registers. ZBug also has a calculator for hexadecimal and octal arithmetic.

- DOS—a separate disk-operating system that lets you store and retrieve programs from disk. It uses less memory than Extended Disk Basic.

Each of these programs are linked together in one integrated package, so names and labels from one are understood by the others. You won't find this feature on most other editor/assembler/debugger/disassembler packages.

The Editor

The system contains a line editor that is almost identical to the Extended Color Basic line editor, plus COPY, MOVE, INSERT, and REPLACE commands that save you from retyping similar or identical lines at different places in your source-code listing.

You also get an autonumbering feature that creates a new line number (in multiples of 10) as soon as you press the enter key. However, this feature prevents EDTASM from assembling source code from other compilers and assemblers that use unnumbered lines.

The editor lets you page slowly through your listing, or you can advance one line at a time with the arrow keys. You can even use this editor as an

easier way to prepare Basic listings than with the Extended Color Basic editor.

A FIND command lets you locate a set of characters anywhere in the text in seconds, as long as the cursor is above the characters when you use the command. Finally, you can save or load files from tape as well as disk, so you don't have to retype your old tape EDTASM+ (the ROM pack version) programs.

The Assembler

The assembler supports all standard 6809 mnemonics for register and memory manipulation. Data (numbers) can be expressed in hexadecimal or decimal notation. However, a zero must precede all hex data beginning with a letter. A macro/include feature lets you write Assembly-language subroutines (or modules), store them on disk, and then call them into any other source-code listing without retyping—or even listing—they. As with the SOUND function in Color Basic, you can specify a macro by name only, and you can pass parameters to it, just like you pass the pitch and duration to Color Basic's SOUND or PLAY commands.

As an alternative, you can append source-code modules to your program listing via the editor's load with append (LDA) command, which eliminates retyping a stored module. If you use the Macro/Include feature instead of appending one module to another, your source-code listing will actually be much shorter. With either version, the final assembled object-code file will be the same length.

An important problem with the

*So you want to learn Assembly language.
Disk EDTASM has enough features to get you started.*

EDTASM assembler is the lack of binary representation. This is critical for masking operations used in many graphics and condition-code register manipulations. Without this feature, found in most other 6809 assemblers, you must manually calculate or look up the conversion from binary to hex numbers for every 8-bit mask you want to use. Then the mask data in the program listing is entered in hex notation, and it becomes much less understandable.

I recommend that you create a file containing a group of EQUATE statements defining the mask bytes that you will use often, like this:

```
10000 M1111 EQU $FF * 1111 1111
10020 M1010 EQU $AA * 1010 1010
10030 M1100 EQU $CC * 1100 1100
10040 etc. etc.
```

You can save this as a source file named MASK1/ASM and call it back later with the Include feature to place it at the top of your program. Then you can use these "pretend binary" definitions in your program instead of hex-notation data. This will make writing and understanding your source code much easier.

Another feature, the conditional assembly, only calls in a macro when certain conditions occur. Frankly, I don't know why you would want this feature, and neither do some advanced Assembly-language programmers I've talked to.

The Monitor/Debugger

ZBug lets you halt your program after every instruction (via the single-step

mode) or after any set of instructions (via the breakpoint feature), so you can examine the effect these instructions had on the computer's memory and registers. You can set breakpoints on labels that you used in your source-code listing, rather than at hex addresses—a feature most other debuggers don't have.

*“Radio Shack’s
Disk EDTASM is a
good, easy-to-use,
fully integrated program
with a few
unfortunate flaws.”*

The disassembler lets you convert a binary code to Assembly-language mnemonics. This operates not only on your own programs in memory, but on any binary code that you can load in, or on the Color Basic ROMs. The labels and symbols that you defined when you assembled your program are saved in memory so you can set the disassembled listing to contain names and symbols instead of just hex numbers.

ZBug has a calculator for hexadecimal and octal arithmetic, so you can compute values you need to design or debug your programs. You can get the output or the input format in decimal or even octal form.

ZBug also offers memory-move and memory-display features, but the display mode is not as good as most other monitors I have seen. The screen only shows one memory location per line, instead of a whole row of numbers. As a result, scrolling through memory to view its contents is very awkward, since you can only view 16 locations at once.

This makes it difficult to read text as it scrolls by vertically. When you modify a block of data, you are at a disadvantage because you see only 16 bytes at a time and can step only one line at a time with the arrow keys.

Finally, ZBug lets you load or save a binary file from tape or disk, and include a symbol table as well, which saves memory-location labels for reloading and eases disassembly later on.

The Disk Operating System

The disk operating system loads into lower memory and replaces the Disk Basic ROM operating system. Among other things, it lets you store and retrieve programs from disk.

This system doesn't include the stack area that standard Basic places at the top of RAM, so you can place an object program there without clearing this area, like you have to in Basic.

The DOS features a menu-driven set of functions including a two-column, selective directory that displays all files, or only those with a certain extension or a certain name. This is much better than Disk Basic's directory that scrolls by quickly before you can view it. Also, you can view an allocation map that tells you how many granules are free

and exactly what granules are occupied.

Also included is a file-copy feature that is less convenient than Disk Basic's copy mode, which lets you view the directory and copy the file name while it is still on the screen. With the EDTASM DOS, the copy feature erases the directory screen, so you must remember the file name and extension name to type them in.

Fortunately, both the EDTASM DOS and Disk Basic use the same disk format, so one can read the other's files, and you can use the Disk Basic copy feature to copy EDTASM files.

While this DOS is separate and supposedly independent from Disk Basic, it must call some routines from the Disk ROM and also the Basic ROM. Therefore, in a 64K machine, you cannot write and debug software in memory in most of the upper 32K while in all-RAM mode.

I put my 64K computer into the all-RAM mode and assembled a program at \$C000, the Disk Basic starting location. But when I tried to save my source code to disk, the computer locked up, implying that the EDTASM DOS was calling the Disk Basic code that I overwrote.

Consequently, you can't assemble and debug programs in memory if the code is located in any of the areas of the upper half of a 64K computer where Disk Basic is relocated unless you first save the code on tape. However, you could assemble code at locations \$C000-\$FEFF in memory and to tape after debugging it. Then you must shut down your computer, reload the old source code from disk, make the source-code corrections after reloading, and then assemble the corrected source code to disk, but not to memory.

Note also that you can't overwrite the area of memory occupied by Color Basic (\$A000-\$BFFF), because it contains EDTASM's keyboard-scan routine. Here you could only write position-independent code, debug it in a different RAM area, and then assemble it to disk at \$A000.

Memory Usage

The EDTASM and ZBug programs running under the DOS come in a 32K version, which combines both programs in one master file so you can run them together without any disk calls (they are memory resident). A second version runs an EDTASMOV (overlay) program. You can also run a separate, stand-alone ZBug by loading it in from disk and overlaying it on top of EDTASMOV, destroying your source code in memory

but not the binary object code assembled in memory.

With the normal (32K) EDTASM/ZBug, both the assembler and monitor are in memory at the same time, so you can only assemble and test a program well above hex address \$4A2E, the end of the EDTASM program. The exact location depends on the length of your source code.

With the 16K EDTASMOV program in memory, you can assemble a program in memory above \$3800 (again, the exact beginning depends on the size of your source code). Neither of these is very good if you want to assemble and test a program in low memory (below \$3800).

To sidestep EDTASM's memory-hogging problem, you can write position-independent code and test it in upper memory or load in the stand-alone ZBug with an offset after loading in a binary (assembled) file from disk. Then you can debug the assembled binary code in lower memory below \$3800.

The following Basic program lets you do this on a 32K computer. Type it in while in Microsoft Disk Basic (*not* the EDTASM DOS), and save it on the EDTASM disk.

```
10 PCLEAR 1
20 CLEAR10,&H62FF
30 INPUT"INSERT DISK WITH BINARY
FILE AND ENTER FILE NAME OR
TYPE NO TO RUN ZBUG WITHOUT
LOADING OTHER FILE";A$
40 IF A$="NO" THEN 60
50 LOADM A$
60 INPUT"INSERT EDTASM DISK AND
HIT ENTER";J
70 LOADM"ZBUG",&H4F00
80 EXEC
```

Call this program MOVEZB and save it to disk, again under Microsoft Disk Basic.

To use your relocated ZBug to examine and debug a program that resides above \$1000 and below \$6300, type RUN"MOVEZB". MOVEZB will automatically load any binary file you choose when you answer the prompt with the name of that file. You don't need to specify the extension if it is /BIN.

ZBug automatically loads at \$6300, so you can examine, debug, and modify your binary code in lower memory. You can save the modified binary file to disk by hitting Q to exit back to Basic and typing SAVEM "XXX", &HSSSS, &HEEEE, &HZZZZ. XXX is the file name, and the other values are the hex start, end, and execute addresses of the binary file to be saved.

The EDTASM manual doesn't men-

tion this technique, but it corrects one of the drawbacks of the disk ZBug package.

Documentation

The 170-page loose-leaf notebook is broken into several sections. The first tells you how to use the various features on the DOS menu and gives you a sample exercise for writing, debugging, and running an entire program.

The Commands section covers all the editor, assembler, debugger, and DOS commands. However, I found several errors here, some of which will cause a bit of confusion. The section even omits some important commands. Luckily, however, they do appear in the reference section.

The language section includes a listing of each Assembly-language mnemonic, although the instructions recommend that you refer to a 6809 Assembly-language text for more complete programming information.

The reference section also has a listing of every system command, broken down according to function (DOS, Editor, ZBug, and so on). However, a column entitled "pages discussed" that intends to offer the numbers of pages on which commands are discussed doesn't do so—a most inconvenient omission.

The memory map in the reference section omits all references to the EDTASM and DOS programs, although the text tells you to look here for the map data.

Advanced programmers might like the fact that the manual gives the full DOS source code and routines for writing Assembly-language I/O calls to access any byte on the disk.

Therefore, since much of the Radio Shack disk-based software such as Disk Spectaculator and Disk Color Scripsit use this DOS, instead of the Microsoft Disk Basic system, you could write and sell machine-language software that accesses data from these other programs. For example, you might enhance Disk Spectaculator to enable Disk Scripsit to read in data files from the spreadsheet.

Conclusions

Radio Shack's Disk EDTASM is a good, easy-to-use, fully integrated program with a few unfortunate flaws: the errors and omissions in the documentation, the lack of free memory below \$3800, and a poor, but usable monitor.

But besides those few shortcomings, this is a valuable aid to both beginning and advanced Assembly-language programmers and competes well with most disk editor/assembler/debuggers on the market. And the price is hard to beat. ■



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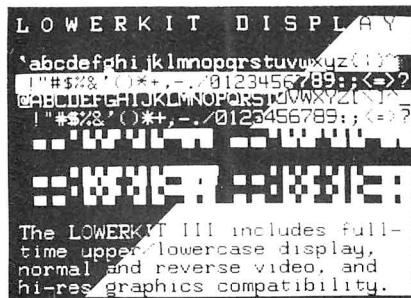
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TYPE

This word processor may look small, but it will serve most of the average person's writing needs.

Most of my word-processing needs are simple. I write mostly single-page letters, and using a full-blown word processor for this purpose is like killing a beetle with a sledgehammer. I needed a program that would let me easily correct typographical errors and let me know when I am running out of space on a line. I created QType for this reason.

QType lets you compose one line at a time on the screen, correct any errors, and then send the line to the printer. You make corrections by back-spacing to the error and overtyping it. A tab is available by pressing the shifted up-arrow key. QType keeps track of how many characters you can use on a line and how many you've already used. Uppercase letters appear as reverse characters.

When you first run the program, it asks for the number of characters you want on a line. Pressing the enter key

at this prompt tells the program you want the default value of 64. Next, QType asks for a tab position. If you request a tab position of 50 and a line length of 64, the top left of the screen will read 50/14 and the top right will read Line 1. This indicates that you are on line 1, space 50, and you have 14 spaces left on the line.

Pressing enter sends a line to the

printer. You create blank lines by pressing enter with no text on a line. You can change the tab position at any time by pressing the shifted up-arrow key and answering the prompt. ■

Address correspondence to Robert E. Cutter, 2505 W. Sixth St., #701, Los Angeles, CA 90057.

```

1Ø POKE282,Ø: CLEAR5ØØØ: DIMC$(1ØØ
)
2Ø X=1:CLS: INPUT"MAX NO CHARACTE
RS PER LINE =";Y: IF Y=<Ø THENY=6
4
3Ø PRINTTAB(Ø6): INPUT"ENTER TAB
POSITION";T:CLS
4Ø PRINTØØ, K+T/"Y-K-T";PRINTØ23
,"LINE"X;
5Ø PRINTØ33,"TAB='<u>'";
REPEAT='<u>'";
6Ø A$=INKEY$: IF A$="" THEN6Ø
7Ø IF A$=CHR$(9) THEN 6Ø
8Ø V=ASC(A$): IF V>96ANDV<123THEN
V=V-32:GOTO1ØØ
9Ø IFV<91ANDV>64THENV=V+32
1ØØ PRINTØ(96+K+T),CHR$(V);CHR$(
2Ø7)
11Ø K=K+1: IF K>Y-4 AND K<Y-1 THE
NSOUND2ØØ,1
12Ø IF A$="<u>" OR A$=CHR$(13) THE
NK=K-1
13Ø IF A$=CHR$(8) ANDK<2THENA$=""
:K=K-1:GOTO4Ø
14Ø IF A$=CHR$(8) THENGOSUB24Ø:K=
K-2
15Ø IF K<Ø THENK=Ø:A$=""
16Ø IF K>Y THENK=Y:GOSUB26Ø
17Ø IF K=>Y-1 THENSOUND3Ø,1
18Ø IF K=>Y THENSOUND3Ø,3Ø
19Ø IF A$="<u>" THEN3Ø
2ØØ IF A$="<u>" THEN28Ø
21Ø B$=B$+A$
22Ø IF A$=CHR$(13) ANDPEEK(112Ø+K
)>94THENA$="" :CLS:PRINT#-2,TAB(
T);B$+CHR$(27):C$(X)=C$(X)+B$:X=
X+1:B$="" :T=Ø:K=Ø
23Ø GOTO4Ø
24Ø N$=LEFT$(B$,K-2)
25Ø B$=N$:A$="" :RETURN
26Ø N$=LEFT$(B$,K)
27Ø B$=N$:A$="" :RETURN
28Ø FORZ=1TOX:PRINT#-2,C$(Z)+CHR
$(27):NEXT
29Ø GOTO4Ø
3ØØ END

```

Program Listing. QType (change all underline characters to up-arrows when typing this in).

System Requirements

**16K RAM
Extended Color Basic
Printer**

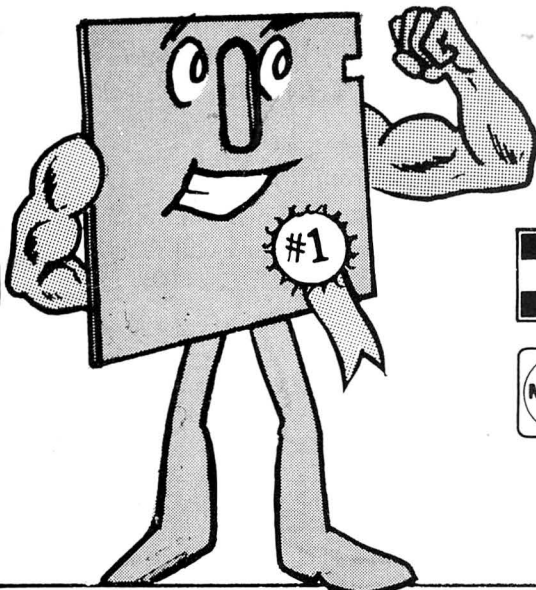
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Peter Bono

CoCo vs. IBM: The Great Math Face-Off

The next time the smug kid with the Commodore next door puts down your CoCo, show him this.

This is a true story: an account of a recent mathematical face-off in which a stock Color Computer actually turned in a more accurate performance than an IBM mainframe. That's right, a mainframe. Not a PCjr, not a PC or PC-XT, but a full-bore IBM 3081 which serves as the central computing facility for a 900-person R&D laboratory. Even though this was only a test of the overall accuracy of one particular numerical procedure, it should be a source of pride to all CoCo enthusiasts interested in picking up bragging rights for their favorite machine.

Where the Problem Came From

The affair begins with a CoCo

owner named Bob Kearns. Bob is an electronics engineer in the telecommunications research section of a large corporate R&D lab in New England. At present, he works with fiber-optical communications systems. As you may know, these transmit digital data (which may represent telephone conversations as well as computer traffic) in the form of extremely short pulses of laser light traveling along hair-thin fibers of ultrapure glass.

One of Bob's concerns is signal dis-

persion—in other words, the study of how much a short light pulse will be lengthened after it has traveled many miles in a fiber. There are several reasons why the pulses will always spread out to some degree, but for now it's only important to understand that the ability to control pulse dispersion is critical to our ability to design high-quality communications links.

If individual pulses grow too broad it becomes impossible to stuff many of them down a fiber at high speed; there has to be some interval between pulses, after all. That would be unfortunate, because speed and signal-carrying capacity are the names of the game.

<p>System Requirements 16K RAM Extended Color Basic</p>
--

At this point you need a little mathematical digression. Engineers are accustomed to analyzing sharp pulses such as idealized digital signals by mathematically dissecting them into a collection of smooth, periodic functions that are easier to treat theoretically. Under some very general conditions, signals encountered in the real world can be represented as superpositions of sines and cosines of various frequencies. The problem of determining what happens when the original signal (a function of time) is passed through a communications system then becomes a matter of describing the behavior of each sine or cosine—in other words, describing the properties of the system as a function of frequency. The trigonometric functions can be mathematically reassembled at the end to show what became of the original signal.

The whole process of taking signals apart and putting them back together in this fashion is called Fourier analysis, at least when sines and cosines are used as the building blocks as I've just described. Perhaps you are familiar with the way a periodic square wave can be written as a particular sum of sine functions:

$$\begin{aligned} \text{(Square wave of period } X) &= \text{Sin}(X) + \\ & (1/3)\text{Sin}(3X) + (1/5)\text{Sin}(5X) + \dots \end{aligned}$$

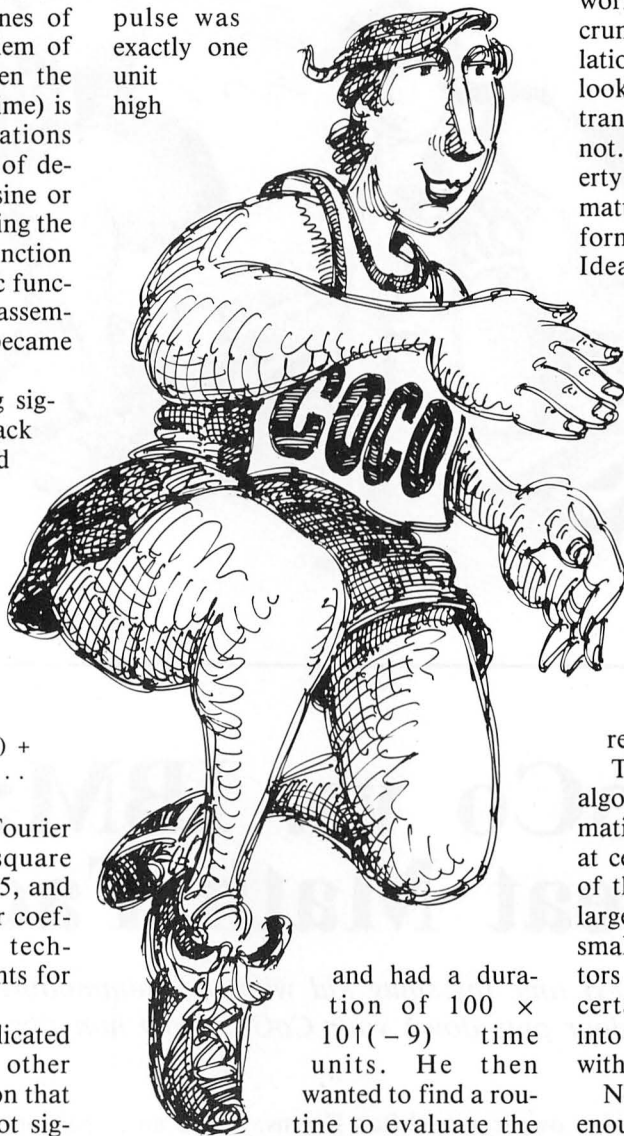
The sines form a so-called Fourier series representation of the square wave, and the fractions 1/3, 1/5, and so on are said to be the Fourier coefficients. There are standard techniques for finding the coefficients for many kinds of input signals.

Things get a little more complicated when the input is something other than a perfectly periodic function that repeats without end. A one-shot signal must be represented as an integral over an infinite number of Fourier components, rather than as the summation of a series. The sines and cosines within the integral will be multiplied by a function called the Fourier transform of the input signal; think of it as a recipe describing how large a portion of each component is needed to make up the original. Knowing the Fourier transform of a given signal is the first step toward being able to evaluate how it will behave when passed through a communications system.

FFTs and The Great Compute-Off

Now I can return to the story of

Bob Kearns, his CoCo, and their mathematical triumph. One standard signal used to probe the characteristics of a fiber-optics system is a rectangular pulse, representing a single burst of laser light. Bob chose to use such a signal for some tests, and for simplicity he chose his scales so that the pulse was exactly one unit high



and had a duration of $100 \times 10^{(-9)}$ time units. He then wanted to find a routine to evaluate the Fourier transform of this pulse; eventually, the routine was to become part of a complete signal-analysis package.

This is no particular problem; there are many standard subroutines for doing this sort of calculation. The most useful are the fast Fourier transforms, or FFTs, which make use of certain symmetries to greatly speed up the process. FFTs are ideally suited to computer implementation, and are almost universally used for problems of any complexity.

Bob began to work with a machine-language subroutine written by a former colleague for his employer's IBM 3081. Soon he was cranking out re-

sults for the amplitude of his Fourier transform. These took the form of lists of numbers for the real and imaginary parts of the transform (it's a complex quantity, in general). There were 512 sampling points, separated by $1 \times 10^{(-9)}$ time units.

Of course, the question of accuracy soon comes up in extensive numerical work of this kind; a lot of number crunching goes on during the calculation, and it's hardly practical to just look at the table of values for the transform and see if it's correct or not. There is a nice symmetry property that one can use to study this matter: The transform of the transform of a signal is the signal itself. Ideally, running the output of the FFT through the routine again should have given Bob his original rectangular pulse as a result.

It didn't, of course. As I have mentioned, the exact expression for a Fourier transform is an integral which extends to infinity, while any real calculation only covers a finite range. Also, a certain amount of error will usually accumulate in a long computation just because computers work with finite-length representations of numbers.

There is yet another problem. The algorithms used to evaluate mathematical functions can introduce errors at certain points; when the argument of the function is very small or very large, when two values differ by a small amount, and so on. These factors generally combine to introduce a certain amount of numerical noise into calculated results, and so they did with Bob Kearns' FFT.

Not a lot of noise, mind you, but enough to be significant. The first subroutine produced a reconstructed pulse whose amplitude was in error by about five parts in 10^{16} where it should have been exactly one, and by a few parts in 10^{17} where it should have been exactly zero. (For the experts: I am describing the real parts of the function. The imaginary components of the reconstructed pulse generally had amplitudes of a few parts in 10^{17} , when they should have been identically zero.)

That's not terribly impressive. Intrigued, Bob began to explore the professional literature for other FFT routines. One, which appeared some years ago in a publication of the Institute of Electrical and Electronic En-

gineers (IEEE), was converted to both single- and double-precision Fortran code and run on the mainframe. Here's the general trend of how the reconstructed pulse deviated from its true value of one or zero:

	Deviations from "1"	Deviations from "0"
Single precision	4-7 parts in 1016	1 part in 1016
Double precision	1 part in 1016	5 parts in 1018

Double-precision arithmetic was clearly an improvement, but it was a little surprising that all the power of the 3081 couldn't result in a better approximation.

Triumph!

Somewhere in the midst of all this activity, Bob got the idea of coding an FFT algorithm in Basic and trying it on his Color Computer. The results were little short of amazing. In the region where the original pulse had an amplitude of 1.0, the twice-transformed version exhibited a variation of only $+/-1$ part in 1018! The zero-amplitude region was also cleaner than anything turned up by the mainframe's computations, deviating from zero by as much as one part in 1018 at only a few points. Over most of this portion of the pulse, the deviation was less than five parts in 1019.

Do It Yourself

The test program, set up for a one-unit high pulse, 100 time slots long, is included in the listing accompanying this article. This isn't the place to go into an explanation of the code's workings, and if you really need an FFT, you can probably figure it out for yourself. I do want to mention a couple of points, though.

To begin with, the routine has been checked on only one ROM combination: Color Basic 1.2 and Extended Color Basic 1.1. It is possible, although unlikely, that earlier ROMs will give slightly different results. The results I've quoted indicate that this calculation is probably getting a lot of accidental benefit from the way some of the CoCo's algorithms are coded, and it may be that there have been some changes over time.

The routine also makes use of a high-speed POKE in lines 30, 120, and 180; delete them and the corresponding slowdowns in lines 90 and 160 if your machine can't handle it.

The printout format is a simple three-column listing: sample point number, real part of the transform, imaginary part of the transform. To

shorten the printing time, lines 80 and 170 are set up to only print every eighth point. The program will run for a couple of minutes, print the results of the forward transform (rectangular pulse to broad spectrum), run for a while longer, and print the outcome of the second pass, which reconstructs the pulse.

```

10 N9=512: 'NUMBER OF POINTS IN F
FT
20 DIM XR(N9), XI(N9)
30 POKE 65495,0
40 U9=0: 'TIME-TO-FREQUENCY TRANS
FORM
50 P9=1E-9: 'TIME NORMALIZATION
60 FOR I=1 TO 100: XR(I)=1.0: NEXT
70 GOSUB 1000
80 FOR I=1 TO N9 STEP 8
90 POKE 65494,0
100 PRINT#-2, I, XR(I), XI(I): NEXT
110 PRINT#-2, " "
120 POKE 65495,0
130 P9=1/(N9*P9)
140 U9=1: 'FREQUENCY-TO-TIME TRAN
SFORM
150 GOSUB 1000
160 POKE 65494,0
170 FOR I=1 TO N9 STEP 8: PRINT#-2
, I, XR(I), XI(I): NEXT
180 POKE 65495,0
190 END
1000 'ACTUAL FFT SUBROUTINE
1010 H9=N9/2: Q9=N9-1: J9=1
1020 M9=LOG(N9)/.693147181: PI=3.
1415926
1030 FOR I=1 TO N9
1040 XR(I)=XR(I)*P9: XI(I)=XI(I)*
P9: NEXT
1050 FOR I9=1 TO Q9
1060 IF I9>=J9 THEN 1100
1070 S9=XR(J9): T9=XI(J9)
1080 XR(J9) = XR(I9): XI(J9)=XI(I
9)
1090 XR(I9)=S9: XI(I9)=T9
1100 K9=H9
1110 IF K9>=J9 THEN 1140
1120 J9=J9-K9: K9=K9/2
1130 GOTO 1110
1140 J9=J9+K9
1150 NEXT I9
1160 IF U9=0 THEN O9=-1 ELSE O9=
1
1170 FOR L9=1 TO M9
1180 A9=2^L9: B9=A9/2
1190 D9=1: E9=0
1200 W9=COS(PI/B9): Y9=O9*SIN(PI/
B9)
1210 FOR J9=1 TO B9
1220 FOR I9=J9 TO N9 STEP A9
1230 C9=I9+B9
1240 V9=XR(C9)*D9-XI(C9)*E9: Z9=X
I(C9)*D9+XR(C9)*E9
1250 XR(C9)=XR(I9)-V9: XI(C9)=XI
(I9)-Z9
1260 XR(I9)=XR(I9)+V9: XI(I9)=XI
(I9)+Z9
1270 NEXT I9
1280 F9=D9: G9=E9
1290 D9=F9*W9-G9*Y9: E9=G9*W9+F9*
Y9
1300 NEXT J9: NEXT L9
1310 RETURN

```

Program Listing. Fast Fourier Transform Routine

The first few lines printed from the first pass are:

```

1      1E-07      0
9      -2.93290978E-09  -1.97720759E-08
17     3.73613444E-09  -1.13334397E-09

```

which, I think you'll agree, are hard to evaluate—unless you have memorized a table of all possible Fourier

transforms! The outcome of the second transformation starts off looking like this:

```

1      1      -8.13997759E-11
9      1      3.83390029E-09
17     1      1.47306014E-09
25     1.00000001  3.97309831E-09

```

and so on. Very close to a unit pulse, indeed.

You may want to experiment with the program, setting up other input signals or sampling intervals; most of the important variables are labeled in the code. By the way, the variables have such funny names because Bob Kearns wanted to splice this routine into other programs without having name conflicts. He decided not to use names ending in "9" anywhere else, I suppose.

So What?

If someone holds a gun to my head, I will have to admit that the superior accuracy demonstrated by the Color Computer in the FFT experiment is something of a fluke. The exact formulation of various ROM algorithms for exponentiation and for calculating trig functions undoubtedly had something to do with it. When the routine in the Basic listing was coded in Fortran and run on the IBM 3081, accuracies for the reconstruction of the input pulse dropped to a few parts in 1017 or even 1016—much closer to the original single-precision results. (It's worth noting that the CoCo has turned in a similarly stirring performance in another test; see the "Computer Recreations" column in the April 1984 *Scientific American* for details.)

Still, it's nice to have a fluke of this kind working for you. Think of the opportunity it gives you to pick up a little loose change by offering to take the burden of Fourier transform computation away from your neighborhood mainframe! All the customers have to give up is a little speed. At the very least, the CoCo's performance in the Great FFT Competition makes a super talking point when you go up against owners of other personal computers.

Although it should be obvious, I'm happy to repeat that this article could not have been written without the cooperation and patience of Robert Kearns. ■

Address correspondence to Scott L. Norman, 8 Doris Road, Framingham, MA 01701.

Personal Money Manager



With a sharp pencil and many sheets of paper you can figure compound interest without a computer. But this program will do that and also calculate interest, annuities, mortgage payments, present values, and time requirements. The program figures those many little “what ifs” that you would like to know for good money management and budget planning. You don’t have to remember all those things that you were supposed to have learned in math class, either.

The program is menu driven because I hate a program with an instruction booklet that I have to plow through. All you need to know is which of the 14 questions you want answered and some bits of information like interest rate, how many times a year interest is compounded, and the amount of money involved. (See Table 1.) Be sure that you enter interest rates as decimals (i.e., $9.762\% = .09762$) You can print out most of the computations if you have a printer. Table 2 lists the formulas used for the menu choices. ■

System Requirements

16K RAM
Extended Color Basic
Printer optional

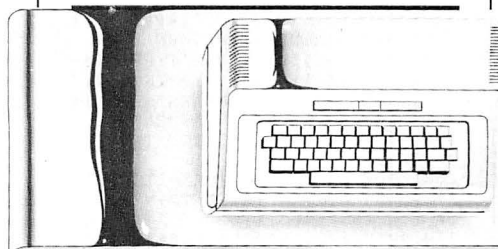
*Don't be intimidated by financial math formulas.
Use this program to calculate interest and more.*

- 1—Amount at compound interest—How much money will you have in 12 years if you now invest \$2,500 at 9% interest rate and it is compounded four times a year?
- 2—Value needed for compounding—How much must you invest now in order to accumulate \$11,000 after 8 years if it will be compounded 12 times a year at 11% annual interest rate?
- 3—Time required to compound—How long will it take for \$2,000 to grow to \$12,000 if it is invested at 12% annual interest rate and compounded four times a year?
- 4—Amount of annuity—How much money will you have if each month for 8 years you save \$175 and invest it at 10.5% interest rate compounded four times a year?
- 5—Payments to annuity—How much must you save each month if you invest at 9.2% annual interest rate compounded 12 times a year and want to accumulate \$12,000 in five years?
- 6—Time required for annuity—How long will it take you to accumulate \$15,000 if you save \$225 every month and invest at 11.2% annual rate compounded 12 times per year?
- 7—Value needed for annuity—How much must you invest now at 8% annual interest rate to be compounded 12 times per year in order to have a monthly income of \$800 for 15 years?
- 8—Annuity from present value—How much will your monthly income be if you have \$45,000 invested at 12.6% annual rate compounded four times a year and wish it to last 20 years?
- 9—Time left for annuity—How long will your money last if you have \$27,000 invested at 11% annual interest rate and wish to have a monthly income of \$900?
- 10—Possible loan amount—How large a loan can you afford if you make payments of \$200 each month over a 20-year period at 9.4% annual interest rate compounded 12 times a year?
- 11—Payments required for loan—How large will each payment have to be in order to pay off a loan of \$75,000 in 25 years at 13% annual interest rate compounded 12 times a year?
- 12—Time required for payments—How long will it take to pay off a loan of \$4,200 if 12 times a year you make payments of \$185 with 12% annual interest rate?
- 13—Comparison of interest rates—What percent annual interest rate, compounded 2 times a year, must you get in order to equal the income of 9% annual rate compounded 12 times a year?
- 14—Taxable vs. tax-free interest—What tax-free interest rate is equivalent to a 12% taxable rate if you are in the 32% income tax bracket?

Table 1. Menu Selections. Values listed are examples. You can input your own values.

- (1) $A = P \cdot (1 + R)^{N \cdot T}$
- (2) $P = A / (1 + R)^{N \cdot T}$
- (3) $Y = (\text{LOG } A - \text{LOG } P) / \text{LOG}(1 + R) / T$
- (4) $A = (P \cdot ((1 + R)^{N \cdot T} - 1)) / R$
- (5) $P = A \cdot R / ((1 + R)^{N \cdot T} - 1)$
- (6) $Y = (\text{LOG}(A \cdot R + P) - \text{LOG } P) / \text{LOG}(1 + R) / T$
- (7) $P = A \cdot (1 - (1 + R)^{-N}) / R$
- (8) $A = R \cdot P / (1 - (1 / (1 + R)^{N \cdot T}))$
- (9) $Y = (\text{LOG } A - \text{LOG}(A - R \cdot P)) / \text{LOG}(1 + R) \cdot T$
- (10) $P = A \cdot (1 - (1 + R)^{-N}) / R$
- (11) $A = R \cdot P / (1 - (1 / (1 + R)^{N \cdot T}))$
- (12) $Y = (\text{LOG } A - \text{LOG}(A - R \cdot P)) / \text{LOG}(1 + R) \cdot T$
- (13) $R1 = [((1 + R2 / T2)^{T2 / T1}) - 1] \cdot T1$
- (14) $T2 = R1 \cdot (1 - TB)$

Table 2. Formulas Used in Menu Selections



Address correspondence to Anna Reeves, Route 2, Box 10 R 9, Espanola, WA 99022.

Program Listing. Interesting Interest

```

10 CLEAR:CLS:PRINT " 1-AMOUNT AT
COMPOUND INTEREST"
20 PRINT " 2-VALUE NEEDED FOR COM
POUNDING"
30 PRINT " 3-TIME REQUIRED TO COM
POUND"
40 PRINT " 4-AMOUNT OF ANNUITY"
50 PRINT " 5-PAYMENTS TO ANNUITY
"
60 PRINT " 6-TIME REQUIRED FOR AN
NUITY"
70 PRINT " 7-VALUE NEEDED FOR ANN
UITY"
80 PRINT " 8-ANNUITY FROM PRESENT
VALUE"
90 PRINT " 9-TIME LEFT FOR ANNUIT
Y"
100 PRINT "10-POSSIBLE LOAN AMOUN
T"
110 PRINT "11-PAYMENTS REQUIRED F
OR LOAN"
120 PRINT "12-TIME REQUIRED FOR P
AYMENTS"
130 PRINT "13-COMPARISON OF INTER
EST RATES"
140 PRINT "14-TAXABLE VS TAX-FREE
INTEREST":INPUTB
150 ON B GOTO 590,650,730,820,91
0,1030,1140,1230,1340,1410,1490,
1580,1660,1740:GOTO10
160 PRINT:INPUT"CONTINUE <Y/N>";
B$
170 IFB$<>"Y"THEN10ELSE RETURN
180 INPUT"ANNUAL INT.RATE(6%=.06
)";I
190 INPUT"NUMBER OF TIMES PER YE
AR THAT INTEREST IS COMPOUNDED
";T:R=I/T:RETURN
200 PRINT"LENGTH OF TIME IN YEAR
S"
210 INPUT"(2 YR 3 MO=2.25)
";Y:N=T*Y:RETURN
220 INPUT"PRINCIPAL INVESTED";P:
RETURN
230 PRINT:PRINT"TOTAL INTEREST
";:RETURN
240 PRINT USING"#####.###";K:RE
TURN
250 PRINT"TOTAL PAYMENTS ";
260 PRINT USING"#####.###";N*A:
RETURN
270 PRINT:INPUT"PRINT TABLE <Y/N
>";B$:IFB$<>"Y" THEN 10 ELSE RET
URN
280 INPUT"SCREEN<S> OR PRINTER <
P>";B$:IFB$="P"THEN420
290 PRINTTAB(4)"INTEREST TOT/INT
T PRIN/BAL":M=0:M2=0
300 FOR X=1TON:M=J*R:M2=M2+M:J=J
+M:PRINT USING"#####.###";X;
310 PRINT USING"#####.###";M;:PR
INT USING"#####.###";M2;J:NEXTX
:RETURN
320 INPUT"SCREEN<S> OR PRINTER<P
>";B$:IFB$="P"THEN350
330 PRINTTAB(4)"PAYMENT TOT/PA
Y INTEREST TOT/INT BALANC
E"
340 TP=0:BA=0:M2=0:FORX=1TON:TP=
X*B:M=BA*R:M2=M2+M:BA=TP+M2:PRIN
T USING"#####.###";X;:PRINT USING"#####
.###";B;:PRINT USING"#####.###
";TP;M;M2;BA:NEXTX:RETURN
350 PRINT#-2,"PAYMENTS";:PRINT#-
2,USING"#####.###";B;:PRINT#-2,"
INT RATE"ITIME"Y"YEARS":PRINT#
-2:PRINT#-2,"NUM PAYMENT T
OT/PAY INTEREST TOT/INT
BALANCE"
360 TP=0:BA=0:M2=0:FORX=1TON:TP=
X*B:M=BA*R:M2=M2+M:BA=TP+M2:PRIN
T#-2,USING"#####.###";X;
370 PRINT#-2,USING"#####.###";
B;TP;M;M2;BA:NEXTX:RETURN
380 INPUT"SCREEN<S> OR PRINTER<P
>";B$:IFB$="P"THEN400
390 PRINTTAB(4)"PAYMENT TOT/PA
Y INTEREST TOT/INT BALANC
E":TP=0:M2=0:FORX=1TON:TP=X*B:M=
BA*R:M2=M2+M:BA=BA+M-B:PRINT USI

```

```

NG"#####.###";X;:PRINT USING"#####.##
";B;:PRINT USING"#####.###";TP;
M;M2;BA:NEXTX:RETURN
400 PRINT#-2,"BALANCE";:PRINT#-2
,USING"#####.###";BA;:PRINT#-2,
"INTEREST RATE"ITIME"Y"YEARS":
PRINT#-2:PRINT#-2,"NUM PAYMEN
T TOT/PAY INTEREST TOT/I
NT BALANCE"
410 TP=0:M2=0:FORX=1TON:TP=X*B:M
=BA*R:M2=M2+M:BA=BA+M-B:PRINT#-2
,USING"#####.###";X;:PRINT#-2,USING"##
#####.###";B;TP;M;M2;BA:NEXTX:RE
TURN
420 PRINT#-2,"INVESTMENT $"J"INT
RATE"ITIME"Y"YEARS":PRINT#-2:P
RINT#-2,"NUM INTEREST TOT.INT
PRIN/BAL"
430 M=0:M2=0:FORX=1TON:M=J*R:M2=
M2+M:J=J+M:PRINT#-2,USING"#####.###";X
;
440 PRINT#-2,USING"#####.###";M;
:PRINT#-2,USING"#####.###";M2;
J:NEXTX:RETURN
450 CLS:PRINT"1-AMOUNT AT COMPO
UND INTEREST":PRINT:RETURN
460 CLS:PRINT"2-VALUE NEEDED FOR
COMPOUNDING":PRINT:RETURN
470 CLS:PRINT"3-TIME REQUIRED TO
COMPOUND":PRINT:RETURN
480 CLS:PRINT"4-AMOUNT OF ANNUIT
Y":PRINT:RETURN
490 CLS:PRINT"5-PAYMENTS TO ANNU
ITY":PRINT:RETURN
500 CLS:PRINT"6-TIME REQUIRED FO
R ANNUITY":PRINT:RETURN
510 CLS:PRINT"7-VALUE NEEDED FOR
ANNUITY":PRINT:RETURN
520 CLS:PRINT"8-ANNUITY FROM PRE
SENT VALUE":PRINT:RETURN
530 CLS:PRINT"9-TIME LEFT FOR AN
NUITY":PRINT:RETURN
540 CLS:PRINT"10-POSSIBLE LOAN A
MOUNT":PRINT:RETURN
550 CLS:PRINT"11-PAYMENTS REQUIR
ED FOR LOAN":PRINT:RETURN
560 CLS:PRINT"12-TIME REQUIRED F
OR PAYMENTS":PRINT:RETURN
570 CLS:PRINT"13-COMPARISON OF I
NTEREST RATES":PRINT:RETURN
580 CLS:PRINT"14-TAXABLE VS TAX-
FREE INTEREST":PRINT:RETURN
590 GOSUB450:PRINT"HOW MUCH MONE
Y WILL YOU HAVE IN 12 YEARS IF Y
OU NOW INVEST $2500AT 9% ANNUAL
INTEREST RATE AND IT IS COMPOUN
DED 4 TIMES A YEAR?"
600 GOSUB160:GOSUB450:GOSUB220:G
OSUB180:GOSUB200
610 A=P*((1+R)^N)
620 GOSUB230:K=A-P:GOSUB240
630 PRINT"TOTAL AMOUNT ";
640 K=A:GOSUB240:GOSUB270:J=P:GO
SUB280:GOTO620
650 GOSUB460:PRINT"HOW MUCH MUST
YOU INVEST NOW IN ORDER TO ACCU
MULATE $11,000 AFTER 8 YEARS
IF IT WILL BE COMPOUNDED 12
TIMES A YEAR AT 11% ANNUAL IN
TEREST RATE?"
660 GOSUB160:GOSUB460
670 INPUT"AMOUNT TO ACCUMULATE";
A
680 GOSUB180:GOSUB200
690 P=A/((1+R)^N)
700 GOSUB230:K=A-P:GOSUB240
710 PRINT"AMOUNT TO INVEST ";
720 K=P:GOSUB240:GOSUB270:J=P:GO
SUB280:GOTO700
730 GOSUB470:PRINT "HOW LONG WIL
L IT TAKE FOR $2000 TO GROW TO $
12000 IF IT IS INVESTED AT
12% ANNUAL INTEREST RATE AND COM
POUNDED 4 TIMES A YEAR?"
740 GOSUB160:GOSUB470
750 INPUT"PRINCIPAL INVESTED";P
760 INPUT"AMOUNT TO ACCUMULATE";
A
770 GOSUB180
780 Y=((LOG(A)-LOG(P))/(LOG(1+R)

```

```

))/T
790 GOSUB230:K=A-P:GOSUB240
800 PRINT"TIME REQUIRED" Y " YEA
RS"
810 GOSUB270:J=P:GOSUB280:GOTO79
0
820 GOSUB480:PRINT"HOW MUCH MONE
Y WILL YOU HAVE IF EVERY MONTH F
OR 8 YEARS YOU SAVE$175 AND INVE
ST IT AT 10.5% INTEREST RATE
COMPOUNDED 4 TIMES A YEAR?"
830 GOSUB160:GOSUB480:GOSUB180:G
OSUB200
840 PRINT"AMOUNT TO BE SAVED EAC
H 1/"T
850 INPUT"YEAR";P
860 A=(P*((1+R)^N-1))/R
870 GOSUB230:K=A-N*P:GOSUB240
880 PRINT"TOTAL OF SAVINGS ";:K=
N*P:GOSUB240
890 PRINT"TOTAL ANNUITY ";:K=
A:GOSUB240
900 GOSUB270:B=P:GOSUB320:GOSUB8
70
910 GOSUB490:PRINT"HOW MUCH MUST
YOU SAVE EACH MONTH IF YOU
INVEST AT 9.2% ANNUAL INTERE
ST RATE COMPOUNDED 12 TIMES A YE
AR AND WANT TO ACCUMULATE $1
2,000 IN 5 YEARS?"
920 GOSUB160:GOSUB490
930 INPUT"AMOUNT TO ACCUMULATE";
A
940 GOSUB180:GOSUB200
950 P=A*R/((1+R)^N-1)
960 GOSUB230:K=A-N*P:GOSUB240
970 PRINT"PAYMENTS MUST BE ";
980 K=P:GOSUB240
990 PRINT"EVERY 1/"T"YEAR"
1000 PRINT"OR MONTHLY ";
1010 K=T*P/12:GOSUB240
1020 GOSUB270:B=P:GOSUB320:GOTO9
60
1030 GOSUB500:PRINT"HOW LONG WIL
L IT TAKE YOU TO ACCUMULATE $
15,000 IF YOU SAVE $225 EVERY M
ONTH AND INVEST AT 11.2% ANNUAL
RATE COMPOUNDED 12 TIMES PER
YEAR"
1040 GOSUB160:GOSUB500
1050 INPUT"AMOUNT TO ACCUMULATE"
;A:GOSUB180
1060 PRINT"AMOUNT TO BE SAVED EA
CH 1/"T
1070 INPUT"YEAR";P
1080 Y=((LOG(A*R+P)-LOG(P))/LOG(
1+R))/T:N=Y*T
1090 GOSUB230:K=A-N*P:GOSUB240
1100 PRINT"AMOUNT SAVED ";
1110 K=N*P:GOSUB240
1120 PRINT"TIME REQUIRED"Y" YEAR
S"
1130 GOSUB270:B=P:GOSUB320:GOTO1
090
1140 GOSUB510:PRINT"HOW MUCH MUS
T YOU INVEST NOW AT 8% ANNUAL IN
TEREST RATE TO BE COMPOUNDED 1
2 TIMES PER YEAR IN ORDER TO HAV
E A MONTHLY INCOME OF $800 FOR
15 YEARS?"
1150 GOSUB160:GOSUB510:GOSUB180
1160 PRINT"INCOME DESIRED EACH 1
/"T"YEAR":INPUT A
1170 GOSUB200
1180 P=A*(1-(1+R)^-N)/R
1190 GOSUB230:K=N*A-P:GOSUB240
1200 PRINT"AMOUNT TO INVEST ";
1210 K=P:GOSUB240
1220 GOSUB270:B=A:BA=P:GOSUB380:
GOTO1190
1230 GOSUB520:PRINT"HOW MUCH WIL
L YOUR MONTHLY INCOME BE IF
YOU HAVE $45,000 INVESTED AT
12.6% ANNUAL RATE COMPOUNDED 4
TIMES A YEAR AND WISH IT TO L
AST 20 YEARS?"
1240 GOSUB160:GOSUB520

```

Listing continued

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Listing continued

```
1250 INPUT "PRINCIPAL INVESTED";
P
1260 GOSUB180:GOSUB200
1270 A=R*P/(1-(1/(1+R)^N))
1280 PRINT:GOSUB230:K=N*A-P:GOSU
B240
1290 PRINT"INCOME WILL BE ";:K
=A:GOSUB240
1300 PRINT"EVERY 1/"T"YEAR"
1310 PRINT"OR MONTHLY ";
1320 K=T*A/12:GOSUB240
1330 GOSUB270:B=(INT(A*100+.5))/
100:BA=P:GOSUB380:GOTO1280
1340 GOSUB530:PRINT"HOW LONG WIL
L YOUR MONEY LAST IF YOU HAVE $27
,000 INVESTED AT 11%ANNUAL INTER
EST RATE AND WISH TOHAVE A MONTH
LY INCOME OF $900?"
1350 GOSUB160:GOSUB530:GOSUB180:
GOSUB220
1360 PRINT"INCOME PER 1/"T;
1370 INPUT"YEAR";A
1380 Y=(LOG(A)-LOG(A-R*P))/(LOG(
1+R)*T):N=Y*T
1390 PRINT:PRINT"TIME LEFT "Y" Y
EARS"
1400 GOSUB270:B=A:BA=P:GOSUB380:
GOTO1390
1410 GOSUB540:PRINT"HOW LARGE A
LOAN CAN YOU AFFORD IF YOU CAN M
AKE PAYMENTS OF $200EACH MONTH O
VER A 20 YEAR PERIODAT 9.4% ANNU
AL INTEREST RATE COMPOUNDED 1
2 TIMES PER YEAR?"
1420 GOSUB 160:GOSUB 540:GOSUB 1
80:GOSUB 200
1430 PRINT"AMOUNT OF PAYMENT EAC
```

```
H 1/"T
1440 INPUT"YEAR";A
1450 P=A*(1-(1+R)^(-N))/R
1460 GOSUB230:K=N*A-P:GOSUB240
1470 PRINT"LOAN AMOUNT ";
1480 K=P:GOSUB240:GOSUB250:GOSUB
270:B=A:BA=P:GOSUB380:GOTO1460
1490 GOSUB550:PRINT"HOW LARGE WI
LL EACH PAYMENT HAVE TO BE IN ORD
ER TO PAY OFF A LOANOF $75,000 I
N 25 YEARS AT 13% ANNUAL INTER
EST RATE COMPOUNDED 12 TIMES PER
YEAR?"
1500 GOSUB160:GOSUB550
1510 INPUT"LOAN AMOUNT ";P
1520 GOSUB180:GOSUB200
1530 A=R*P/(1-(1/(1+R)^N))
1540 GOSUB230:K=N*A-P:GOSUB240:G
OSUB250
1550 PRINT"PAYMENTS MUST BE ";
1560 K=A:GOSUB240
1570 PRINT"EACH 1/"T" YEAR":GOSU
B270:B=(INT(A*100+.5))/100:BA=P:
GOSUB380:GOTO1550
1580 GOSUB560:PRINT"HOW LONG WIL
L IT TAKE TO PAY OFF A LOAN OF $4
200 IF 12 TIMES A YEAR YOU MAK
E PAYMENTS OF $185 WITH 12% ANN
UAL INTEREST RATE?"
1590 GOSUB160:GOSUB560
1600 INPUT"LOAN AMOUNT ";P:GOS
UB180
1610 PRINT"PAYMENT EACH 1/"T"YEA
R":INPUT A
1620 Y=(LOG(A)-LOG(A-R*P))/(LOG(
1+R)*T):N=Y*T
1630 GOSUB230:K=N*A-P:GOSUB240:G
OSUB250
```

```
1640 PRINT"TIME REQUIRED"Y" YEAR
S"
1650 GOSUB270:B=A:BA=P:GOSUB380:
GOTO1630
1660 GOSUB570:PRINT"WHAT PERCENT
ANNUAL INTEREST RATE, COMPOU
NDED 2 TIMES A YEAR,MUST YOU GET
IN ORDER TO EQUAL THE INCOME O
F 9% ANNUAL RATE COMPOUNDED 1
2 TIMES A YEAR?"
1670 GOSUB160:GOSUB570
1680 PRINT:INPUT"KNOWN INT. RATE
(6%=.06)";R2
1690 INPUT"HOW MANY TIMES A YEAR
IS THE KNOWN INTEREST RATE
COMPOUNDED";T2
1700 INPUT"HOW MANY TIMES A YEAR
IS THE UNKNOWN INTEREST RATE
COMPOUNDED";T1
1710 R1=((1+R2/T2)^(T2/T1))-1)*
T1
1720 PRINT"IT IS EQUIVILANT TO
A RATE OF "R1"OR"R1*100%"
1730 PRINT:INPUT"<ENTER> FOR MEN
U";B$:GOTO10
1740 GOSUB580:PRINT"WHAT TAX-FRE
E INTEREST RATE IS EQUIVILANT T
O A 12% TAXABLE RATEIF YOU ARE I
N THE 32 PERCENT INCOME TAX B
RACKET?"
1750 GOSUB160:GOSUB580
1760 INPUT"TAXABLE INT. RATE(6%
=.06)";R1
1770 INPUT"YOUR TAX BRACKET(27%
=.27)";TB:R2=R1*(1-TB)
1780 PRINT:PRINT"THAT IS EQUAL T
O A TAX-FREE RATEOF"R2"OR"100*R2
"%":GOTO1730
```

END

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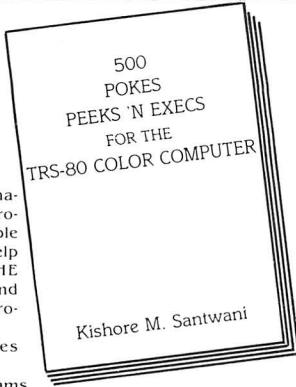
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K-LOCK FOR PRIVACY

Keep your private disks safe from prying eyes with this software-lock program. Here's the key.

K-Lock is a utility designed to provide a software lock on selected disks so they can only be accessed by a password, which you can change at any time. The DIR command on a locked disk displays only "Locked" and no other files will appear. You cannot access, display, or delete disk files, or add

additional files to a locked disk. Enter the correct password and the disk is ready for normal, free access.

To use K-Lock, load the program and place the disk to be locked or unlocked in drive 0. EXEC Program Listing 1 (or run the Basic version, Program Listing 2) and it will give you the disk status (locked or unlocked). If unlocked, enter the password of your choice (12 or fewer characters) and the disk will lock.

If you mistype your intended password, hit the break key to start over. To unlock a disk, enter the password after K-Lock advises you that the disk is locked. If you enter it correctly, the disk is unlocked. The password does not appear on the screen when unlocking a disk. If unsuccessful after three tries at the password, the program removes itself from memory.

How It Works

K-Lock moves the first directory entry to the unused portion of the entry and replaces the first entry with a notice reading "Locked." The

first character of the second directory entry is saved in an unused portion of the second entry and replaced with FF. This marks the end of the directory. Now the granule-allocation table needs to be doctored to prevent new files from being written to the locked disk.

Each table entry marked as available for use (FF) is replaced with a dummy entry so that the disk operating system thinks the disk is full. I used 69 as the dummy entry for the granule-allocation table because it won't occur otherwise and can be easily found when reversing the process to unlock the disk. The password is then placed in an unused portion of the second directory entry in coded form.

An experienced programmer can defeat any software protection, but K-Lock does add a measure of security to your business or personal records. It can prevent nonprogrammers from accessing your personal records or correspondence. The "Locked" message is also a good reminder that the disk contains privileged information. ■

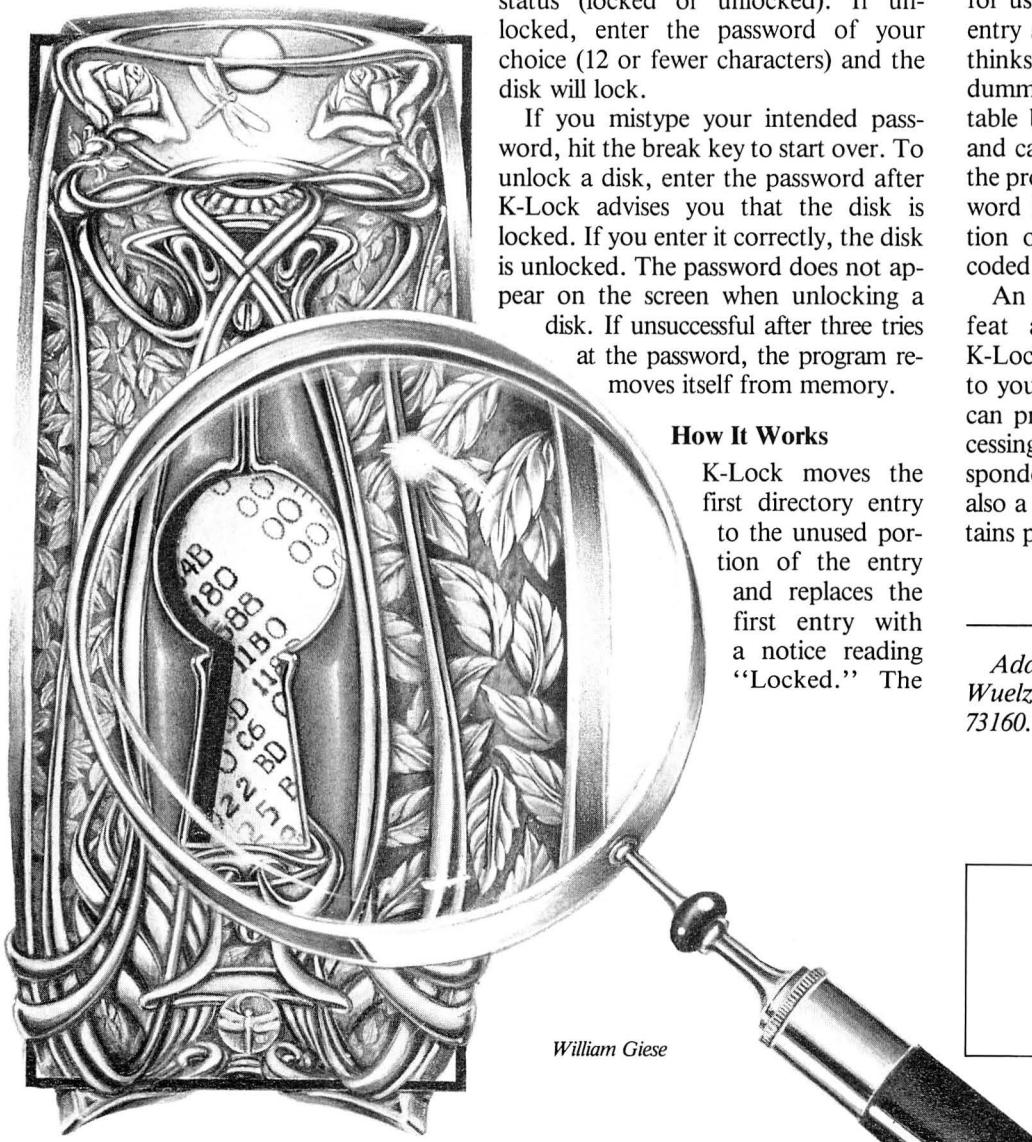
Address correspondence to Kenneth Wuelzer, 752 West Main, Moore, OK 73160.

Continued on p. 44

System Requirements

16K RAM
Disk Color Basic
EDTASM+ optional

William Giese



1983 unit sales	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Average	Best	Worst		
Bach	136	139	119	161	130	104	84	121	95	115	75	161	1440	144	161	75		
Chalone	120	170	152	170	182	102	89	157	162	129	64	158		144	182	64		
Dolan	188	157	103	112	161	122	99	145	145	103				144	188	97		
Feagan	105	94	127	115	157	97	61	132	113					144	174	61		
Graham	135	135	183	116	151	104	86	149						144	183	63		
Harpel	134	102	190	161	180	85								144				
Jordan	105	109	188	171	120									144				
Latour	112	128	124	129										144				
Lucido	158	110												144				
Phelps	167													144				
Prats														144				
Schaeferle														144	193	78		
Taylor														144	190	88		
Torres					131								1620	135	177	105		
Turner				127	131								75	178	1635	136	190	75
Wehlen			145	142	154					137	125	106	60	151	1495	125	154	60
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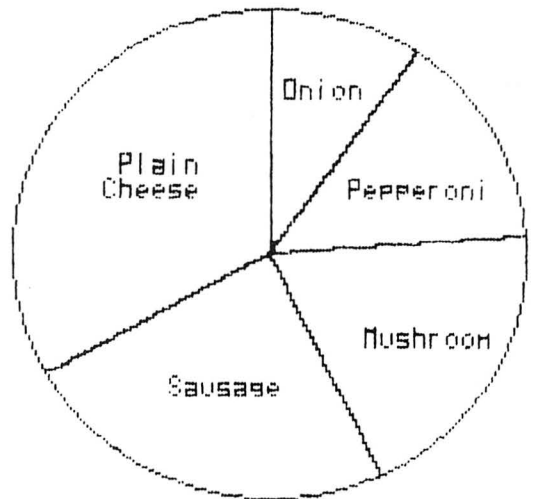
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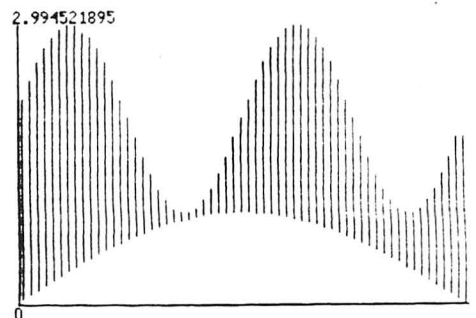
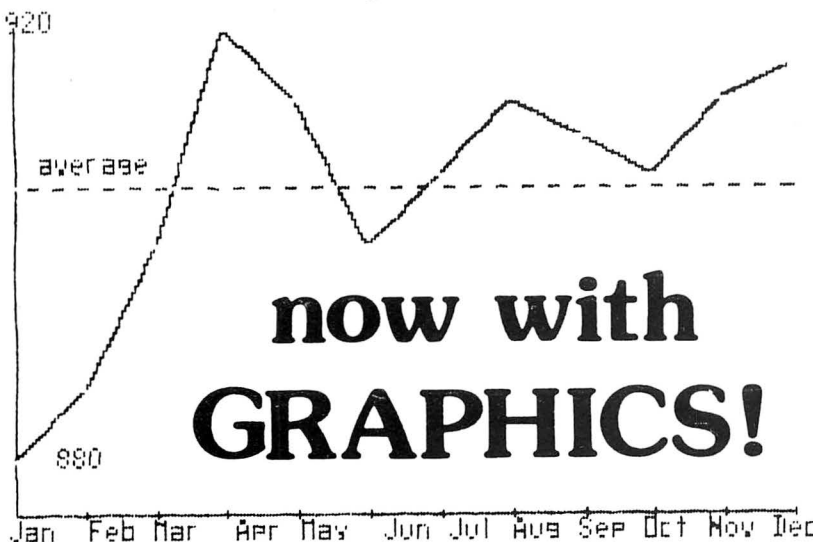
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```

1000          00190      ORG      $1000 . START AT 1000
1000 35      10      00200      X      . RETURN TO BASIC
1002 BF     1287     00210      STX     SAVE . SAVE RETURN FROM STK
1005 BD     1173     00220 BEGIN JSR     CLS  . CLEAR SCREEN
1008 CE     040C     00230      LDJ     #$40C . SCREEN ADDR
100B 8E     1202     00240      LDX     #MSG . TXT ADDR
100E BD     1180     00250      JSR     #PRNT . WRITE TO SCREEN
1011 CE     054B     00260      LDU     #$54B . SCREEN ADDR
1014 AD     1180     00270      JSR     #PRNT . WRITE TO SCREEN
1017 CE     0588     00280      LDU     #$588 . SCREEN ADDR
101A BD     1180     00290      JSR     #PRNT . WRITE TO SCREEN
101D BD     11D2     00300      JSR     WAIT . WAIT FOR REPLY
1020 C6     02      00310      LDB     #2 . READ OPTION
1022 BD     11C7     00320      JSR     DSK3 . READ DIRECTORY
1025 B6     13B8     00330      LDA     B32 . SECOND DIR ENTRY
1028 81     FF      00340      CMPA   #SFF .
102A 1027 00A3     00350      LBEQ   LOCKED . DISK IS LOCKED
102E BD     1173     00360      JSR     CLS  . CLEAR SCREEN
1031 CE     0400     00370      LDU     #S400 . SCREEN ADDR
1034 8E     1233     00380      LDX     #DISKU . TXT ADDR
1037 BD     1180     00390      JSR     #PRNT . WRITE TO SCREEN
103A CE     0440     00400      LDU     #S440 . SCREEN ADDR
103D 8E     1265     00410      LDX     #PASS . TXT ADDR
1040 BD     1180     00420      JSR     #PRNT . WRITE TO SCREEN
1043 86     FF      00430      LDA     #SFF . ECHO ON
1045 B7     1297     00440      STA     ECHO .
1048 BD     11DE     00450      JSR     INPUT . INPUT PASSWORD
104B C6     02      00460      LDB     #2 . READ OPTION
104D BD     11BC     00470      JSR     DSK2 . READ GRAN TABLE
1050 B6     1388     00480      LDA     B32 . SECOND DIR ENTRY
1053 B7     13D6     00490      STA     B62 . SAVE 1ST LETTER
1056 86     FF      00500      LDA     #SFF .
1058 B7     13B8     00510      STA     B32 . MARK AS UNUSED DIR
105B 8E     1298     00520      LDX     #BUFF1 . ADDR OF GRAN TABLE
105E C6     45      00530      LDB     #69 . DUMMY VALUE
1060 A6     84      00540      LDA     ,X . GET GRAN TABLE LINK
1062 81     FF      00550      CMPA   #SFF . AVAILABLE ?
1064 27     09      00560      BEQ     G2 .
1066 30     01      00570      LEAX   1,X . NEXT ENTRY
1068 8C     1398     00580      CMPX   #BUFF2 . END GRAN TABLE
106B 25     F3      00590      BLO    G1 . LOOP BACK
106D 20     06      00600      BRA    G3 . DONE
106F E7     84      00610      STB     ,X . REMARK ENTRY W/DUMMY VALUE
1071 30     01      00620      LEAX   1,X . NEXT ENTRY
1073 20     EB      00630      BRA    G1 . LOOP BACK
1075 CE     1398     00640      LDU     #BUFF2 . ADDR OF DIRECTORY
1078 8E     13A8     00650      LDX     #B16 . DEAD SPACE
107B A6     C0      00660      LDA     ,U+ . MOVE DIR ENTRY
107D A7     80      00670      STA     ,X+ .
107F 1183 13A8     00680      CMPU   #B16 . END DIR ?
1083 25     F6      00690      BLO    G4 . NEXT CHAR
1085 108E 0000     00700      LDY     #0 . CLEAR COUNTER
1089 8E     1289     00710      LDX     #IN . ADDR OF PASSWORD
108C CE     13C8     00720      LDU     #B48 . ADDR TO PUT PASSWORD
108F A6     80      00730      LDA     ,X+ . CHAR FROM PASSWORD
1091 1F     89      00740      TFR    A,B .
1093 C0     0D      00750      SUBB   #13 .
1095 E7     C0      00760      STB     ,U+ . SAVE CODED CHAR
1097 81     0D      00770      CMPA   #S0D . CARRIAGE RETURN ?
1099 27     08      00780      BEQ     G6 .
109B 31     21      00790      LEAY   1,Y . INC COUNTER
109D 108C 000C     00800      CMPY   #12 . 12 CHAR YET ?
10A1 25     EC      00810      BLO    G5 . NEXT CHAR
10A3 CE     1398     00820      LDU     #BUFF2 . FIRST ENTRY
10A6 8E     1273     00830      LDX     #LMSG . LOCK MSG
10A9 A6     80      00840      LDA     ,X+ . MOVE TO FIRST ENTRY
10AB A7     C0      00850      STA     ,U+ .
10AD 1183 13A8     00860      CMPU   #B16 . DONE ?
10B1 25     F6      00870      BLO    G7 . NEXT CHAR
10B3 C6     03      00880      LDB     #3 . WRITE OPTION
10B5 BD     11BC     00890      JSR     DSK2 . WRITE GRAN TABLE
10B8 C6     03      00900      LDB     #3 . WRITE OPTION
10BA BD     11C7     00910      JSR     DSK3 . WRITE DIRECTORY
10BD CE     0540     00920      LDU     #$540 . SCREEN ADDR
10C0 8E     1225     00930      LDX     #DISK . DISK IS LOCKED
10C3 BD     1180     00940      JSR     #PRNT . WRITE TO SCREEN
10C6 BD     11D2     00950      JSR     WAIT . WAIT FOR REPLY
10C9 BE     1287     00960      LDX     SAVE . RETURN TO BASIC POINTER
10CC 34     10      00970      PSHS   X . RESTORE BOTTOM OF STK
10CE 7E     A1C1     00980      JMP     #A1C1 . END
10D1 BD     1173     00990 LOCKED JSR     CLS  . CLEAR SCREEN
10D4 CE     0400     01000      LDU     #$400 . SCREEN ADDR
10D7 8E     1225     01010      LDX     #DISK . DISK IS LOCKED
10DA BD     1180     01020      JSR     #PRNT . WRITE TO SCREEN
10DD CE     0440     01030      LDU     #$440 . SCREEN ADDR
10E0 8E     1265     01040      LDX     #PASS . ENTER PASSWORD
10E3 BD     1180     01050      JSR     #PRNT . WRITE TO SCREEN
10E6 4F     00      01060      CLRA   . ECHO OFF
10E7 B7     1297     01070      STA     ECHO .
10EA BD     11DE     01080      JSR     INPUT . INPUT PASSWORD
10ED C6     02      01090      LDB     #2 . READ OPTION
10EF BD     11C7     01100      JSR     DSK3 . READ DIRECTORY
10F2 8E     1289     01110      LDX     #IN . ADDR OF INPUT PASSWORD
10F5 CE     13C8     01120      LDU     #B48 . ADDR OF PASSWORD
10F8 5F     00      01130      CLR    CLR . CLEAR COUNTER
10F9 A6     80      01140      LDA     ,X+ . GET CHAR
10FB 80     0D      01150      SUBA   #13 .
10FD B7     1286     01160      STA     COMP . STORE FOR COMPARE
1100 A6     C0      01170      LDA     ,U+ . GET PASSWORD CHAR
1102 B1     1286     01180      CMPA   COMP . EQUAL ?
1105 26     50      01190      BNE    L5 . INVALID PASSWORD
1107 81     00      01200      CMPA   #0 . CARRIAGE RETURN
1109 27     05      01210      BEQ    OK . END OF PASSWORD
110B 5C     01220      INCB   . INC COUNTER

```

Listing 1 continued

```

10 FOR I=4096 TO 5284
20 READ X
30 POKE I,X
40 NEXT I
50 EXEC&H1000
60 DATA 53, 16, 191, 18, 135, 1
89, 17, 115
70 DATA 206, 4, 12, 142, 18, 2,
189, 17
80 DATA 128, 206, 5, 75, 189, 1
7, 128, 206
90 DATA 5, 136, 189, 17, 128, 1
89, 17, 210
100 DATA 198, 2, 189, 17, 199,
182, 19, 184
110 DATA 129, 255, 16, 39, 0, 1
63, 189, 17
120 DATA 115, 206, 4, 0, 142, 1
8, 51, 189
130 DATA 17, 128, 206, 4, 64, 1
42, 18, 101
140 DATA 189, 17, 128, 134, 255
, 183, 18, 151
150 DATA 189, 17, 222, 198, 2,
189, 17, 188
160 DATA 182, 19, 184, 183, 19,
214, 134, 255
170 DATA 183, 19, 184, 142, 18,
152, 198, 69
180 DATA 166, 132, 129, 255, 39
, 9, 48, 1
190 DATA 140, 19, 152, 37, 243,
32, 6, 231
200 DATA 132, 48, 1, 32, 235, 2
06, 19, 152
210 DATA 142, 19, 168, 166, 192
, 167, 128, 17
220 DATA 131, 19, 168, 37, 246,
16, 142, 0
230 DATA 0, 142, 18, 137, 206,
19, 200, 166
240 DATA 128, 31, 137, 192, 13,
231, 192, 129
250 DATA 13, 39, 8, 49, 33, 16,
140, 0
260 DATA 12, 37, 236, 206, 19,
152, 142, 18
270 DATA 115, 166, 128, 167, 19
2, 17, 131, 19
280 DATA 168, 37, 246, 198, 3,
189, 17, 188
290 DATA 198, 3, 189, 17, 199,
206, 5, 64
300 DATA 142, 18, 37, 189, 17,
128, 189, 17
310 DATA 210, 190, 18, 135, 52,
16, 126, 161
320 DATA 193, 189, 17, 115, 206
, 4, 0, 142
330 DATA 18, 37, 189, 17, 128,
206, 4, 64
340 DATA 142, 18, 101, 189, 17,
128, 79, 183
350 DATA 18, 151, 189, 17, 222,
198, 2, 189
360 DATA 17, 199, 142, 18, 137,
206, 19, 200
370 DATA 95, 166, 128, 128, 13,
183, 18, 134
380 DATA 166, 192, 177, 18, 134
, 38, 80, 129
390 DATA 0, 39, 5, 92, 193, 12,
37, 233
400 DATA 182, 19, 214, 183, 19,
184, 142, 19
410 DATA 152, 206, 19, 168, 166
, 192, 167, 128
420 DATA 140, 19, 168, 37, 247,
198, 3, 189
430 DATA 17, 199, 198, 2, 189,
17, 188, 142
440 DATA 18, 152, 198, 255, 166
, 132, 129, 69
450 DATA 39, 23, 48, 1, 140, 19
, 152, 37
460 DATA 243, 198, 3, 141, 119,
206, 5, 64
470 DATA 142, 18, 51, 189, 17,
128, 126, 16
480 DATA 198, 231, 132, 48, 1,
32, 221, 141
490 DATA 26, 206, 4, 36, 142, 1

```

Listing 2 continued

Listing 1 continued

```

110C C1 0C 01230 CMPB #12 . MAX CHARS
110E 25 E9 01240 BLO L2 . NEXT CHAR
1110 B6 13D6 01250 OK LDA B62 . SECOND DIR ENTRY CHAR
1113 B7 13B8 01260 STA B32 . RESTORE SECOND ENTRY
1116 8E 1398 01270 LDX #BUFF2 . FIRST DIR ENTRY
1119 CE 13A8 01280 LDU #B16 . REAL DIR ENTRY
111C A6 C0 01290 L3 LDA ,U+ . GET CHAR
111E A7 80 01300 STA ,X+ . RESTORE CHAR
1120 8C 13A8 01310 CMPX #B16 . DONE ?
1123 25 F7 01320 BLO L3
1125 C6 03 01330 LDB #3 . WRITE OPTION
1127 BD 11C7 01340 JSR DSK3 . WRITE DIRECTORY
112A C6 02 01350 LDB #2 . READ OPTION
112C BD 11BC 01360 JSR DSK2 . READ GRAN TABLE
112F 8E 1298 01370 LDX #BUFF1 . ADDR GRAN TABLE
1132 C6 FF 01380 LDB #FFF . MARK AS AVAILABLE
1134 A6 84 01390 O1 LDA ,X . GRAN TABLE ENTRY
1136 81 45 01400 CMPA #69 . DUMMY VALUE ?
1138 27 17 01410 BEQ FIX . REPAIR ENTRY
113A 30 01 01420 LEAX 1,X . INC COUNTER
113C 8C 1398 01430 CMPX #BUFF2 . DONE ?
113F 25 F3 01440 BLO O1 . NEXT ENTRY
1141 C6 03 01450 LDB #3 . WRITE OPTION
1143 8D 77 01460 BSR DSK2 . WRITE GRAN TABLE
1145 CE 0540 01470 LDU #540 . SCREEN ADDR
1148 8E 1233 01480 LDX #DISKU . DISK IS UNLOCKED
114B BD 1180 01490 JSR PRNT . WRITE TO SCREEN
114E 7E 10C6 01500 JMP FINI . FINISHED
1151 E7 84 01510 FIX STB ,X . MARK AVAILABLE
1153 30 01 01520 LEAX 1,X . INC POINTER
1155 20 DD 01530 BRA O1 . NEXT ENTRY
1157 8D 1A 01540 L5 BSR CLS . CLEAR SCREEN
1159 CE 0424 01550 LDU #5424 . SCREEN ADDR
115C 8E 1243 01560 LDX #SORRY . INVALID PASSWORD
115F BD 1180 01570 JSR PRNT . WRITE TO SCREEN
1162 8D 6E 01580 BSR WAIT . WAIT FOR REPLY
1164 7C 1285 01590 INC COUNT . BAD PASSWORD COUNTER
1167 B6 1285 01600 LDA COUNT . CHECK # ATTEMPTS
116A 81 03 01610 CMPA #3 . MAX ALLOWED
116C 1024 0328 01620 LBHS EO . ZERO MEMORY
1170 7E 1005 01630 JMP BEGIN . RESTART PROGRAM
01640
01650 *** SUBROUTINES ***
01660
1173 8E 0400 01670 CLS LDX #5400 . START SCREEN MEMORY
1176 86 AF 01680 LDA #5AF . BLUE
1178 A7 80 01690 C1 STA ,X+
117A 8C 0600 01700 CMPX #5600 . END SCREEN MEMORY
117D 25 F9 01710 BLO C1 . NEXT
117F 39 09 01720 RTS . RETURN
1180 A6 80 01730 PRNT LDA ,X+ . GET CHAR
1182 B5 1283 01740 BITA MASK . LAST LETTER ?
1185 26 04 01750 BNE P1
1187 A7 C0 01760 STA ,U+ . WRITE TO SCREEN
1189 20 F5 01770 BRA PRNT . NEXT LETTER
118B 84 7F 01780 P1 ANDA #7F . STRIP HIGH BIT
118D A7 C0 01790 STA ,U+ . WRITE TO SCREEN
118F 39 09 01800 RTS . RETURN
1190 BE C006 01810 DSK LDX %C006 . ADDR OF PARAMETERS
1193 E7 84 01820 STB ,X . READ/WRITE OPTION
1195 4F 01 01830 CLRA . ZERO ACC
1196 A7 01 01840 STA 1,X . DRIVE NUMBER 0
1198 86 11 01850 LDA #17 . STARTING TRACK
119A A7 02 01860 STA 2,X
119C B6 1284 01870 LDA SECCTR . STARTING SECTOR
119F A7 03 01880 STA 3,X
11A1 EF 04 01890 STU 4,X . BUFFER ADDR
11A3 AD 9F C004 01900 JSR [%C004] . DISK I/O
11A7 A6 06 01910 LDA 6,X . CHECK I/O STATUS
11A9 26 05 01920 BNE ERR . I/O ERROR ?
11AB 4F 01930 CLRA . ZERO ACC
11AC B7 FF40 01940 STA %FF40 . TURN OFF DRIVE MOTOR
11AF 39 09 01950 RTS . RETURN
11B0 CE 0500 01960 ERR LDU #5500 . SCREEN ADDR
11B3 8E 125B 01970 LDX #ERROR . DISK I/O ERROR
11B6 BD 1180 01980 JSR PRNT . WRITE TO SCREEN
11B9 8D 17 01990 BSR WAIT . WAIT FOR REPLY
11BB 39 09 02000 RTS . RETURN
11BC CE 1298 02010 DSK2 LDU #BUFF1 . BUFFER ONE
11BF 86 02 02020 #2 . GRAN TABLE
11C1 B7 1284 02030 STA SECCTR . START SECTOR
11C4 8D CA 02040 BSR DSK . DISK I/O
11C6 39 09 02050 RTS . RETURN
11C7 CE 1398 02060 DSK3 LDU #BUFF2 . BUFFER TWO
11CA 86 03 02070 LDA #3 . DIRECTORY
11CC B7 1284 02080 STA SECCTR . START SECCTR
11CF 8D BF 02090 BSR DSK . DISK I/O
11D1 39 09 02100 RTS . RETURN
11D2 BD A1C1 02110 WAIT JSR %A1C1 . GET CHAR
11D5 27 FB 02120 BEQ WAIT . LOOP TIL REPLY
11D7 81 03 02130 CMPA #3 . BREAK KEY ?
11D9 1027 FE28 02140 LBEQ BEGIN . RESTART PROGRAM
11DD 39 09 02150 RTS . RETURN
11DE CE 1289 02160 INPUT LDU #IN . ADDR OF INPUT BUFFER
11E1 8E 0540 02170 LDX #540 . ECHO ADDR
11E4 108E 0000 02180 LDY #0 . CLEAR COUNTER
11E8 8D E8 02190 I1 BSR WAIT . GET CHAR
11EA 81 0D 02200 CMPA #50D . CARRIAGE RETURN
11EC 27 11 02210 BEQ DONE
11EE A7 C0 02220 STA ,U+ . STORE IN BUFFER
11F0 F6 1297 02230 LDB ECHO . ECHO ON ?
11F3 27 02 02240 BEQ I2 . ECHO OFF
11F5 A7 80 02250 STA ,X+ . ECHO TO SCREEN
11F7 31 21 02260 I2 LEAY 1,Y . INC COUNTER
11F9 108C 000C 02270 CMPY #12 . MAX CHARS
11FD 25 E9 02280 BLO I1 . GET NEXT CHAR

```

Listing 1 continued

Listing 2 continued

```

8, 67, 189
500 DATA 17, 128, 141, 110, 124
, 18, 133, 182
510 DATA 18, 133, 129, 3, 16, 3
6, 3, 40
520 DATA 126, 16, 5, 142, 4, 0,
134, 175
530 DATA 167, 128, 140, 6, 0, 3
7, 249, 57
540 DATA 166, 128, 181, 18, 131
, 38, 4, 167
550 DATA 192, 32, 245, 132, 127
, 167, 192, 57
560 DATA 190, 192, 6, 231, 132,
79, 167, 1
570 DATA 134, 17, 167, 2, 182,
18, 132, 167
580 DATA 3, 239, 4, 173, 159, 1
92, 4, 166
590 DATA 6, 38, 5, 79, 183, 255
, 64, 57
600 DATA 206, 5, 0, 142, 18, 91
, 189, 17
610 DATA 128, 141, 23, 57, 206,
18, 152, 134
620 DATA 2, 183, 18, 132, 141,
202, 57, 206
630 DATA 19, 152, 134, 3, 183,
18, 132, 141
640 DATA 191, 57, 189, 161, 193
, 39, 251, 129
650 DATA 3, 16, 39, 254, 40, 57
, 206, 18
660 DATA 137, 142, 5, 64, 16, 1
42, 0, 0
670 DATA 141, 232, 129, 13, 39,
17, 167, 192
680 DATA 246, 18, 151, 39, 2, 1
67, 128, 49
690 DATA 33, 16, 140, 0, 12, 37
, 233, 167
700 DATA 192, 57, 75, 96, 109,
96, 76, 79
710 DATA 67, 203, 87, 82, 73, 8
4, 84, 69
720 DATA 78, 96, 66, 217, 75, 6
9, 78, 78
730 DATA 69, 84, 72, 96, 76, 96
, 87, 85
740 DATA 69, 76, 90, 69, 210, 6
8, 73, 83
750 DATA 75, 96, 73, 83, 96, 76
, 79, 67
760 DATA 75, 69, 196, 68, 73, 8
3, 75, 96
770 DATA 73, 83, 96, 85, 78, 76
, 79, 67
780 DATA 75, 69, 196, 83, 79, 8
2, 82, 89
790 DATA 108, 96, 96, 73, 78, 8
6, 65, 76
800 DATA 73, 68, 96, 80, 65, 83
, 83, 87
810 DATA 79, 82, 196, 68, 73, 8
3, 75, 96
820 DATA 69, 82, 82, 79, 210, 6
9, 78, 84
830 DATA 69, 82, 96, 80, 65, 83
, 83, 87
840 DATA 79, 82, 196, 76, 79, 6
7, 75, 69
850 DATA 68, 32, 32, 32, 32, 16
, 0, 0
860 DATA 32, 0, 1, 128, 0, 0, 0
, 0
870 DATA 0, 0, 0, 0, 0, 0, 0, 0
880 DATA 0, 0, 0, 0, 0, 0, 0, 0
890 DATA 0, 255, 0, 255, 0, 255
, 0, 255
900 DATA 0, 255, 0, 255, 0, 255
, 0, 255
910 DATA 0, 255, 0, 255, 0, 255
, 0, 255
920 DATA 0, 255, 0, 255, 0, 255
, 0, 255
930 DATA 0, 255, 0, 255, 0, 255
, 0, 255
940 DATA 0, 255, 0, 255, 0, 255
, 0, 255
950 DATA 0, 255, 0, 255, 0, 255
, 0, 255
960 DATA 0, 255, 0, 255, 0, 255

```

Listing 2 continued

Listing 2 continued

```

, Ø, 255
97Ø DATA Ø, 255, Ø, 255, Ø, 255
, Ø, 255
98Ø DATA Ø, 255, Ø, 255, Ø, 255
, Ø, 255
99Ø DATA Ø, 255, Ø, 255, Ø, 255
, Ø, 255
1ØØØ DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
1Ø1Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
    
```

```

1Ø2Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
1Ø3Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
1Ø4Ø DATA Ø, 1Ø4, Ø, 255, Ø, 25
5, Ø, 255
1Ø5Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
1Ø6Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
1Ø7Ø DATA Ø, 255, Ø, 255, Ø, 25
    
```

```

5, Ø, 255
1Ø8Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
1Ø9Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
11ØØ DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
111Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
112Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
113Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
114Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
115Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
116Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
117Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
118Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
    
```

```

119Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
12ØØ DATA Ø, 186, Ø, 255, Ø, 25
5, Ø, 255
121Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
122Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
123Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
124Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
125Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
126Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
127Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
128Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
129Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
13ØØ DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
131Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
132Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
133Ø DATA Ø, 255, Ø, 255, Ø, 25
5, Ø, 255
134Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
135Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
136Ø DATA 255, 233, 255, Ø, 255
, Ø, 255, Ø
137Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
138Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
139Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
14ØØ DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
141Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
142Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
143Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
144Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
145Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
146Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
147Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
148Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
149Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
15ØØ DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
151Ø DATA 255, Ø, 255, Ø, 255,
Ø, 255, Ø
152Ø DATA 255, 87, 255, Ø, 255,
Ø, 255, Ø
153Ø DATA 142, 16, Ø, 79, 167,
128, 14Ø, 2Ø
154Ø DATA 152, 37, 249, 32, 254
, Ø, 255, Ø
    
```

END

Listing 1 continued

```

11FF A7 C0 02290 DONE STA ,U+ . STORE LAST CHAR
1201 39 02300 RTS . RETURN
02310
02320 *** DATA & WORK AREA ***
02330
1202 4B 02340 MSG FCC 'K' . K - LOCK
1203 606D 02350 FDB $606D . WRITTEN BY
1205 60 02360 FCB $60 . KENNETH L WUELZER
1206 4C 02370 FCC 'LOC'
4F
43
1209 CB 02380 FCB $CB
120A 57 02390 FCC 'WRITTEN'
52
49
54
54
45
4E
13C8 02950 B48 RMB 14 . PASSWORD LOCATION
13D6 02960 B62 RMB 194 . SAVE 1ST CHAR HERE
02970
02980 *** ZERO MEMORY ***
02990
1498 8E 1000 03000 E0 LDX #$1000 . PROGRAM START
149B 4F 03010 CLRA . ZERO ACC
149C A7 80 03020 E1 STA ,X+ . ZERO MEMORY
149E 8C 1498 03030 CMPX #E0 . ZERO TO HERE
14A1 25 F9 03040 BLO E1 . LOOP BACK
14A3 20 FE 03050 E2 BRA E2 . LOCK UP SYSTEM
1000 03060 END $1000
    
```

END

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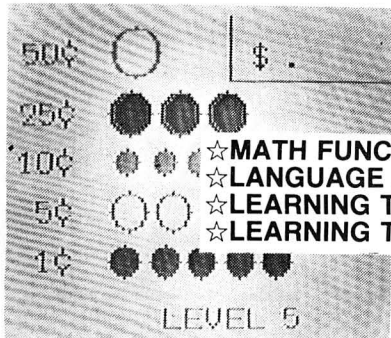
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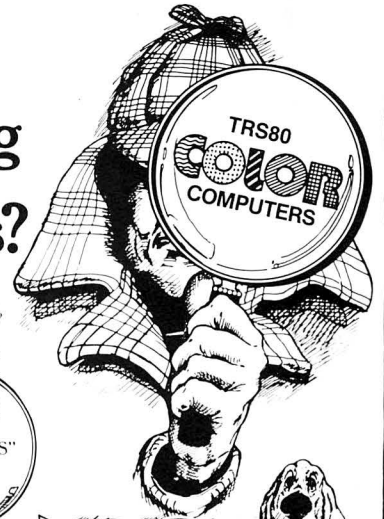
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FLASHCAR

Your Color Computer can give new life to the old "three R's." Try some 'rithmetic, CoCo-style.

Remember flashcards from your school days? They may not have expanded your mind, but they sure taught you the multiplication tables. As a bonus, the competition with other children added fun to arithmetic practice. This program, Flashcards, allows two children to race through simple arithmetic problems.

Flashcards has helped first graders learn addition and subtraction as well as how to remain calm during competition. Small children cannot easily control the joystick in this game. They get excited, especially when their friends stand behind them yelling, "Fourteen you dummy, not 12!" Winning requires a steady hand as well as a quick mind.

Often I let children play in teams. One player maneuvers the joystick while the other gives the answers. This division of labor makes the game more fun for six-year-olds. They learn about cooperation, and they can share the pain of losing with a partner.

Using the Program

Using Flashcards is easy. Hook up two joysticks and CLOAD and run the

program. Select the type of problems you want: addition, subtraction, multiplication, division, or combinations of these. Choose the number of correct answers required to win, and enter the names of the players.

You will see two 11-key keypads drawn on the screen. Each keypad has the digits 0-9 and an erase key. Above each keypad is a problem. Each player uses a joystick to move the cursor to the desired keys, then selects them with the firing button. For example, if your problem is $7 + 5$, select 1, then 2.

When you have solved the problem, your answer switches to reverse video for a moment, then you get a new problem. The game ends when one player achieves the winning score.

If you enter a wrong digit, you can restart your answer by selecting the erase key. You cannot enter more than four digits, so your answer cannot spill over onto your opponent's space.

Teachers who want to discourage competition can select the no-scoring option. In this mode the game runs forever with no scores displayed. To select the no-scoring option, enter -1 when asked for the winning score.

Flashcards uses three important programming ideas: parallel processing; single-shot keys; and Boolean arithmetic.

Parallel Processing

Parallel processing means running multiple programs simultaneously. The

parallel programs are called coroutines, and are located in lines 180-520 and 530-880. The first coroutine interacts with the player on the left, receiving input from the left joystick and firing button. The second coroutine interacts with the player on the right. Both participants play at the same time, so it seems that two programs are operating simultaneously.

Since the CoCo has only one CPU, it cannot literally run two programs at the same time. It can, however, switch rapidly back and forth between two programs under software control. That is how Flashcard gives the appearance of two programs running simultaneously.

If you look down each coroutine you see the command `ON...GOTO` in five places. These are the points where the program switches from one coroutine to the other. Each coroutine cannot execute more than nine instructions before switching to the other coroutine. Typically, the coroutines execute four to six lines of code between switches. While the program is running, the switches occur about nine times per second. This rapid switching back and forth between the coroutines gives the appearance that the coroutines are running simultaneously.

The trick with parallel processing is to jump from the first coroutine to the second, then back to where you left the first, and then back to where you left the second, and so forth. Each routine must include break points where

System Requirements

16K RAM
Extended Color Basic
2 Joysticks

DS

you jump to the other coroutine. These break points must be inside the innermost loops, so you never remain long in one coroutine ignoring the other. Most importantly, the coroutines must be able to operate asynchronously. You have to be able to jump from any break point in one coroutine to any break point in the other.

I manage the interface between the two coroutines with two variables, P0 and P1. While within the coroutine for the left player, P1 holds a value between one and five indicating where to go when returning to the coroutine for the right player. At each of the five break points in the left coroutine, I first assign a value between one and five to P0 indicating from which break point I am about to leave the left coroutine. Then I execute ON P1 GOTO to return to the point where I previously left the right coroutine.

When ready to leave the right coroutine to return to the left coroutine, I execute ON P0 GOTO to return to the point where I left the left coroutine. Variables P0 and P1 are initialized to one in line 170. These initial values ensure that both coroutines begin at their first instructions.

You can experiment with parallel processing using Radio Shack's Color Logo. Color Logo allows the creation of multiple turtles that operate in parallel and exchange messages. With Color Logo it is not necessary to program the



Frank Cordelle

break points I have included in Flashcards. You just write two subroutines, and tell the computer to run them simultaneously. The switching back and forth is managed automatically by the Logo operating system.

Single-Shot Keys

When the Basic interpreter polls the keyboard, it recognizes each keystroke only once. It acknowledges a key the first time it senses that the key is pressed, then it ignores that key until it senses that the key has been released.

Flashcards does the same thing with the firing buttons. If the cursor is on six and you press the firing button, you adjoin a single-digit six to your answer, not a string of sixes. The firing button acts as a single-shot key without automatic repeat.

Lines 420-430 sense the firing button for the player on the left. The variable V0 is set to zero when the button is tested and found to be released. V0 is set to one the first time the button is tested

and found to be pushed. The routine for adding a digit to the answer is not entered except when V0 flips from zero to one. That is, the firing button is acknowledged only once each time it is pushed.

Boolean Arithmetic

The problem is to encode a procedure that detects the left or right joystick fire button whether or not the other button is pushed. Attach two joysticks to your CoCo and enter the following:

```
10 PRINT @0, PEEK(65280)
20 GOTO 10
```

Condition	PEEK(65280)
neither button pushed	255
right button pushed	254
left button pushed	253
both buttons pushed	252

Table 1. Values Returned when You Press the Joystick's Fire Button



When you press the joystick buttons the computer returns values found in Table 1. Page 88 of *Getting Started with Color Basic* suggests that different CoCos might return different values, so be sure to try this on your own computer.

In Flashcards, lines 420 and 780 determine if the left and right joystick buttons are pushed. Here is how they work. The Basic keyword IF is normally followed by a relational expression like $X < 3$ or $A\$ = \text{"YES"}$. However, IF can be followed by any numeric expression. The statement IF $X + 2$ THEN 680 causes the program to branch to line 680 if $X + 2$ is nonzero. To test this feature

of the IF statement, enter the following:

```
10 INPUT X
20 IF X THEN PRINT "TRUE" ELSE PRINT "FALSE"
30 GOTO 10
```

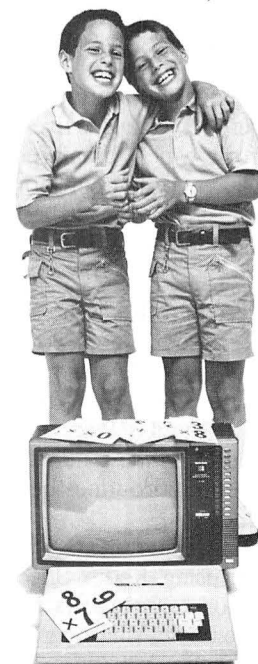
Often you use multiple conditions with IF. Programmers combine relational expressions with AND, OR, and NOT, as in line 100 of Flashcards. You can also combine integers between -32768 and 32767 with AND, OR, and NOT just as you combine relational expressions. Basic treats integers in this range as signed 16-bit quantities. AND, OR, and NOT operate bitwise on them. (A clear introduction to binary arithmetic and Assembly-language programming can be found in Adam Osborne's *An Introduction to Microcomputers, Volume I Basic Concepts*.)

Table 2 shows the results of combining some numbers with AND. Table 2 and Table 1 together show how the joystick button tests in lines 420 and 780 work. In line 420, PEEK(65280) AND 2 is zero (false) only if the left joystick

button is pushed. In line 780, PEEK(65280) AND 1 is zero (false) only if the right joystick button is pushed. These tests work correctly even when you push both joystick buttons simultaneously.

I would enjoy hearing from anyone who uses Flashcards with children, and I will send a free copy to any teacher who sends me a return envelope and a note on school letterhead. ■

Address correspondence to David Meredith, Department of Mathematics, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132.



AND	252	253	254	255
1	0	1	0	1
2	0	0	2	2

Table 2. Results of Combining Numbers with AND

```

'10 REM FLASHCARDS BY DAVID MERED
ITH 1983
20 BL$=STRING$(2,128):Q0=36:Q1=5
3:A2=296:A3=313:T0=392:T1=409:RE
M Q0 (Q1) IS SCREEN LOCATION OF
LEFT (RIGHT) PROBLEM; A IS LOCAT
IONS OF ANSWERS, T IS LOCATIONS
OF SCORES
30 DIML(1,10):FOR I=0 TO 1:FOR J
=0 TO 2:FOR K=0TO2:L(I,3*J+K+1)=
1221+17*I-32*J+2*K:NEXT K:NEXTJ:
NEXTI:L(0,0)=1253:L(1,0)=1270:L(
0,10)=1255:L(1,10)=1272:REM L(0,
1) IS LOCATION OF DIGIT I ON LEF
T KEYPAD, L(1,I) IS SAME FOR RIG
HT
40 DIM N$(1)
50 CLS:PRINT:PRINT" f1
ash cards":PRINT:PRINT"INPUT PRO
BLEM TYPE
60 PRINT" A FOR ADDITION":PR
INT" S FOR SUBTRACTION":PRIN
T" AS FOR ADD AND SUBTRACT":P
RINT" M FOR MULTIPLICATION":
PRINT" D FOR DIVISION":PRINT
" MD FOR MULTIPLY AND DIVIDE"
:PRINT" ALL FOR ALL TYPES"
70 REM LATER L6 AND L7 ARE USED
TO SELECT PROBLEM TYPE--TYPE = R
ND(L6)+L7, A VALUE BETWEEN 1 AND
4 INDICATING ADD, SUB, MULT, OR
DIVIDE
80 INPUT CS:IFCS="A"THENL6=1:L7=
0ELSEIFCS="S"THENL6=1:L7=1ELSEIF
CS="AS"THENL6=2:L7=0ELSEIFCS="M"
THENL6=1:L7=2ELSEIFCS="D"THENL6=
1:L7=3ELSEIFCS="MD"THENL6=2:L7=2
ELSEIFCS="ALL"THENL6=4:L7=0ELSEP
RINT"REPEAT COMMAND":GOTO80
90 PRINT:PRINT"HOW MANY TO WIN?
(ENTER -1:PRINT"TO SUPPRESS SC
ORING.)"
100 INPUT WN:IF WN<-1 OR WN=0 TH
EN PRINT"REPEAT ENTRY":GOTO 100
110 PRINT:INPUT"FIRST PLAYER";N$(
0):L5=LEN(N$(0)):IF L5>=11 THEN
N$(0)=LEFT$(N$(0),11) ELSE N$(0
)=N$(0)+STRING$(11-L5, " ")
120 INPUT"SECOND PLAYER";N$(1):L
5=LEN(N$(1)):IF L5>=11 THEN N$(1
)=LEFT$(N$(1),11) ELSE N$(1)=N$(
1)+STRING$(11-L5, " ")
130 CLS:PRINT@15,BL$:PRINT@47,BL
$:PRINT@79,BL$:PRINT@111,BL$:PRI
NTE@133,"7 8 9 ";BL$;" 7
8 9":PRINT@165,"4 5 6 ";BL$;"
4 5 6":PRINT@197,"1 2 3
";BL$;" 1 2 3":PRINT@229,"
0 ERASE ";BL$;" 0 ERASE"
140 PRINT@271, BL$:PRINT@289,"A
NSWER ";BL$;" ANSWER
":PRINT@335,BL$:PRINT@367,BL$;
150 IF WN>0 THEN PRINT@386,"SCOR
E 0 ";BL$;" SCORE 0" ELSE
PRINT@399,BL$
160 PRINT@431,BL$:PRINT@452, N$
(0);BL$;" ";N$(1) " ";
";BL$;" ";
170 W$="winner ":S0=0:S1=0:P
0=1:P1=1:REM S0,S1=SCORES OF PLA
YERS 0 (LEFT) AND 1 (RIGHT); P0 AN
D P1 KEEP TRACK OF NEXT INSTRUCT
ION IN COROUTINES FOR LEFT AND R
IGHT PLAYERS.
180 REM BEGIN COROUTINE FOR LEFT
PLAYER. CHOOSE A PROBLEM FIRST
190 P0=1:ON P1 GOTO 550,690,750,
830,860:REM SWITCH TO COROUTINE
FOR RIGHT PLAYER. P0 HOLDS VALUE
INDICATING RETURN TO THIS POINT
200 X=RND(-TIMER):REM RANDOMIZE
RANDOM FUNCTION
210 ON RND(L6)+L7 GOTO 220,250,2
70,300:REM CHOOSE ADDITION, SUBT
RACTION, MULTIPLICATION, OR DIVI
SION PROBLEM FOR LEFT PLAYER
220 A0=RND(10)-1:B0=RND(10)-1:N0
=A0+B0
230 PRINT@Q0,A0;"+";B0;
240 GOTO 320
250 B0=RND(9):N0=RND(9):A0=N0+B0
260 PRINT@Q0,A0;"-";B0;:GOTO 320
270 A0=RND(10)-1:B0=RND(10)-1:N0
=A0*B0
280 PRINT@Q0,A0;"*";B0;

```

```

290 GOTO 320
300 N0=RND(10)-1:B0=RND(9):A0=N0
*B0
310 PRINT@Q0,A0;"/";B0;
320 P0=2:ON P1 GOTO 550,690,750,
830,860:REM SWITCH TO COROUTINE
FOR RIGHT PLAYER, REMEMBER TO CO
ME BACK HERE
330 M0=0:L0=5:I=L(0,L0):POKE I,P
EEK(I)-64:PRINT@A2," ";REM
SET LEFT ANSWER M0=0 AND PUT CUR
SOR ON 5 TO START AND BLANK ANSW
ER FROM PREVIOUS PROBLEM
340 REM GET JOYSTICK POSITION TO
MOVE LEFT CURSOR
350 J2=JOYSTK(2):IF J2<20 THEN J
2=0 ELSE IF J2<43 THEN J2=1 ELSE
J2=2
360 J3=JOYSTK(3):IF J3<16 THEN J
3=0 ELSE IF J3<32 THEN J3=1 ELSE
IF J3<48 THEN J3=2 ELSE J3=3
370 IF J3<3 THEN K0=J2-3*J3+7 EL
SE IF J2=0 THEN K0=0 ELSE K0=10:
REM K0=NEXT KEY TO GET CURSOR (1
0=ERASE)
380 P0=3:ON P1 GOTO 550,690,750,
830,860:REM SWITCH TO COROUTINE
FOR RIGHT PLAYER
390 IF K0=L0 THEN 420:REM IF CUR
SOR NOT MOVED
400 I=L(0,L0):POKE I,PEEK(I)+64:
L0=K0:I=L(0,L0):POKE I,PEEK(I)-6
4:REM MOVE LEFT CURSOR FROM OLD
POSITION TO NEW POSITION, WHICH
BECOMES OLD POSITION
410 REM CHECK FIRE BUTTON--IF IT
IS PUSHED AND WAS NOT PUSHED LA
ST TIME THROUGH HERE, ADD DIGIT
TO ANSWER AND CHECK FOR CORRECT
ANSWER. V1=1 IF LAST TIME THROU
GH HERE BUTTON WAS PUSHED.
420 IF (PEEK(65280) AND 2) THEN
V0=0:GOTO350:IF FIRE BUTTON NOT
PUSHED THEN RECHECK JOYSTICKS
430 IF V0=1 THEN 350 ELSE V0=1
440 IF L0=10 THEN 520:REM IF ERA
SE KEY
450 IF M0<1000 THEN M0=10*M0+L0:
PRINT@A2,M0;:REM IF LEFT ANSWER
LESS THAN 4 DIGITS THEN ADD NEW
DIGIT TO ANSWER AND PRINT OVER O
LD ANSWER
460 P0=4:ON P1 GOTO 550,690,750,
830,860:REM RETURN TO COROUTINE
FOR RIGHT PLAYER
470 IF M0<N0 THEN 350:REM IF AN
SWER NOT YET CORRECT GET NEW CUR
SOR POSITION FROM JOYSTICKS.
480 I=1024+A2:FOR J=I TO I+4:POK
E J,PEEK(J)-64:NEXT J:IF WN>0 TH
ENS0=S0+1:PRINT@T0,S0;:IF S0=WN
THEN 900:REM SINCE ANSWER CORREC
T THEN REVERSE PRINT ANSWER AND
ADD ONE TO SCORE IF KEEPING SCOR
E. IF WINNING SCORE ACHIEVED,GO
TO 930
490 P0=5:C0=0
500 IF C0<5 THEN C0=C0+1:ON P1 G
OTO 550,690,750,830,860:REM GOTO
RIGHT COROUTINE 5 TIMES TO DELA
Y INTRODUCTION OF NEW PROBLEM ON
LEFT
510 I=L(0,L0):POKE I,PEEK(I)+64:
PRINT@A2," ";:GOTO 190:REM T
URN OFF CURSOR, ERASE LAST ANSWER
R, AND GO GET A NEW PROBLEM
520 PRINT@A2," ";:M0=0:GOTO3
50:REM ERASE LEFT ANSWER
'530 REM BEGIN COROUTINE FOR RIGH
T PLAYER
540 P1=1:ON P0 GOTO 200,330,390,
470,500:RETURN TO COROUTINE FOR
LEFT PLAYER. P1 INDICATES TO RE
TURN HERE
550 X=RND(-TIMER):REM RANDOMIZE
RANDOM FUNCTION
560 ON RND(L6)+L7 GOTO 570,600,6
30,660:REM CHOOSE ADDITION, SUBT
RACTION, MULTIPLICATION, OR DIVI
SION PROBLEM FOR RIGHT PLAYER
570 A1=RND(10)-1:B1=RND(10)-1:N1
=A1+B1
580 PRINT@Q1,A1;"+";B1
590 GOTO 680
600 B1=RND(9):N1=RND(9):A1=N1+B1
620 PRINT@Q1,A1;"-";B1:GOTO 680

```

```

630 A1=RND(10)-1:B1=RND(10)-1:N1
=A1*B1
640 PRINT@Q1,A1;"*";B1
650 GOTO 680
660 N1=RND(10)-1:B1=RND(9):A1=N1
*B1
670 PRINT@Q1,A1;"/";B1
680 P1=2:ON P0 GOTO 200,330,390,
470,500:RETURN TO COROUTINE FOR
LEFT PLAYER--USE P1 TO REMEMBER
TO RETURN HERE
690 M1=0:L1=5:I=L(1,L1):POKE I,P
EEK(I)-64:REM SET RIGHT ANSWER M
1=0 AND PLACE RIGHT CURSOR ON 5
TO START
700 REM GET JOYSTICK POSITION TO
MOVE RIGHT CURSOR
710 J0=JOYSTK(0):IF J0<20 THEN J
0=0 ELSE IF J0<43 THEN J0=1 ELSE
J0=2
720 J1=JOYSTK(1):IF J1<16 THEN J
1=0 ELSE IF J1<32 THEN J1=1 ELSE
IF J1<48 THEN J1=2 ELSE J1=3
730 IF J1<3 THEN K1=J0-3*J1+7 EL
SE IF J0=0 THEN K1=0 ELSE K1=10:
REM K1=NEXT KEY TO GET CURSOR
(10=ERASE)
740 P1=3:ON P0 GOTO 200,330,390,
470,500:REM RETURN TO COROUTINE
FOR LEFT PLAYER
750 IF K1=L1 THEN 780:REM IF CUR
SOR NOT MOVED
760 I=L(1,L1):POKE I,PEEK(I)+64:
L1=K1:I=L(1,L1):POKE I,PEEK(I)-6
4:REM MOVE RIGHT CURSOR FROM OLD
POSITION TO NEW POSITION AND MA
KE OLD POSITION = NEW POSITION
770 REM CHECK FIRE BUTTON--IF IT
IS PUSHED AND WAS NOT PUSHED LA
ST TIME THROUGH HERE, ADD DIGIT
TO ANSWER AND CHECK FOR CORRECT
ANSWER. V1=1 IF LAST TIME THROU
GH HERE BUTTON WAS PUSHED.
780 IF (PEEK(65280) AND 1) THEN
V1=0: GOTO 710:REM IF FIRE BUTTO
N NOT PUSHED THEN RECHECK JOYSTI
CKS
790 IF V1=1 THEN 710 ELSE V1=1
800 IF L1=10 THEN 880:REM IF ERA
SE KEY
810 IF M1<1000 THEN M1=10*M1+L1:
PRINT@A3,M1;:REM IF RIGHT ANSWER
LESS THAN 4 DIGITS THEN ADD NEW
DIGIT TO ANSWER AND PRINT OVER
OLD ANSWER
820 P1=4:ON P0 GOTO 200,330,390,
470,500:REM RETURN TO COROUTINE
FOR LEFT PLAYER
830 IF M1<N1 THEN 710: REM IF A
NSWER NOT YET CORRECT, GET NEW C
URSOR POSITION FROM JOYSTICKS.
840 I=1024+A3:FOR J=I TO I+4:POK
E J,PEEK(J)-64:NEXT J:IF WN>0 TH
EN S1=S1+1:PRINT@T1,S1:IF S1=WN
THEN 900:REM SINCE ANSWER CORREC
T THEN REVERSE PRINT IT, ADD TO
SCORE IF KEEPING SCORE AND LEAVE
COROUTINES IF WINNING SCORE AC
HIEVED.
850 P1=5:C1=0
860 IF C1<5 THEN C1=C1+1:ON P0 G
OTO 200,330,390,470,500:REM GO T
O LEFT COROUTINE 5 TIMES AFTER C
ORRECT ANSWER TO DELAY INTRODUCT
ION OF NEW PROBLEM ON RIGHT
870 I=L(1,L1):POKE I,PEEK(I)+64:
PRINT@A3," ";:GOTO 540:REM TU
RN OFF CURSOR, ERASE LAST ANSWER
, AND GET A NEW PROBLEM
880 PRINT@A3," ";:M1=0:GOTO
710:REM ERASE RIGHT ANSWER
890 REM INDICATE WHICH PLAYER WO
N AND BEGIN NEW GAME IF DESIRED
900 IF S0=WN THEN PP=0 ELSE PP=1
910 F=452+17*PP
920 FOR I=1 TO 3:PRINT@F,W$;:TIM
ER=0
930 IF TIMER <30 THEN 930
940 PRINT@F,N$(PP);:TIMER =0
950 IF TIMER <30 THEN 950
960 NEXT I:PRINT@F,W$;:PRINT@488
,"SAME GAME (Y/N)?"
970 R$=INKEY$:IF R$=" " THEN 970
ELSE IF R$="Y" THEN 130 ELSE IF
R$="N" THEN 50 ELSE 970

```

BY JAMES W. WOOD

NIGHT RACER

Can you guide your car through all 16 screens in this game without crashing? Try it and see.

If racing is in your blood, but a fast car and track aren't in your backyard, this program is a good substitute.

In Night Racer you guide your car between the orange curbs of a winding road as a changing landscape flashes by. Your objective: Hold the road and complete the course.

Listings 1-16 each draw one screen of your road trip and POKE the screen in-

to high memory. To create the game I stapled 16 PRINT@ position sheets together, top to bottom, and drew the road course. Next, I programmed each sheet.

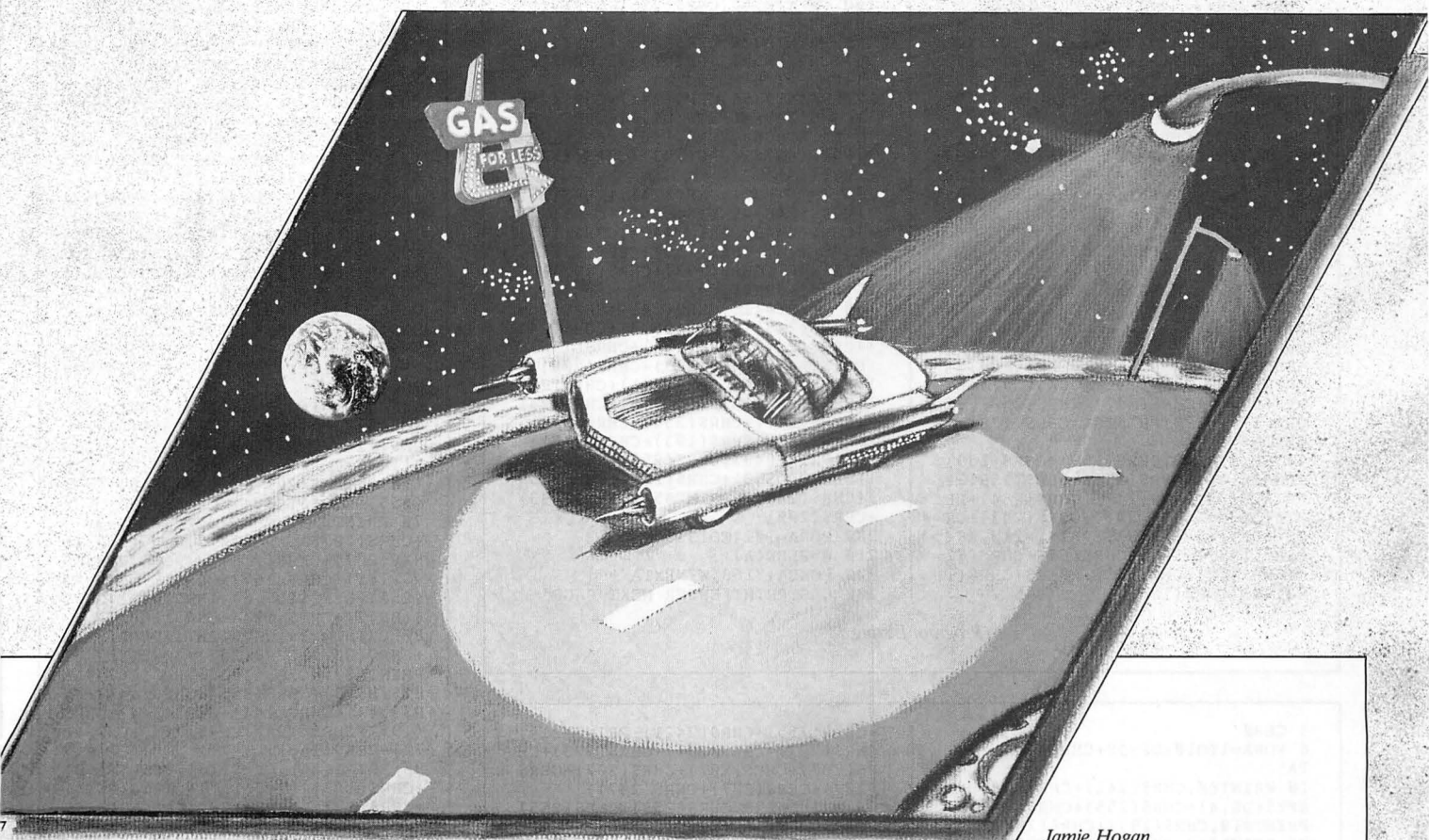
Lines 10-160 of each listing print the 16 lines of road and scenery on the screen. I numbered the lines like this so that you can easily create your own scenery if my deserts, lakes, and cities do not please you. If you change the course, you must keep black within the orange curbs as CHR\$(144). Anything black appearing outside of the curbs should be CHR\$(128). If you don't make this distinction you will not be able to travel on the road and may create an off-the-road, four-wheel-drive game.

Listing 17 is a Basic listing for a machine-language subroutine that creates the game's movement. The routine moves the screen down one line, places another line at the top, and returns to Basic.

Enter Listings 1-17 and CSAVE them separately. After these 17 are ready, CLOAD them in order, running each one before CLOADING the next. After you run Listing 17, use an Extended Color Basic system to make a machine-language tape. Insert a new tape, press the play and record buttons on the tape recorder, type CSAVEM"NTRCR",7617,16383,0, and press the enter key. Type and CSAVE Listing 18 on another cassette. To play Night

System Requirements

**16K RAM
Color, Disk, or
Extended Color Basic**



Jamie Hogan

Racer you will only need these last two tapes, but keep Listings 1-17 in a safe place.

Playing

To play, enter PCLEAR1: CLEAR 200,7617 and CLOADM the machine-language tape. CLOAD Listing 18 and run it—you're off to the races.

Program Alternatives

To add sound when using an Extended Color Computer, try line 35 PLAY "L25501A". If you're looking for fast action and the hardest level isn't challenging enough, remove line 50 or the FOR...NEXT loop from line 40. Line 50 keeps track of your distance. You

could use the double-speed POKE 65494,0. But be sure to return to normal speed with POKE65494,0 before using the recorder. (This speed-up probably won't work with disk.)

The machine-language tape from Basic Listings 1-17 must be made using an Extended Color Basic computer. Once this tape is made, a non-Extended computer can use it. If you do not have access to an Extended Basic machine to make the machine-language recording, then you must CLOAD and run all listings, 1-18, each time you turn on your computer to play the game.

Make these changes to the Basic listing. Remove DEFUSR0=7617 in line 10 and replace it with POKE275,

29:POKE276,193. Remove the zero from S=USR0(A) in line 30.

To transfer the machine-language routine to a 32K disk system, enter PCLEAR1: CLEAR200,7617. CLOADM the machine-language tape made as described in this article. Type:

```
FOR A=7617 TO 16383:W=PEEK(A): POKE
A+16384,W:NEXT A
```

and go get a cup of coffee. When these instructions stop executing, enter:

```
CLEAR200,24001
SAVEM"NTRCR",24001,32767,0
```

Make these changes in the Basic Listing 18:

Continued on p. 55

```

1 REM JAMES W. WOOD,424 N. MISSO
URI, ATWOOD, IL, 61913
3 CLEAR200,7617
4 R$=CHR$(191)
5 CLS0
6 FORA=1T010:D$=D$+CHR$(144):NEX
TA
10 PRINT@11,CHR$(255)+LEFT$(D$,5
)+CHR$(245)+CHR$(250);
20 PRINT@42,CHR$(241)+CHR$(254)+
LEFT$(D$,4)+CHR$(241)+CHR$(247)+
CHR$(250);
30 PRINT@64,CHR$(211)+CHR$(211)+
CHR$(211)+CHR$(210);:PRINT@73,CH
R$(241)+CHR$(254)+CHR$(248)+LEFT
$(D$,4)+CHR$(245)+CHR$(250);:PRI
NT@90,CHR$(135)+CHR$(130);
40 PRINT@96,CHR$(223)+CHR$(223)+
CHR$(223)+CHR$(223)+CHR$(219);:P
RINT@104,CHR$(241)+CHR$(247)+CHR
$(250)+LEFT$(D$,4)+CHR$(245)+CHR
$(254)+CHR$(248);:PRINT@121,CHR$(
135)+CHR$(143)+CHR$(143)+CHR$(1
30);
50 PRINT@128,CHR$(159)+CHR$(159)
+CHR$(159)+CHR$(159)+CHR$(159)+C
HR$(216);:PRINT@136,CHR$(245)+CH
R$(248)+LEFT$(D$,5)+CHR$(247)+CH
R$(250);
60 PRINT@160,CHR$(159)+CHR$(159)
+CHR$(159)+CHR$(159)+CHR$(159);:
PRINT@167,CHR$(241)+CHR$(247)+LE
FT$(D$,5)+CHR$(247)+CHR$(250);:F
ORA=178T0190:PRINT@EA,CHR$(178);:
NEXTA
70 PRINT@192,CHR$(159)+CHR$(159)
+CHR$(156)+CHR$(156)+CHR$(159);:
PRINT@199,CHR$(247)+CHR$(254)+LE
FT$(D$,3)+CHR$(241)+CHR$(243)+CH
R$(254)+CHR$(248);:PRINT@210,R$+
CHR$(188)+R$+R$+CHR$(65)+CHR$(72
)+CHR$(72)+CHR$(83)+R$+R$+CHR$(1
88)+R$+CHR$(186);

```

```

80 PRINT@224,CHR$(159)+CHR$(159)
+CHR$(147)+CHR$(147)+CHR$(159)+C
HR$(128)+CHR$(247)+CHR$(254)+LEF
T$(D$,4)+CHR$(247)+CHR$(254)+CHR
$(248);:PRINT@242,R$+R$+CHR$(188
)+R$+CHR$(188)+R$+R$+CHR$(188)+R
$+CHR$(188)+R$+R$+CHR$(186);
90 PRINT@262,CHR$(255)+LEFT$(D$,
5)+CHR$(255);:PRINT@274,R$+R$+R$
+R$+R$+CHR$(186)+CHR$(181)+R$+R$
+R$+R$+R$+CHR$(186);
100 PRINT@294,CHR$(255)+LEFT$(D$,
5)+CHR$(255);
110 PRINT@326,CHR$(255)+LEFT$(D$,
5)+CHR$(255);:PRINT@345,CHR$(17
9)+CHR$(178);
120 PRINT@356,CHR$(241)+CHR$(255
)+CHR$(248)+LEFT$(D$,5)+CHR$(255
);:PRINT@369,CHR$(135)+CHR$(130)
);:PRINT@376,CHR$(193)+CHR$(154)+
CHR$(154);
130 PRINT@387,CHR$(241)+CHR$(255
)+CHR$(248)+LEFT$(D$,5)+CHR$(245
)+CHR$(254);:PRINT@400,CHR$(135)
+CHR$(143)+CHR$(143)+CHR$(130);:
PRINT@407,CHR$(193)+CHR$(200)+CH
R$(188)+CHR$(184);
140 PRINT@418,CHR$(241)+CHR$(255
)+CHR$(248)+LEFT$(D$,4)+CHR$(241
)+CHR$(247)+CHR$(254)+CHR$(248);:
PRINT@438,CHR$(193)+CHR$(200);
150 PRINT@449,CHR$(241)+CHR$(255
)+CHR$(248)+LEFT$(D$,3)+CHR$(241
)+CHR$(247)+CHR$(254)+CHR$(248);:
PRINT@469,CHR$(193)+CHR$(200);
160 PRINT@481,CHR$(255)+CHR$(248
)+LEFT$(D$,3)+CHR$(241)+CHR$(254
)+CHR$(248);:PRINT@500,CHR$(193)
+CHR$(200);
200 FORA=1024T01535
210 W=PEEK(A)
220 POKEA+7168,W:NEXTA
230 CLS:PRINT"ENTER NEXT PAGE"

```

Program Listing 1

```

5 CLS0
6 FORA=1T010:D$=D$+CHR$(144):NEX
TA
10 PRINT@0,CHR$(241)+CHR$(255)+L
EFT$(D$,4)+CHR$(255)+CHR$(248);:
PRINT@19,CHR$(193)+CHR$(200);
20 PRINT@32,CHR$(255)+CHR$(254)+
LEFT$(D$,3)+CHR$(245)+CHR$(254);:
PRINT@50,CHR$(193)+CHR$(200);:P
RINT@55,CHR$(211)+CHR$(211)+CHR$(
211)+CHR$(211)+CHR$(211)+CHR$(2
11)+CHR$(211);
30 PRINT@64,CHR$(255)+CHR$(250)+
LEFT$(D$,3)+CHR$(244)+CHR$(253)+
CHR$(255)+CHR$(251);:PRINT@81,CH
R$(193)+CHR$(200);:PRINT@86,CHR$(
215)+CHR$(223)+CHR$(223)+CHR$(2
23)+CHR$(223)+CHR$(223)+CHR$(223
)+CHR$(223)+CHR$(219);
40 PRINT@96,CHR$(255)+CHR$(251)+
CHR$(242)+LEFT$(D$,4)+CHR$(244)+
CHR$(252)+CHR$(255);:PRINT@111,C
HR$(145)+CHR$(193)+CHR$(200);:PR
INT@117,CHR$(212)+CHR$(207)+CHR$(
207)+CHR$(207)+CHR$(207)+CHR$(2
07)+CHR$(207)+CHR$(207)+CHR$(207
)+CHR$(207)+CHR$(216);
50 PRINT@128,CHR$(252)+CHR$(255)
+CHR$(251)+CHR$(242)+LEFT$(D$,5)
+CHR$(255)+CHR$(242);:PRINT@143,
CHR$(191)+CHR$(152);:PRINT@150,C
HR$(207)+CHR$(204)+CHR$(207)+CHR
$(204)+CHR$(207)+CHR$(204)+CHR$(
207)+CHR$(204)+CHR$(204)+CHR$(2
07)+CHR$(204)+CHR$(207);
60 PRINT@161,CHR$(252)+CHR$(255)
+CHR$(250)+LEFT$(D$,6)+CHR$(255)
+CHR$(243);:PRINT@174,CHR$(164)+
CHR$(128)+CHR$(168);:PRINT@182,C
HR$(207)+CHR$(207)+CHR$(204)+CHR
$(207)+CHR$(207)+CHR$(204)+CHR$(
207)+CHR$(204)+CHR$(207);
70 PRINT@194,CHR$(252)+CHR$(253)
+CHR$(251)+CHR$(242)+LEFT$(D$,5)

```

```

+CHR$(255)+CHR$(242);:PRINT@214,
CHR$(207)+CHR$(207)+CHR$(128)+CH
R$(207)+CHR$(207)+CHR$(207)+CHR$(
207)+CHR$(207)+CHR$(207);
80 PRINT@228,CHR$(253)+CHR$(255)
+CHR$(242)+LEFT$(D$,4)+CHR$(252)
+CHR$(255)+CHR$(251)+CHR$(242);
90 PRINT@261,CHR$(244)+CHR$(255)
+CHR$(242)+LEFT$(D$,5)+CHR$(252)
+CHR$(253)+CHR$(250);
100 PRINT@294,CHR$(244)+CHR$(255
)+CHR$(242)+LEFT$(D$,5)+CHR$(245
)+CHR$(251);:PRINT@307,CHR$(143)
+CHR$(65)+CHR$(84)+CHR$(87)+CHR$(
79)+CHR$(79)+CHR$(68)+CHR$(143)
);
110 PRINT@323,CHR$(135)+CHR$(130)
);:PRINT@327,CHR$(252)+CHR$(255)
+CHR$(242)+LEFT$(D$,5)+CHR$(244)
+CHR$(253)+CHR$(251)+CHR$(128)+C
HR$(80)+CHR$(79)+CHR$(80)+CHR$(4
6)+CHR$(49)+CHR$(53)+CHR$(48)+CH
R$(48);
120 PRINT@354,CHR$(132)+CHR$(140)
)+CHR$(140);:PRINT@360,CHR$(252)
+CHR$(253)+CHR$(250)+LEFT$(D$,6)
+CHR$(255);:PRINT@374,CHR$(149)+
CHR$(154);
130 PRINT@393,CHR$(244)+CHR$(253)
)+CHR$(250)+LEFT$(D$,5)+CHR$(252
)+CHR$(253)+CHR$(251);:PRINT@406
,CHR$(149)+CHR$(154);
140 PRINT@426,CHR$(244)+CHR$(253)
)+CHR$(251)+LEFT$(D$,6)+CHR$(244
)+CHR$(250);
150 PRINT@460,CHR$(253)+LEFT$(D$,
7)+CHR$(250);
160 PRINT@492,CHR$(245)+LEFT$(D$,
7)+CHR$(250);
200 FORA=1024T01535
210 W=PEEK(A)
220 POKEA+7680,W:NEXTA
230 CLS:PRINT"ENTER NEXT PAGE"

```

Program Listing 2

Program Listing 3

```

2 CLS0
4 FORA=1T010:D$=D$+CHR$(144):NEX
TA:FORA=1T010:B$=B$+CHR$(175):NE
XTA
10 PRINT@12,CHR$(245)+LEFT$(D$,7
)+CHR$(251);:PRINT@27,CHR$(129)+
CHR$(139);
20 PRINT@37,CHR$(129)+CHR$(139);:
PRINT@44,CHR$(244)+CHR$(250)+LE
FT$(D$,6)+CHR$(245)+CHR$(242);:P
RINT@57,CHR$(135)+CHR$(130)+CHR$(
140)+CHR$(140)+CHR$(136);
30 PRINT@68,CHR$(129)+CHR$(143)+
CHR$(143)+CHR$(139);:PRINT@77,CH
R$(253)+LEFT$(D$,7)+CHR$(251);:P
RINT@88,CHR$(135)+CHR$(143)+CHR$(
143)+CHR$(130)+CHR$(128)+CHR$(1
61)+CHR$(167)+CHR$(175);
40 PRINT@109,CHR$(244)+CHR$(250)
+LEFT$(D$,6)+CHR$(245)+CHR$(242)
);:PRINT@123,CHR$(163)+CHR$(167)+
CHR$(175)+CHR$(175)+CHR$(174);
50 PRINT@131,CHR$(211)+CHR$(211)
+CHR$(211)+CHR$(186);:PRINT@137,
CHR$(129)+CHR$(139);:PRINT@142,C
HR$(253)+CHR$(242)+LEFT$(D$,6)+C
HR$(250);:PRINT@152,CHR$(163)+CH
R$(167)+LEFT$(B$,3)+CHR$(174)+CH
R$(172);
60 PRINT@162,CHR$(215)+CHR$(223)
+CHR$(223)+CHR$(223)+CHR$(219)+C
HR$(128)+CHR$(129)+CHR$(143)+CHR
$(143)+CHR$(139);:PRINT@174,CHR$(
161)+CHR$(255)+LEFT$(D$,6)+CHR$(
255)+LEFT$(B$,4)+CHR$(168);
70 PRINT@193,CHR$(212)+CHR$(207)
+CHR$(207)+CHR$(207)+CHR$(207)+C
HR$(207)+CHR$(216);:PRINT@204,CH
R$(161)+CHR$(167)+CHR$(175)+CHR$(
255)+LEFT$(D$,6)+CHR$(255)+LEFT
$(B$,2)+CHR$(174)+CHR$(168);
80 PRINT@226,CHR$(207)+CHR$(207)
+CHR$(207)+CHR$(207)+CHR$(207);:
PRINT@234,CHR$(163)+CHR$(167)+LE
FT$(B$,3)+CHR$(255)+CHR$(144)+CH
R$(144)+CHR$(144)+CHR$(144)+CHR$(
199)+CHR$(194)+CHR$(255)+CHR$(1
72)+CHR$(168);
90 PRINT@261,CHR$(161)+CHR$(163)
+CHR$(163)+CHR$(167)+LEFT$(B$,4)
+CHR$(172)+CHR$(128)+CHR$(255)+L
EFT$(D$,4)+CHR$(196)+CHR$(200)+C
HR$(244)+CHR$(250)+CHR$(128)+CHR
$(76)+CHR$(65)+CHR$(75)+CHR$(69)
);
100 PRINT@290,CHR$(161)+CHR$(163)
)+CHR$(163)+CHR$(167)+LEFT$(B$,5)
)+CHR$(174)+CHR$(168);:PRINT@303
,CHR$(244)+CHR$(250)+LEFT$(D$,6)
+CHR$(253)+CHR$(128)+CHR$(87)+CH
R$(79)+CHR$(79)+CHR$(68);
110 PRINT@321,CHR$(161)+LEFT$(B$,
7)+CHR$(174)+CHR$(172);:PRINT@3
36,CHR$(253)+LEFT$(D$,6)+CHR$(24
4)+CHR$(250)+CHR$(128)+CHR$(149)
+CHR$(154);
120 PRINT@352,LEFT$(B$,7)+CHR$(1
74)+CHR$(168)+CHR$(128)+CHR$(129
)+CHR$(139);:PRINT@368,CHR$(244)
+CHR$(250)+LEFT$(D$,6)+CHR$(253)
);
130 PRINT@384,LEFT$(B$,7)+CHR$(1
68)+CHR$(128)+CHR$(129)+CHR$(143
)+CHR$(143)+CHR$(139);:PRINT@401
,CHR$(253)+LEFT$(D$,6)+CHR$(244)
+CHR$(250);
140 PRINT@416,LEFT$(B$,6)+CHR$(1
70);:PRINT@433,CHR$(244)+CHR$(25
0)+LEFT$(D$,6)+CHR$(253);
150 PRINT@448,LEFT$(B$,5)+CHR$(1
74);:PRINT@466,CHR$(253)+LEFT$(D
$,6)+CHR$(244)+CHR$(250);
160 PRINT@480,LEFT$(B$,4)+CHR$(1
74)+CHR$(128)+CHR$(129)+CHR$(139
);:PRINT@498,CHR$(245)+LEFT$(D$,
7)+CHR$(251);
200 FORA=1024T01583
210 W=PEEK(A):POKEA+8192,W:NEXT
A
230 CLS
240 PRINT"ENTER ANOTHER SCREEN"

```



```

5 PCLEAR1: CLEAR200,24001: LOADM
"NTRCR"
10 DEFUSRO=24001: CLSO
30 FORA = 32736TO24576STEP - 32: S =
USR0(A): IFPEEK(343) = 247 THEN
POKE343,255:C=C-1
350 BS=INKEYS:IFBS="Y" THEN RUN 20
ELSE IF BS="N" THEN END ELSE 350

```

This game isn't Pole Position or Turbo, but I think you'll enjoy it. While you're busy playing Night Racer, I'll be busy chrome plating my disk drives. ■

Write to James W. Wood at 424 N. Missouri, Box 507, Atwood, IL 61913.

Program Listing 4

```

5 CLSØ
6 FORA=1TO1Ø: D$=D$+CHR$(144): NEX
T
1Ø PRINTØ, CHR$(175)+CHR$(175)+C
HR$(175)+CHR$(174); : PRINTØ7, CHR$(
14Ø)+CHR$(14Ø)+CHR$(136); : PRINT
Ø18, CHR$(245)+CHR$(242)+LEFT$(D$,
6)+CHR$(253)+CHR$(25Ø);
2Ø PRINTØ32, CHR$(175)+CHR$(175)+

```

```

CHR$(174); : PRINTØ44, CHR$(129)+CH
R$(139); : PRINTØ51, CHR$(253)+CHR$(
25Ø)+LEFT$(D$, 5)+CHR$(244)+CHR$(
253)+CHR$(25Ø);
3Ø PRINTØ64, CHR$(175)+CHR$(174);
: PRINTØ68, CHR$(129)+CHR$(139); : P
RINTØ76, CHR$(14Ø)+CHR$(14Ø)+CHR$(
136); : PRINTØ83, CHR$(244)+CHR$(2
53)+CHR$(25Ø)+LEFT$(D$, 5)+CHR$(2
44)+CHR$(253)+CHR$(251);
4Ø PRINTØ1ØØ, CHR$(14Ø)+CHR$(14Ø)
+CHR$(136); : PRINTØ117, CHR$(253)+
CHR$(251)+CHR$(243)+LEFT$(D$, 4)+
CHR$(244)+CHR$(253)+CHR$(25Ø);
5Ø PRINTØ129, CHR$(129)+CHR$(139)
; : PRINTØ137, CHR$(129)+CHR$(139);
: PRINTØ149, CHR$(244)+CHR$(252)+C
HR$(255)+CHR$(243)+CHR$(242)+LEF
T$(D$, 3)+CHR$(245)+CHR$(251);
6Ø PRINTØ161, CHR$(14Ø)+CHR$(14Ø)
+CHR$(136); : PRINTØ169, CHR$(14Ø)
+CHR$(14Ø)+CHR$(136); : PRINTØ184, C
HR$(245)+CHR$(25Ø)+LEFT$(D$, 4)+C
HR$(255);
7Ø PRINTØ216, CHR$(247)+CHR$(25Ø)
+LEFT$(D$, 3)+CHR$(241)+CHR$(255)
;
8Ø PRINTØ247, CHR$(241)+CHR$(255)
+LEFT$(D$, 4)+CHR$(245)+CHR$(25Ø)
;
9Ø PRINTØ27Ø, CHR$(225)+CHR$(231)
+CHR$(235)+CHR$(226); : PRINTØ279,
CHR$(247)+CHR$(25Ø)+LEFT$(D$, 4)+
CHR$(245)+CHR$(25Ø);
1ØØ PRINTØ3Ø1, CHR$(231)+CHR$(239)
+CHR$(239)+CHR$(239)+CHR$(239);

```

```

CHR$(235); : PRINTØ311, CHR$(255)+L
EFT$(D$, 5)+CHR$(247)+CHR$(25Ø);
11Ø PRINTØ332, CHR$(228)+CHR$(143
)+CHR$(143)+CHR$(143)+CHR$(143)+
CHR$(143)+CHR$(143)+CHR$(232); : P
RINTØ341, CHR$(245)+CHR$(254)+CHR
$(252)+LEFT$(D$, 4)+CHR$(243)+CHR
$(255);
12Ø PRINTØ365, CHR$(143)+CHR$(74)
+CHR$(79)+CHR$(69)+CHR$(83)+CHR$(
143); : PRINTØ373, CHR$(247)+CHR$(
25Ø)+LEFT$(D$, 5)+CHR$(255);
13Ø PRINTØ397, CHR$(143)+CHR$(143)
)+CHR$(143)+CHR$(143)+CHR$(143)+
CHR$(143); : PRINTØ4Ø5, CHR$(255)+L
EFT$(D$, 5)+CHR$(241)+CHR$(255);
14Ø PRINTØ436, CHR$(245)+CHR$(254)
)+LEFT$(D$, 5)+CHR$(245)+CHR$(25Ø
);
15Ø PRINTØ456, CHR$(227)+CHR$(233)
); : PRINTØ467, CHR$(254)+CHR$(252)
+CHR$(248)+LEFT$(D$, 4)+CHR$(245)
+CHR$(254)+CHR$(248);
16Ø PRINTØ487, CHR$(23Ø)+CHR$(128)
)+CHR$(128)+CHR$(233)+CHR$(128)+
CHR$(128)+CHR$(225)+CHR$(233); : P
RINTØ498, CHR$(241)+CHR$(25Ø)+LEF
T$(D$, 5)+CHR$(245)+CHR$(254)+CHR
$(248);
2ØØ FORA=1Ø24TO1535
21Ø W=PEEK(A): POKEA+87Ø4, W: NEXT
A
22Ø CLS: PRINT"ENTER NEXT PAGE"

```

END

Program Listing 6

```

5 CLSØ
6 FORA=1TO1Ø: D$=D$+CHR$(144): NEX
T
1Ø PRINTØ5, CHR$(225)+CHR$(232); :
PRINTØ11, CHR$(233)+CHR$(233)+CHR
$(232)+CHR$(128)+CHR$(235)+CHR$(
226)+CHR$(243)+CHR$(247)+CHR$(25
Ø)+LEFT$(D$, 5)+CHR$(245)+CHR$(25
Ø); : PRINTØ3Ø, CHR$(225)+CHR$(227)
;
2Ø PRINTØ33, CHR$(225)+CHR$(227)+
CHR$(236)+CHR$(227)+CHR$(232)+CH
R$(128)+CHR$(145); : PRINTØ48, CHR$(
228)+CHR$(255)+CHR$(25Ø)+LEFT$(
D$, 5)+CHR$(241)+CHR$(247)+CHR$(2
5Ø)+CHR$(128)+CHR$(225)+CHR$(23Ø)
)+CHR$(232);
3Ø PRINTØ64, CHR$(225)+CHR$(232);
: PRINTØ69, CHR$(145)+CHR$(151)+CH
R$(152)+CHR$(156)+CHR$(153)+CHR$(
146); : PRINTØ8Ø, CHR$(241)+CHR$(2
55)+CHR$(25Ø)+LEFT$(D$, 5)+CHR$(2
45)+CHR$(25Ø)+CHR$(128)+CHR$(225)
)+CHR$(232);
4Ø PRINTØ96, CHR$(232); : PRINTØ1ØØ
, CHR$(15Ø)+CHR$(152); : PRINTØ1Ø6,
CHR$(148)+CHR$(146); : PRINTØ11Ø, C
HR$(147)+CHR$(243)+CHR$(247)+CHR
$(255)+LEFT$(D$, 5)+CHR$(241)+CHR
$(247)+CHR$(25Ø)+CHR$(227)+CHR$(
232); : PRINTØ127, CHR$(146);
5Ø PRINTØ128, CHR$(153)+CHR$(128)
+CHR$(15Ø)+CHR$(153)+CHR$(152); :
PRINTØ139, CHR$(148)+CHR$(153)+CH
R$(15Ø)+CHR$(128)+CHR$(255)+CHR$(
25Ø)+LEFT$(D$, 6)+CHR$(245)+CHR$(
25Ø)+CHR$(236)+CHR$(128)+CHR$(1
5Ø)+CHR$(146)+CHR$(145)+CHR$(156)
)+CHR$(148);
6Ø PRINTØ161, CHR$(156); : PRINTØ16
4, CHR$(129)+CHR$(128)+CHR$(133)+
CHR$(13Ø); : PRINTØ174, CHR$(241)+C
HR$(255)+CHR$(25Ø)+LEFT$(D$, 6)+C
HR$(245)+CHR$(25Ø)+CHR$(145)+CHR
$(156)+CHR$(128)+CHR$(148)+CHR$(
152)+CHR$(134)+CHR$(13Ø);
7Ø PRINTØ192, CHR$(129)+CHR$(134)
+CHR$(131)+CHR$(134)+CHR$(14Ø)+C
HR$(137)+CHR$(136)+CHR$(132)+CHR

```

```

$(137)+CHR$(131); : PRINTØ2Ø5, CHR$(
243)+CHR$(247)+CHR$(25Ø)+LEFT$(
D$, 6)+CHR$(245)+CHR$(254)+CHR$(2
48)+CHR$(152); : PRINTØ221, CHR$(13
4)+CHR$(128)+CHR$(132);
8Ø PRINTØ234, CHR$(14Ø)+CHR$(137)
+CHR$(131)+CHR$(255)+LEFT$(D$, 7)
+CHR$(241)+CHR$(247)+CHR$(25Ø); :
PRINTØ25Ø, CHR$(134)+CHR$(13Ø)+CH
R$(131)+CHR$(136);
9Ø PRINTØ268, CHR$(245)+CHR$(254)
+LEFT$(D$, 6)+CHR$(241)+CHR$(247)
+CHR$(25Ø); : PRINTØ281, CHR$(134)+
CHR$(128)+CHR$(132);
1ØØ PRINTØ299, CHR$(241)+CHR$(247)
)+CHR$(25Ø)+LEFT$(D$, 6)+CHR$(245)
)+CHR$(25Ø)+CHR$(14Ø)+CHR$(14Ø)
+CHR$(14Ø)+CHR$(136);
11Ø PRINTØ331, CHR$(245)+CHR$(25Ø)
)+LEFT$(D$, 6)+CHR$(255)+CHR$(252)
)+CHR$(248)+CHR$(82)+CHR$(69)+CH
R$(68);
12Ø PRINTØ362, CHR$(243)+CHR$(247)
)+CHR$(25Ø)+LEFT$(D$, 6)+CHR$(255)
)+CHR$(128)+CHR$(82)+CHR$(73)+CH
R$(68)+CHR$(71)+CHR$(69);
13Ø PRINTØ394, CHR$(255)+LEFT$(D$,
6)+CHR$(241)+CHR$(243)+CHR$(255)
); : PRINTØ4Ø6, CHR$(77)+CHR$(84)+C
HR$(83);
14Ø PRINTØ425, CHR$(241)+CHR$(255)
)+LEFT$(D$, 6)+CHR$(245)+CHR$(25Ø)
); : PRINTØ439, CHR$(159); : PRINTØ44
2, CHR$(129);
15Ø PRINTØ456, CHR$(241)+CHR$(247)
)+CHR$(25Ø)+LEFT$(D$, 5)+CHR$(241)
)+CHR$(247)+CHR$(25Ø); : PRINTØ471
, CHR$(159)+CHR$(128)+CHR$(129)+C
HR$(143)+CHR$(139);
16Ø PRINTØ487, CHR$(241)+CHR$(247)
)+CHR$(25Ø)+LEFT$(D$, 5)+CHR$(241)
)+CHR$(247)+CHR$(25Ø); : PRINTØ5Ø5
, CHR$(14Ø)+CHR$(14Ø)+CHR$(14Ø)+C
HR$(136);
2ØØ FORA=1Ø24TO1535
21Ø W=PEEK(A)
22Ø POKEA+9216, W: NEXTA
23Ø CLS: PRINT"ENTER NEXT PAGE"

```

```

5 CLSØ
6 FORA=1TO1Ø: D$=D$+CHR$(144): NEX
T
1Ø PRINTØ7, CHR$(245)+CHR$(25Ø)+L
EFT$(D$, 5)+CHR$(243)+CHR$(247)+C
HR$(25Ø); : PRINTØ2Ø, CHR$(129)+CHR
$(13Ø);
2Ø PRINTØ39, CHR$(245)+CHR$(25Ø)+
LEFT$(D$, 4)+CHR$(241)+CHR$(255)+
CHR$(25Ø); : PRINTØ51, CHR$(129)+CH
R$(143)+CHR$(143)+CHR$(13Ø);
3Ø PRINTØ7Ø, CHR$(243)+CHR$(247)+
CHR$(25Ø)+LEFT$(D$, 4)+CHR$(247)+
CHR$(25Ø); : PRINTØ82, CHR$(129)+CH
R$(143)+CHR$(143)+CHR$(143)+CHR$(
143)+CHR$(13Ø);
4Ø PRINTØ1Ø2, CHR$(255)+CHR$(25Ø)
+LEFT$(D$, 5)+CHR$(255); : PRINTØ11
5, CHR$(136)+CHR$(149)+CHR$(154)+
CHR$(132);
5Ø PRINTØ133, CHR$(241)+CHR$(255)
+CHR$(25Ø)+LEFT$(D$, 3)+CHR$(241)
+CHR$(243)+CHR$(255); : PRINTØ148,
CHR$(149)+CHR$(154);
6Ø PRINTØ16Ø, CHR$(163)+CHR$(163)
+CHR$(163); : PRINTØ165, CHR$(255)+
CHR$(25Ø)+LEFT$(D$, 4)+CHR$(245)+
CHR$(255);
7Ø PRINTØ194, CHR$(164)+CHR$(172)
+CHR$(172)+CHR$(255)+CHR$(25Ø)+L
EFT$(D$, 4)+CHR$(245)+CHR$(255)+C
HR$(172)+CHR$(172)+CHR$(172)+CHR
$(172)+CHR$(173)+CHR$(175)+CHR$(
175)+CHR$(171)+CHR$(163)+CHR$(16
3)+CHR$(162);
8Ø PRINTØ229, CHR$(244)+CHR$(253)
+CHR$(242)+LEFT$(D$, 3)+CHR$(244)
+CHR$(253)+CHR$(25Ø); : PRINTØ247,
CHR$(172)+CHR$(172)+CHR$(173)+CH
R$(171)+CHR$(163)+CHR$(163)+CHR$(
163)+CHR$(162);
9Ø PRINTØ262, CHR$(244)+CHR$(251)
+LEFT$(D$, 4)+CHR$(245)+CHR$(251)
+CHR$(242); : PRINTØ284, CHR$(164)+
CHR$(173)+CHR$(171)+CHR$(163);
1ØØ PRINTØ295, CHR$(253)+CHR$(251)
)+CHR$(242)+LEFT$(D$, 3)+CHR$(245)
)+CHR$(25Ø); : PRINTØ316, CHR$(161)
+CHR$(167)+CHR$(174)+CHR$(172);
11Ø PRINTØ328, CHR$(245)+CHR$(25Ø)
)+LEFT$(D$, 4)+CHR$(251)+CHR$(242)
); : PRINTØ347, CHR$(161)+CHR$(167)

```

Listing 6 continued

Program Listing 5

HA
HA
HA

Listing 6 continued

```
+CHR$(170);
120 PRINT@361,CHR$(255)+LEFT$(D$,5)+CHR$(255);:PRINT@375,CHR$(163)+CHR$(167)+CHR$(174)+CHR$(172)+CHR$(172)+CHR$(168);
130 PRINT@386,CHR$(161)+CHR$(163)+CHR$(163)+CHR$(174)+CHR$(172)+CHR$(172)+CHR$(172)+CHR$(255)+LEFT$(D$,5)+CHR$(255)+CHR$(163)+CHR$(163)+CHR$(163)+CHR$(163)+CHR$(167)+CHR$(174)+CHR$(172)+CHR$(172)+CHR$(172)+CHR$(172)+CHR$(168);
140 PRINT@416,CHR$(172)+CHR$(172)+CHR$(172);:PRINT@425,CHR$(255)+LEFT$(D$,5)+CHR$(255)+CHR$(242);
;
150 PRINT@457,CHR$(253)+LEFT$(D$,5)+CHR$(245)+CHR$(250);
160 PRINT@489,CHR$(245)+CHR$(242)+LEFT$(D$,4)+CHR$(245)+CHR$(251);
;
200 FORA=1024TO1535
210 W=PEEK(A):POKEA+9728,W:NEXT A
220 CLS:PRINT"ENTER NEXT PAGE"
```

END

```
5 CLS0
6 FORA=1TO10:D=D$+CHR$(144):NEXT A
10 PRINT@4,CHR$(135)+CHR$(130);:PRINT@10,CHR$(250)+LEFT$(D$,5)+CHR$(255)+CHR$(242);
20 PRINT@35,CHR$(135)+CHR$(143)+CHR$(143)+CHR$(130);:PRINT@42,CHR$(251)+CHR$(242)+LEFT$(D$,4)+CHR$(245)+CHR$(255)+CHR$(242);
30 PRINT@74,CHR$(245)+CHR$(251)+CHR$(242)+LEFT$(D$,4)+CHR$(245)+CHR$(251)+CHR$(242);
40 PRINT@106,CHR$(244)+CHR$(253)+CHR$(251)+CHR$(242)+LEFT$(D$,4)+CHR$(245)+CHR$(251)+CHR$(242);
50 PRINT@140,CHR$(253)+CHR$(250)
```

```
+LEFT$(D$,5)+CHR$(245)+CHR$(250);
;
60 PRINT@172,CHR$(245)+CHR$(251)+CHR$(242)+LEFT$(D$,4)+CHR$(245)+CHR$(250);
70 FORA=192TO204:PRINT@A,CHR$(177);:NEXTA:PRINT@205,CHR$(244)+CHR$(255)+LEFT$(D$,4)+CHR$(245)+CHR$(250);:FORA=213TO223:PRINT@A,CHR$(177);:NEXTA
80 FORA=224TO255:PRINT@A,CHR$(189);:NEXTA:PRINT@238,CHR$(255)+LEFT$(D$,4)+CHR$(255);
90 FORA=256TO287:PRINT@A,CHR$(189);:NEXTA:PRINT@270,CHR$(255)+LEFT$(D$,4)+CHR$(255);
100 PRINT@301,CHR$(245)+CHR$(250)+LEFT$(D$,4)+CHR$(245)+CHR$(250);
;
110 PRINT@333,CHR$(244)+CHR$(253)+CHR$(250)+LEFT$(D$,3)+CHR$(245)+CHR$(251)+CHR$(242);:PRINT@344,CHR$(196)+CHR$(194)+CHR$(195)+CHR$(193)+CHR$(200);
120 PRINT@366,CHR$(245)+CHR$(250)+LEFT$(D$,4)+CHR$(252)+CHR$(253)+CHR$(250)+CHR$(128)+CHR$(128)+CHR$(198)+CHR$(207)+CHR$(201);
130 PRINT@397,CHR$(245)+CHR$(254)+CHR$(248)+LEFT$(D$,5)+CHR$(245)+CHR$(250)+CHR$(128)+CHR$(196)+CHR$(82)+CHR$(207)+CHR$(82)+CHR$(200);
140 PRINT@428,CHR$(255)+CHR$(252)+CHR$(248)+LEFT$(D$,5)+CHR$(245)+CHR$(254)+CHR$(248);:PRINT@442,CHR$(207);
150 PRINT@459,CHR$(247)+CHR$(254)+LEFT$(D$,6)+CHR$(255)+CHR$(252)+CHR$(248);:PRINT@474,CHR$(207);
;
160 PRINT@490,CHR$(247)+CHR$(254)+LEFT$(D$,5)+CHR$(241)+CHR$(255)+CHR$(252);
200 FORA=1024TO1535
210 W=PEEK(A)
220 POKEA+10240,W:NEXTA
230 CLS:PRINT"ENTER NEXT PAGE"
```

Program Listing 7

Program Listing 8

```
5 CLS0
6 FORA=1TO10:D=D$+CHR$(144):NEXT A
10 PRINT@9,CHR$(245)+CHR$(255)+LEFT$(D$,5)+CHR$(245)+CHR$(254)+CHR$(248);
20 PRINT @41,CHR$(247)+CHR$(255)+LEFT$(D$,5)+CHR$(245)+CHR$(251);
;
30 PRINT@71,CHR$(241)+CHR$(247)+CHR$(255)+LEFT$(D$,7)+CHR$(253)+CHR$(251);
40 PRINT@103,CHR$(255)+CHR$(254)+LEFT$(D$,9)+CHR$(253)+CHR$(251)+CHR$(242);
50 PRINT@135,CHR$(255)+LEFT$(D$,10)+CHR$(144)+CHR$(245)+CHR$(251)+CHR$(242);
60 PRINT@167,CHR$(255)+LEFT$(D$,2)+CHR$(251)+CHR$(242)+LEFT$(D$,7)+CHR$(244)+CHR$(253)+CHR$(250);
;
70 PRINT@199,CHR$(255)+LEFT$(D$,2)+CHR$(255)+CHR$(252)+CHR$(253)+CHR$(243)+CHR$(242)+LEFT$(D$,5)+CHR$(245)+CHR$(251)+CHR$(243)+CHR$(243)+CHR$(243)+CHR$(242);
80 PRINT@225,CHR$(135)+CHR$(130);:PRINT@231,CHR$(255)+LEFT$(D$,2)+CHR$(255);:PRINT@237,CHR$(245)+CHR$(251)+CHR$(242)+LEFT$(D$,5)+CHR$(244)+CHR$(252)+CHR$(253)+CHR$(251);
90 PRINT@256,CHR$(135)+CHR$(143)+CHR$(143)+CHR$(130);:PRINT@263,
```

```
CHR$(255)+LEFT$(D$,2)+CHR$(255);:PRINT@270,CHR$(244)+CHR$(253)+CHR$(251)+CHR$(243)+CHR$(242)+LEFT$(D$,4)+CHR$(244)+CHR$(255)+CHR$(251);
100 PRINT@292,CHR$(135)+CHR$(130)+CHR$(128)+CHR$(255)+LEFT$(D$,2)+CHR$(255);:PRINT@304,CHR$(244)+CHR$(252)+CHR$(251)+CHR$(242)+LEFT$(D$,4)+CHR$(244)+CHR$(255)+CHR$(251);
110 PRINT@323,CHR$(135)+CHR$(143)+CHR$(143)+CHR$(130)+CHR$(255)+LEFT$(D$,2)+CHR$(255);:PRINT@338,CHR$(245)+CHR$(251)+CHR$(242)+LEFT$(D$,4)+CHR$(244)+CHR$(253)+CHR$(251)+CHR$(242);
120 PRINT@359,CHR$(255)+LEFT$(D$,2)+CHR$(255);:PRINT@371,CHR$(244)+CHR$(253)+CHR$(255)+CHR$(242)+LEFT$(D$,4)+CHR$(252)+CHR$(253)+CHR$(251)+CHR$(242);
130 PRINT@391,CHR$(255)+LEFT$(D$,2)+CHR$(255);:PRINT@404,CHR$(244)+CHR$(253)+CHR$(251)+CHR$(243)+LEFT$(D$,4)+CHR$(244)+CHR$(253)+CHR$(251);
140 PRINT@423,CHR$(255)+LEFT$(D$,2)+CHR$(255);:PRINT@438,CHR$(241)+CHR$(255)+LEFT$(D$,5)+CHR$(245)+CHR$(254);:PRINT@431,CHR$(135)+CHR$(130);
150 PRINT@455,CHR$(255)+LEFT$(D$,2)+CHR$(255)+CHR$(242);:PRINT@469,CHR$(245)+CHR$(254)+LEFT$(D$,
```

Listing 8 continued

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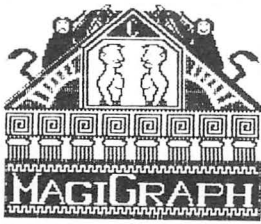
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SYSTEMS SOFTWARE

MACRO-80C: DISK-BASED EDITOR, ASSEMBLER AND MONITOR—With all the features the serious programmer wants, this package includes a powerful 2-pass macro assembler with conditional assembly, local labels, include files and cross referenced symbol tables. MACRO-80C supports the complete Motorola 6809 instruction set in standard source format. Incorporating all the features of our Rompack-based assembler (SDS-80C), MACRO-80C contains many more useful instructions and pseudo-ops which aid the programmer and add power and flexibility. The screen-oriented editor is designed for efficient and easy editing of assembly language programs. MACRO-80C allows global changes and moving/copying blocks of text. You can edit lines of assembly source which exceed 32 characters. DCBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

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Includes a 112-page manual with a glossary of the system-specific words, a full standard FIG glossary and complete source listing.

MICRO WORKS COLOR FORTH... THE BEST! From the leader in FORTH, Talbot Microsystems. **\$109.95**

MACHINE LANGUAGE

MONITOR TAPE: A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. **CBUG TAPE: \$29.95**

MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or the Romless Pack I. **CBUG ROM: \$39.95**

SOURCE GENERATOR: This package is a disassembler which runs on the Color Computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler: \$49.95**

CSPOOL

Color Computer Print Spooler

Stop Waiting Around for the Printer! **CSPOOL** allows you to use your printer and computer concurrently, takes only 26 bytes of Color Basic's memory, and gives you 32K of print buffer. It's like having two computers in one! By intercepting characters sent to the printer and storing them in the upper 32K of RAM, **CSPOOL** allows you to run other programs while your printer is doing its job. **CSPOOL** is FREE with the purchase of a 64K RAM UPGRADE KIT from The Micro Works, or it may be purchased separately on cassette or diskette for **\$19.95**. Requires 64K; not for FLEX or OS9.

64K MEMORY UPGRADE KIT: For Rev. levels E, ET, NC, TDP-100s, and Color Computer II. Eight prime 64K RAM chips, instructions, and **CSPOOL: \$64.95**.

HARDWARE

PARALLEL PRINTER INTERFACE—Serial to parallel converter allows use of all standard parallel printers. PI80C plugs into the serial output port, leaving your Rompack slot free. You supply the printer cable. **PI80C: \$59.95**

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Listing 8 continued

```
5)+CHR$(241)+CHR$(247)+CHR$(248)
;:PRINT@462,CHR$(132)+CHR$(140)+
CHR$(140);
160 PRINT@487,CHR$(255)+LEFT$(DS
,2)+CHR$(244)+CHR$(251);:PRINT@5
01,CHR$(245)+CHR$(250)+LEFT$(DS,
```

```
4)+CHR$(247)+CHR$(254)+CHR$(248)
;
200 FORA=1024TO1535
210 W=PEEK(A)
220 POKEA+10752,W:NEXTA
230 CLS:PRINT"ENTER NEXT PAGE"
```

END

```
5 CLS0
6 FORA=1TO10:DS=D$+CHR$(144):NEX
TA
10 PRINT@7,CHR$(255)+LEFT$(DS,3)
+CHR$(255)+CHR$(242);:PRINT@17,C
HR$(135)+CHR$(130);:PRINT@21,CHR
$(245)+CHR$(250)+LEFT$(DS,4)+CHR
$(255);
20 PRINT@39,CHR$(255)+LEFT$(DS,3)
)+CHR$(253)+CHR$(251)+CHR$(242);
:PRINT@48,CHR$(132)+CHR$(140)+CH
R$(140);:PRINT@52,CHR$(241)+CHR$(
247)+CHR$(250)+LEFT$(DS,4)+CHR$(
255);
30 PRINT@71,CHR$(255)+LEFT$(DS,3)
)+CHR$(244)+CHR$(253)+CHR$(250);
:PRINT@84,CHR$(245)+CHR$(250)+LE
FT$(DS,5)+CHR$(255);
40 PRINT@103,CHR$(255)+LEFT$(DS,
4)+CHR$(244)+CHR$(253)+CHR$(251)
+CHR$(243)+CHR$(242);:PRINT@115,
CHR$(241)+CHR$(247)+CHR$(250)+LE
FT$(DS,5)+CHR$(255);
50 PRINT@135,CHR$(255)+CHR$(242)
)+LEFT$(DS,4)+CHR$(244)+CHR$(252)
+CHR$(253)+CHR$(251)+CHR$(243)+C
HR$(243)+CHR$(247)+CHR$(254)+CHR
$(248)+LEFT$(DS,4)+CHR$(241)+CHR
$(255);
60 PRINT@167,CHR$(245)+CHR$(251)
+CHR$(242)+LEFT$(DS,5)+CHR$(244)
+CHR$(252)+CHR$(252)+CHR$(252)+C
HR$(252)+CHR$(248)+LEFT$(DS,4)+C
HR$(241)+CHR$(247)+CHR$(250);
70 PRINT@200,CHR$(245)+CHR$(251)
+CHR$(242)+LEFT$(DS,10)+LEFT$(DS
,3)+CHR$(241)+CHR$(247)+CHR$(250)
```

```
);
80 PRINT@232,CHR$(244)+CHR$(253)
+CHR$(251)+CHR$(242)+LEFT$(DS,10)
)+LEFT$(DS,2)+CHR$(245)+CHR$(250)
);
90 PRINT@265,CHR$(244)+CHR$(253)
+CHR$(250)+LEFT$(DS,10)+CHR$(144)
+CHR$(245)+CHR$(254)+CHR$(248);
:PRINT@284,CHR$(135)+CHR$(130);
100 PRINT@298,CHR$(245)+CHR$(250)
)+LEFT$(DS,10)+CHR$(255)+CHR$(25
2)+CHR$(248);:PRINT@315,CHR$(132)
)+CHR$(140)+CHR$(140);
110 PRINT@325,CHR$(135)+CHR$(130)
);:PRINT@330,CHR$(244)+CHR$(255)
+CHR$(242)+LEFT$(DS,8)+CHR$(255)
+CHR$(250);
120 PRINT@356,CHR$(132)+CHR$(140)
)+CHR$(140);:PRINT@363,CHR$(244)
+CHR$(255)+CHR$(242)+LEFT$(DS,6)
+CHR$(255)+CHR$(250);
130 PRINT@396,CHR$(245)+CHR$(250)
)+LEFT$(DS,5)+CHR$(245)+CHR$(250)
);
140 PRINT@428,CHR$(245)+CHR$(250)
)+LEFT$(DS,5)+CHR$(245)+CHR$(250)
);
150 PRINT@460,CHR$(245)+CHR$(250)
)+LEFT$(DS,5)+CHR$(245)+CHR$(250)
);
160 PRINT@493,CHR$(255)+LEFT$(DS
,5)+CHR$(255)+CHR$(248);
200 FORA=1024TO1535
210 W=PEEK(A)
220 POKEA+11264,W
230 NEXTA
240 CLS:PRINT"ENTER NEXT PAGE"
```

Program Listing 9

```
5 CLS0
6 FORA=1TO10:DS=D$+CHR$(144):NEX
TA
10 PRINT@12,CHR$(241)+CHR$(255)+
LEFT$(DS,5)+CHR$(255);
20 PRINT@43,CHR$(241)+CHR$(255)+
CHR$(248)+LEFT$(DS,4)+CHR$(241)+
CHR$(255);
30 PRINT @75,CHR$(245)+CHR$(250)
)+LEFT$(DS,5)+CHR$(247)+CHR$(250)
);
40 PRINT@105,CHR$(241)+CHR$(247)
+CHR$(254)+CHR$(248)+LEFT$(DS,4)
+CHR$(241)+CHR$(255);
50 PRINT @137,CHR$(245)+CHR$(250)
)+LEFT$(DS,6)+CHR$(247)+CHR$(250)
);:PRINT@154,CHR$(129)+CHR$(130)
);
60 PRINT@168,CHR$(245)+CHR$(254)
+CHR$(248)+LEFT$(DS,4)+CHR$(241)
+CHR$(247)+CHR$(254);:PRINT@185,
CHR$(135)+CHR$(143)+CHR$(143)+CH
R$(130);
70 PRINT@199,CHR$(245)+CHR$(254)
+CHR$(248)+LEFT$(DS,5)+CHR$(245)
+CHR$(250);:PRINT@212,CHR$(129)+
CHR$(130);:PRINT@217,CHR$(132)+C
HR$(143)+CHR$(142);
80 PRINT@230,CHR$(241)+CHR$(247)
+CHR$(250)+LEFT$(DS,6)+CHR$(247)
+CHR$(250);:PRINT@243,CHR$(135)+
CHR$(143)+CHR$(143)+CHR$(130);:P
RINT@250,CHR$(149);
90 PRINT@261,CHR$(241)+CHR$(247)
+CHR$(250)+LEFT$(DS,7)+CHR$(255)
```

```
;:PRINT@275,CHR$(132)+CHR$(143)+
CHR$(142);:PRINT@282,CHR$(148);
100 PRINT@293,CHR$(245)+CHR$(250)
)+LEFT$(DS,7)+CHR$(243)+CHR$(255)
);:PRINT@308,CHR$(149);
110 PRINT@325,CHR$(245)+CHR$(250)
)+LEFT$(DS,6)+CHR$(241)+CHR$(255)
);:PRINT@340,CHR$(148);
120 PRINT@357,CHR$(247)+CHR$(250)
)+LEFT$(DS,6)+CHR$(247)+CHR$(250)
);:PRINT@374,CHR$(194);
130 PRINT@388,CHR$(247)+CHR$(254)
)+LEFT$(DS,6)+CHR$(241)+CHR$(255)
);:PRINT@405,CHR$(193)+CHR$(203)
);
140 PRINT@419,CHR$(247)+CHR$(254)
)+LEFT$(DS,7)+CHR$(247)+CHR$(250)
);:PRINT@436,CHR$(193)+CHR$(207)
+CHR$(207)+CHR$(203);
150 PRINT@450,CHR$(247)+CHR$(254)
)+LEFT$(DS,6)+CHR$(241)+CHR$(247)
)+CHR$(254)+CHR$(248);:PRINT@466
,CHR$(87);:FORA=467TO473:PRINT@A
,CHR$(255);:NEXTA
160 PRINT@480,CHR$(241)+CHR$(247)
+CHR$(254)+LEFT$(DS,7)+CHR$(245)
)+CHR$(254);:PRINT@498,CHR$(79);
:FORA=499TO505:PRINT@A,CHR$(255)
);:NEXTA
200 FORA=1024TO1535
210 W=PEEK(A)
220 POKEA+11776,W
230 NEXTA
240 CLS:PRINT"ENTER NEXT PAGE"
```

Program Listing 10

```
5 CLS0
6 FORA=1TO10:DS=D$+CHR$(144):NEX
TA
7 PRINT@18,CHR$(79);:PRINT@50,CH
R$(68);:PRINT@82,CHR$(143);:PRIN
T@114,CHR$(84);:PRINT@146,CHR$(7
9);:PRINT@178,CHR$(87);:PRINT@21
0,CHR$(69);:PRINT@242,CHR$(82);
8 FORA=19TO467STEP32:PRINT@A,CHR
$(255);:PRINT@A+6,CHR$(255);:NEX
TA:FORA=468TO472:PRINT@A,CHR$(25
5);:NEXTA
9 FORA=20TO24:FORB=0TO13:PRINT@A
+B*32,CHR$(127+RND(8)*16);:NEXTB
,A
10 PRINT@0,CHR$(245)+CHR$(255)+C
HR$(251)+CHR$(242)+LEFT$(DS,5)+C
HR$(241)+CHR$(247)+CHR$(250);
20 PRINT@33,CHR$(244)+CHR$(252)+
CHR$(255)+LEFT$(DS,5)+CHR$(247)+
CHR$(254);
30 PRINT@67,CHR$(255)+LEFT$(DS,5)
)+CHR$(255);
40 PRINT@99,CHR$(255)+CHR$(242)+
LEFT$(DS,4)+CHR$(255);
50 PRINT@131,CHR$(245)+CHR$(251)
)+LEFT$(DS,4)+CHR$(255);
60 PRINT@164,CHR$(255)+LEFT$(DS,
4)+CHR$(253)+CHR$(250);
70 PRINT@196,CHR$(253)+CHR$(250)
)+LEFT$(DS,4)+CHR$(255);
80 PRINT@229,CHR$(255)+LEFT$(DS,
4)+CHR$(245)+CHR$(250);
90 PRINT@261,CHR$(253)+CHR$(250)
)+LEFT$(DS,3)+CHR$(244)+CHR$(255)
);
100 PRINT@293,CHR$(245)+CHR$(250)
)+LEFT$(DS,4)+CHR$(255);
110 PRINT@325,CHR$(245)+CHR$(250)
)+LEFT$(DS,4)+CHR$(255);
120 PRINT@357,CHR$(245)+CHR$(250)
)+LEFT$(DS,4)+CHR$(253)+CHR$(251)
);
130 PRINT@389,CHR$(245)+CHR$(251)
)+LEFT$(DS,5)+CHR$(253)+CHR$(251)
);
140 PRINT@422,CHR$(253)+CHR$(251)
)+LEFT$(DS,5)+CHR$(253)+CHR$(251)
);
150 PRINT@455,CHR$(255)+CHR$(242)
)+LEFT$(DS,5)+CHR$(255);
160 PRINT@487,CHR$(245)+CHR$(250)
)+LEFT$(DS,5)+CHR$(253)+CHR$(250)
);
200 FORA=1024TO1535
210 W=PEEK(A)
220 POKEA+12288,W
230 NEXTA
240 CLS:PRINT"ENTER NEXT PAGE"
```

Program Listing 11

Program Listing 12

```
5 CLS0
6 FORA=1TO10:DS=D$+CHR$(144):NEX
TA
10 PRINT@7,CHR$(245)+CHR$(251)+L
EFT$(DS,5)+CHR$(245)+CHR$(251);
20 PRINT @40,CHR$(253)+CHR$(251)
)+LEFT$(DS,5)+CHR$(253)+CHR$(251)
);
30 PRINT @72,CHR$(244)+CHR$(255)
)+LEFT$(DS,6)+CHR$(255)+CHR$(251)
);
40 PRINT@105,CHR$(253)+CHR$(250)
)+LEFT$(DS,5)+CHR$(245)+CHR$(255)
+CHR$(250);
50 PRINT@137,CHR$(245)+CHR$(251)
+CHR$(242)+LEFT$(DS,5)+CHR$(245)
+CHR$(250);
60 PRINT@170,CHR$(245)+CHR$(250)
)+LEFT$(DS,5)+CHR$(244)+CHR$(255)
);
70 PRINT@202,CHR$(244)+CHR$(255)
)+LEFT$(DS,6)+CHR$(255);
80 PRINT@235,CHR$(253)+CHR$(251)
```

Listing 12 continued


```

5 CLSØ
6 FORA=1T01Ø:D$=D$+CHR$(144):NEX
TA
1Ø PRINTØ17,CHR$(247)+CHR$(254)+
CHR$(248)+LEFT$(D$,4)+CHR$(241)+
CHR$(247)+CHR$(254);
2Ø PRINTØ34,CHR$(13Ø)+CHR$(138)+
CHR$(13Ø);:PRINTØ43,CHR$(13Ø)+CHR
R$(138);:PRINTØ49,CHR$(253)+CHR$(
251)+LEFT$(D$,5)+CHR$(245)+CHR$(
255);
3Ø PRINTØ66,CHR$(139)+CHR$(139)+
CHR$(138);:PRINTØ75,CHR$(139)+CHR
R$(138)+CHR$(138);:PRINTØ82,CHR$(
253)+CHR$(251)+LEFT$(D$,4)+CHR$(
244)+CHR$(255)+CHR$(242);
4Ø PRINTØ99,CHR$(138);:PRINTØ1Ø8
,CHR$(142)+CHR$(136);:PRINTØ115,
CHR$(253)+CHR$(25Ø)+LEFT$(D$,4)+
CHR$(245)+CHR$(25Ø);
5Ø PRINTØ131,CHR$(136);:PRINTØ14
Ø,CHR$(138);:PRINTØ147,CHR$(244)
+CHR$(253)+CHR$(242)+LEFT$(D$,3)
+CHR$(244)+CHR$(255);
6Ø PRINTØ18Ø,CHR$(244)+CHR$(255)
+CHR$(242)+LEFT$(D$,3)+CHR$(253)
+CHR$(251);
7Ø PRINTØ199,CHR$(133);:PRINTØ21
3,CHR$(245)+CHR$(25Ø)+LEFT$(D$,4)
+CHR$(253)+CHR$(251);
8Ø PRINT Ø23Ø,CHR$(138)+CHR$(133)
+CHR$(129);:PRINTØ245,CHR$(245)
+CHR$(25Ø)+LEFT$(D$,5)+CHR$(255)
;

```

```

9Ø PRINTØ262,CHR$(139)+CHR$(135)
+CHR$(135);:PRINTØ277,CHR$(244)+
CHR$(255)+CHR$(242)+LEFT$(D$,4)+
CHR$(253)+CHR$(25Ø);
1Ø PRINTØ295,CHR$(133);:PRINTØ3
Ø1,CHR$(13Ø)+CHR$(133)+CHR$(129)
;:PRINTØ31Ø,CHR$(245)+CHR$(25Ø)+
LEFT$(D$,4)+CHR$(244)+CHR$(255)+
CHR$(242);
11Ø PRINT Ø327,CHR$(133);:PRINTØ
333,CHR$(139)+CHR$(135)+CHR$(135)
);:PRINTØ342,CHR$(244)+CHR$(251)
+LEFT$(D$,5)+CHR$(245)+CHR$(255)
;
12Ø PRINTØ359,CHR$(132);:PRINTØ3
66,CHR$(133);:PRINTØ375,CHR$(253)
+CHR$(25Ø)+LEFT$(D$,4)+CHR$(247)
)+CHR$(248);
13Ø PRINTØ398,CHR$(133);:PRINTØ4
Ø6,CHR$(241)+CHR$(255)+CHR$(248)
+LEFT$(D$,3)+CHR$(247)+CHR$(248)
;
14Ø PRINTØ439,CHR$(253)+CHR$(251)
+LEFT$(D$,3)+CHR$(244)+CHR$(251)
);
15Ø PRINTØ472,CHR$(253)+CHR$(242)
+LEFT$(D$,3)+CHR$(244)+CHR$(251)
);
16Ø PRINTØ5Ø5,CHR$(255)+LEFT$(D$,
4)+CHR$(255);
2ØØ FORA=1Ø24TØ1535
21Ø W=PEEK(A)
22Ø POKEA+14336,W:NEXTA
23Ø CLS:PRINT"ENTER NEXT PAGE"

```

Program Listing 15

```

9Ø RC=RC+1:FORE=8TØØSTEP-1:CLSE:
SOUND5,1:NEXTE:IF RC=3 THEN 33Ø
ELSE FORE=ØTØ48ØSTEP32:PRINTØE,B
L$;:NEXTE:GOTO6ØØ
1ØØ CLSØ:FORA=13TØ3STEP-1:SET(3,
A,1):NEXTA:FORA=4TØ11:SET(A,A,1)
:NEXTA:FORA=13TØ3STEP-1:SET(12,A
,1):NEXTA
11Ø FORA=3TØ13:SET(2Ø,A,2):NEXTA
:FORA=18TØ22:SET(A,3,2):NEXTA:FO
RA=18TØ22:SET(A,13,2):NEXTA
12Ø SET(35,4,3):FORA=34TØ29STEP-
1:SET(A,3,3):NEXTA:FORA=4TØ12:SE
T(28,A,3):NEXTA:FORA=29TØ34:SET(
A,13,3):NEXTA:SET(35,12,3):SET(3
6,11,3):FORA=33TØ38:SET(A,1Ø,3):
NEXTA
13Ø FORA=3TØ13:SET(41,A,4):NEXTA
:FORA=42TØ47:SET(A,8,4):NEXTA:FO
RA=3TØ13:SET(48,A,4):NEXTA
14Ø FORA=52TØ6Ø:SET(A,3,5):NEXTA
:FORA=3TØ13:SET(56,A,5):NEXTA
15Ø FORA=17TØ27:SET(3,A,6):NEXTA
:FORA=4TØ9:SET(A,17,6):NEXTA:FOR
A=18TØ21:SET(1Ø,A,6):NEXTA:FORA=
9TØ4STEP-1:SET(A,22,6):NEXTA:FOR
A=6TØ1Ø:SET(A,A+17,6):NEXTA
16Ø FORA=18TØ27:SET(15,A,7):NEX
T A:FORA=16TØ22:SET(A,17,7):NEXTA:
FORA=18TØ27:SET(23,A,7):NEXTA:FO
RA=16TØ22:SET(A,22,7):NEXTA
17Ø SET(36,18,8):FORA=35TØ29STEP
-1:SET(A,17,8):NEXTA:FORA=18TØ26
:SET(28,A,8):NEXTA:FORA=29TØ35:S
ET(A,27,8):NEXTA:SET(36,26,8)
18Ø FORA=17TØ27:SET(41,A,1):NEX
T A:FORA=42TØ49:SET(A,17,1):NEXTA:
FORA=42TØ46:SET(A,22,1):NEXTA:FO
RA=42TØ49:SET(A,27,1):NEXTA
19Ø FORA=17TØ27:SET(53,A,2):NEX
T A:FORA=54TØ59:SET(A,17,2):NEXTA:
FORA=18TØ21:SET(6Ø,A,2):NEXTA:FO
RA=59TØ54STEP-1:SET(A,22,2):NEX
T A:FORA=23TØ27:SET(A+33,A,2):NEX
T A
2ØØ FORA=1TØ5ØØ:NEXTA
21Ø CLS:PRINT" NIGHTRACER":PRIN
T" ENTER DIFFICULTY LEVEL":P
RINT" 1 2 3 4 5 6 7 8 9 1Ø 11 12
":PRINT"HARD
EASY"
22Ø INPUTZ:IFZ<1 OR Z>12 THENPRI
NT"NEED A NUMBER FROM 1 TO 12.":
GOTO22Ø
23Ø C$=CHR$(175):C=495:Z=12
24Ø FORA=1TØ31:BL$=BL$+CHR$(144)
:NEXTA
25Ø CLS:PRINTØ42,"NIGHT RACER";:
PRINTØ96,"LOOKING OUT THE WINDOW
OF YOUR":PRINT"SLEEP BLUE RACE
CAR YOU CAN":PRINT"SEE THE ORANG
E BORDERS OF THE":PRINT"HIGHWAY.
AS THE NIGHT SCENES":PRINT"FLOW
BY, YOUR MAIN CONCERN IS"
26Ø PRINT"KEEPING THE nightracer
FROM":PRINT"CRASHING. THE MACHI
NE WILL":PRINT"CRASH IF IT TOUCH
ES ANY AREA":PRINT"EXCEPT THE BL
ACK BETWEEN THE":PRINT"ROAD BORD
ERS.
27Ø PRINT" USE THE WHITE ARROW K
EYS":PRINT"TO STEER LEFT AND RIG
HT."
28Ø PRINT" PRESS 'R' TO ST
ART";
29Ø IF INKEY$="R"THEN3ØØELSE29Ø
3ØØ CLS:PRINTØ256,"YOU ARE ALLOW
ED THREE CRASHES!":FORT=1TØ5ØØ:N
EXTT
31Ø CLSØ:FORA=ØTØ48ØSTEP32:PRINT
ØA,BL$;:NEXTA
32Ø GOTO3ØØ
33Ø CLS:PRINTØ256," YOU TRAVELED
";M;" MILES":PRINT" CARE TO TR
Y AGAIN? (Y/N)"
34Ø A$=INKEY$
35Ø B$=INKEY$:IFB$="Y"THEN RUN E
LSE IF B$="N" THEN END ELSE 35Ø
36Ø REM JAMES W. WOOD, 424 N. MI
SSOURI, ATWOOD, IL, 61913

```

Program Listing 16

```

5 CLSØ
6 FORA=1TØ1Ø:D$=D$+CHR$(144):NEX
TA
7 O$=CHR$(247)+CHR$(254)
8 FORA=1TØ8:B$=B$+CHR$(175):NEXT
A
1Ø PRINTØ25,CHR$(255)+LEFT$(D$,4)
+CHR$(255);
2Ø PRINTØ42,CHR$(161)+CHR$(162);
:PRINTØ56,O$+LEFT$(D$,3)+CHR$(24
1)+CHR$(255);
3Ø PRINTØ73,CHR$(161)+LEFT$(B$,2)
+CHR$(171)+CHR$(162);:PRINTØ87,
O$+LEFT$(D$,3)+CHR$(241)+CHR$(25
5)+CHR$(248);
4Ø PRINTØ1Ø4,CHR$(163)+LEFT$(B$,
5)+CHR$(174)+CHR$(168);:PRINTØ11
8,O$+LEFT$(D$,3)+CHR$(241)+CHR$(
255)+CHR$(248);
5Ø PRINTØ134,CHR$(167)+LEFT$(B$,
5)+CHR$(172)+CHR$(168);:PRINTØ14
9,O$+LEFT$(D$,4)+CHR$(255)+CHR$(
248);
6Ø PRINT Ø163,CHR$(161)+CHR$(167)
+LEFT$(B$,5)+CHR$(174)+CHR$(168)
);:PRINTØ18Ø,CHR$(247)+CHR$(254)
+LEFT$(D$,4)+CHR$(247)+CHR$(254)
;
7Ø PRINTØ195,CHR$(173)+LEFT$(B$,
4)+CHR$(172)+CHR$(168);:PRINTØ21
1,O$+LEFT$(D$,4)+O$;
8Ø PRINTØ228,CHR$(172)+CHR$(168)
+CHR$(172)+CHR$(168);:PRINTØ242,
O$+LEFT$(D$,4)+O$;
9Ø PRINTØ273,O$+LEFT$(D$,4)+O$;
1ØØ PRINT Ø3Ø4,O$+LEFT$(D$,4)+O$
;
11Ø PRINT Ø335,O$+LEFT$(D$,4)+O$
;
12Ø PRINTØ366,O$+LEFT$(D$,4)+CHR
$(241)+CHR$(255);
13Ø PRINTØ397,O$+LEFT$(D$,4)+CHR
$(241)+CHR$(255)+CHR$(248);:PRIN
TØ41Ø,CHR$(135)+CHR$(13Ø);
14Ø PRINTØ428,O$+LEFT$(D$,4)+CHR
$(241)+CHR$(255)+CHR$(248);:PRIN
TØ441,CHR$(135)+CHR$(143)+CHR$(1
43)+CHR$(13Ø);
15Ø PRINTØ459,O$+LEFT$(D$,4)+CHR

```

```

$(241)+CHR$(255)+CHR$(248);
16Ø PRINTØ491,CHR$(255)+LEFT$(D$,
5)+CHR$(245)+CHR$(25Ø);
2ØØ FORA=1Ø24TØ1535
21Ø W=PEEK(A)
22Ø POKEA+14848,W:NEXTA
23Ø CLS:PRINT"ENTER ML-ROUT"

```

```

1Ø FORA=7617TØ7679:READ D:POKEA,
D:NEXTA
2Ø DATA 189,179,237,253,1,29
3Ø DATA 142,3Ø,32,16,142,4,Ø
4Ø DATA 166,164,167,128,167,16Ø
5Ø DATA 16,14Ø,5,224,38,244,142
6Ø DATA 3Ø,Ø,16,19Ø,1,29,166
7Ø DATA 164,167,128,167,16Ø,14Ø
8Ø DATA 3Ø,32,38,245,142,3Ø,Ø
9Ø DATA 16,142,4,Ø,166,132,167
1ØØ DATA 16Ø,167,128,16,14Ø,6,Ø
11Ø DATA 38,244,57

```

Program Listing 17

```

1Ø CLEAR2ØØ,7617:DEFUSRØ=7617:CL
SØ
2Ø GOTO1ØØ
3Ø FORA=16352TØ8192STEP-32:S=USR
Ø(A):IFPEEK(343)=247THEN POKE343
,255:C=C-1
32 IF PEEK(344)=247 THEN POKE344
,255:C=C+1
4Ø FORT=1TØZ:NEXTT:IFPEEK(1Ø24+C)
<>144THEN9Ø
5Ø M=M+1
6Ø PRINTØC,C$;:NEXTA
7Ø Z=Z-2:IFZ<1THENZ=1
8Ø GOTO3ØØ

```

Program Listing 18

*** 96K-M EXPANDER ***
 * You have a 64K computer but can only use 32K. Our *
 * 96KX-M module allows full use of both 32K memory *
 * banks. Run BASIC in both, transfer data from one *
 * bank to the other, or continue a BASIC program *
 * into the other bank. Nothing to load just EXEC *
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System Requirements

16K RAM
Extended Color Basic
or with changes
4K RAM
Color or Micro Color Basic
(MC-10)



*“At one time
 or another everyone
 must convert inches,
 pounds, or what-have-you
 into centimeters, kilograms,
 or whatever.”*

Delete all REMs and lines 1-10.

Change the PRINT USING to PRINT in lines 270, 280, 310, 320, 350, 360, 390, 400, 430, 440, 470, 480, 510, 520, 530, 560, 570, 580, 610, 620, 650, 660, 690, 700.

Change line 2040 to IF K\$="Y" THEN RETURN
 Add 2050 GOTO 70.

Table 1. MC-10 and Color Basic Conversion

The whole world, with the exception of the U.S., is now converted to the Systeme International d'Unites, or more commonly known as the Metric System. At one time or another everyone must convert inches, pounds, or

what-have-you into centimeters, kilograms, or whatever.

With this Metric Converter program, you can convert from one system to the other in a single operation. The program displays both equivalents on the

Program Listing. Metric Converter

```

1 CLS:PRINT:PRINT
2 PRINT "*****"
3 PRINT "*" METRIC <-> IMPER
4 PRINT "*" IAL *
5 PRINT "*" CONVERTER
6 PRINT "*" EDGAR POULIN
7 PRINT "*" SHERBROOKE QUE.
8 PRINT "*" AUGUST 1983
9 PRINT "*****"
10 FOR X=1 TO 1100:NEXT
11 PU$="#####.## %
12 % "#####.#### %
13 % "
14 20 EQ$="":SQ$="SQ. ":SP$=" <->
15 "
16 30 CE$="CELSIUS":CM$="CENTIMETER
17 S":F$="FEET":FA$="FAHRENEIT":FO$
18 ="FL. OUNCES"
19 40 GI$="IMP. GALLONS":GR$="GRAMS
20 ":GU$="U.S. GALLONS":IN$="INCHES
21 "
22 50 KG$="KILOGRAMS":KM$="KILOMETE
23 RS":LB$="POUNDS":L$="LITERS
24 60 M$="METERS":MI$="MILES":ML$="
25 MILLILITERS":MM$="MILLIMETERS":O
26 Z$="OUNCES"
27 65 ' PRINT PROGRAM MENU.
28 70 CLS: PRINT@10, "SELECTION":PR
29 INT
30 80 PRINT" A) QUIT"
31 90 PRINT" B) INCHES<->MILLIMET
32 ERS"
33 100 PRINT" C) INCHES<->CENTIME
34 TERS"
35 110 PRINT" D) FEET<->METERS"
36 120 PRINT" E) MILES<->KILOMETE
37 RS"
38 130 PRINT" F) SQ. FEET<->SQ. M
39 ETERS"
40 140 PRINT" G) FL. OUNCES<->MIL
41 LILITERS"
42 150 PRINT" H) U.S. GALLONS<->L
43 ITERS"
44 160 PRINT" I) IMPERIAL GALLONS
45 <->LITERS"
46 170 PRINT" J) OUNCES<->GRAMS"
47 180 PRINT" K) POUNDS<->KILOGRA
48 MS"
49 190 PRINT" L) FAHRENHEIT<->CEL
50 SIUS"
51 200 PRINT:PRINTTAB(8)"WHAT OPTIO
52 N ?": SOUND240,1
53 210 K$=INKEY$: IF K$="" THEN 210
54 220 K=ASC(K$)-64:IF K$<CHR$(65)
55 OR K$>CHR$(76) THEN 210
56 230 ' SELECTIONS A B C D
57 E F G H I J K L
58 240 CLS:ON K GOTO 250,260,300,34
59 0,380,420,460,500,550,600,640,68
60 0
61 245 ' END PROGRAM.
62 250 CLS: END
63 255 ' CONVERTS INCHES AND MILLIM
64 ETERS.
65 260 CLS:PRINT@5, IN$+SP$+MM$: GO
66 SUB 1000: MM=UN*25.4: IN=UN*.039
67 47
68 270 PRINT USING PU$;UN;IN$+EQ$;M
69 M;MM$:PRINT
    
```


METRIC

*Can't seem to get the hand of converting feet to meters?
Let the computer do it for you.*

screen at one time. This is an easy way to compare the differences in size from one measurement system to the other. Because in the U.S. your gallon is not the same as ours is (was) here in Canada, I've also included the Imperial gal-

lon conversion. With this feature, you will see the three systems on your screen at one time.

Table 1 lists the changes needed to make Metric Converter run under Col-or Basic on the MC-10. One note of

caution: Make sure you enter line 10 exactly as it is written. ■

Address correspondence to Edgar Poulin, 2907 Des Ormes St., Sherbrooke, Quebec, Canada J1L 1G3.

```
280 PRINT USING PU$;UN;MM$+EQ$;I
N;IN$
290 GOSUB 2000: GOTO 250
295 ' CONVERTS INCHES AND CENTIM
ETERS.
300 CLS: PRINT@5, IN$+SP$+CM$: G
OSUB 1000: CM=UN*2.54: IN=UN*.39
47
310 PRINT USING PU$;UN;IN$+EQ$;C
M;CM$:PRINT
320 PRINT USING PU$;UN;CM$+EQ$;I
N;IN$
330 GOSUB 2000: GOTO 300
335 ' CONVERTS FEET AND METERS.
340 CLS: PRINT@7, F$+SP$+M$: GOS
UB 1000: M=UN*.3048: F=UN*3.2808
350 PRINT USING PU$;UN;F$+EQ$;M;
M$:PRINT
360 PRINT USING PU$;UN;M$+EQ$;F;
F$
370 GOSUB 2000: GOTO 340
375 ' CONVERTS MILES AND KILOMET
ERS.
380 CLS: PRINT@4, MI$+SP$+KM$: G
OSUB 1000: KM=UN*1.6093: MI=UN*.
6214
390 PRINT USING PU$;UN;MI$+EQ$;K
M;KM$:PRINT
400 PRINT USING PU$;UN;KM$+EQ$;M
I;MI$
410 GOSUB 2000: GOTO 380
415 ' CONVERTS SQ. FEET AND SQ.
METERS.
420 CLS: PRINT@4, SQ$+F$+SP$+SQ$
+M$: GOSUB 1000: M2=UN*.0929: F2
=UN*10.764
430 PRINT USING PU$;UN;SQ$+F$+EQ
$;M2;SQ$+M$:PRINT
440 PRINT USING PU$;UN;SQ$+M$+EQ
```

```
$;F2;SQ$+F$
450 GOSUB 2000: GOTO 420
455 ' CONVERTS FL. OUNCES AND MI
LLILITERS.
460 CLS: PRINT@3, FO$+SP$+ML$: G
OSUB 1000: ML=UN*28.413: FO=UN*.0
352
470 PRINT USING PU$;UN;FO$+EQ$;M
L;ML$:PRINT
480 PRINT USING PU$;UN;ML$+EQ$;F
O;FO$
490 GOSUB 2000: GOTO 460
495 ' CONVERTS U.S. GALLONS AND
LITERS.
500 CLS: PRINT@5, GU$+SP$+L$: GOS
UB 1000: L=UN*3.7854: GU=UN*.264
2:GI=UN*4/5
510 PRINT USING PU$;UN;GU$+EQ$;L
;L$:PRINT
520 PRINT USING PU$;UN;GU$+EQ$;G
I;GI$:PRINT
530 PRINT USING PU$;UN;L$+EQ$;GU
;GU$
540 GOSUB 2000: GOTO 500
545 ' CONVERTS IMP. GALLONS AND
LITERS.
550 CLS: PRINT@5, GI$+SP$+L$: GO
SUB 1000: L=UN*4.546: GI=UN*.219
9:GU=UN*5/4
560 PRINT USING PU$;UN;GI$+EQ$;L
;L$:PRINT
570 PRINT USING PU$;UN;GI$+EQ$;G
U;GU$:PRINT
580 PRINT USING PU$;UN;L$+EQ$;GI
;GI$
590 GOSUB 2000: GOTO 550
595 ' CONVERTS OUNCES AND GRAMS.
600 CLS: PRINT@5, OZ$+SP$+GR$: G
OSUB 1000: GR=UN*28.35: OZ=UN*.0
```

```
353
610 PRINT USING PU$;UN;OZ$+EQ$;G
R;GR$:PRINT
620 PRINT USING PU$;UN;GR$+EQ$;O
Z;OZ$
630 GOSUB 2000: GOTO 600
635 ' CONVERTS POUNDS AND KILOGR
AMS.
640 CLS: PRINT@5, LB$+SP$+KG$: G
OSUB 1000: KG=UN*.4536: LB=UN*2.
2046
650 PRINT USING PU$;UN;LB$+EQ$;K
G;KG$:PRINT
660 PRINT USING PU$;UN;KG$+EQ$;L
B;LB$
670 GOSUB 2000: GOTO 640
675 ' CONVERTS FAHRENHEIT AND CEL
SIUS.
680 CLS: PRINT@5, FA$+SP$+CE$: G
OSUB 1000: CE=(UN-32)*5/9: FA=(U
N*9/5)+32
690 PRINT USING PU$;UN;FA$+EQ$;C
E;CE$:PRINT
700 PRINT USING PU$;UN;CE$+EQ$;F
A;FA$
710 GOSUB 2000: GOTO 680
995 ' SUBROUTINES.
1000 SOUND240,1: PRINT@69,"HOW M
ANY UNITS ";: INPUT UN: PRINT: R
ETURN
2000 SOUND240,1: PRINT@424, "??
ANOTHER "?":PRINT@488,"YES, N
O, QUIT";
2010 K$=INKEY$: IF K$="" THEN 20
10
2020 IF K$<CHR$(65) THEN 2010
2030 IF K$="Q" THEN 250
2040 IF K$="Y" THEN RETURN ELSE
70
```

TIMER TIPS

In a quiet, seldom-visited chapter near the back of the Extended Color Basic manual there dwells a function called **TIMER**. Used as a programming aid, **TIMER** can help a software designer gain feeling for the way routines unfold in time for the user. A feeling or intuition of this sort is essential for making the most subtle adjustments, subordinating the responses of a machine to those of a human.

Similar functions in other versions of Basic display hours, minutes, and seconds. This timer does not. Instead, it just gives a number from 0 to 65,535, cycling in about 18 minutes.

The Shape of Time

A program has an existence in time just as real as in any other dimension. It is written and stored in a type of space where the unit of measure is positioned in the listing or sequence of line numbers, but it functions in a totally different realm. The end user sees a time structure or temporal sequence, not the listing sequence. A single line can take more execution time, assuming more importance than a whole page in the listing. A program of correct sequential

structure can be a frustrating, useless turkey if it has a poorly designed structure in time.

Fast execution is a major benefit of well-designed time structure, but you want this structure to be correct, too. For example, if a routine that accepts key input runs too fast, keybounce problems occur. If it runs with inconsistent intervals between input checks, the keyboard sometimes skips keystrokes and at other times enters multiples.

This is also true of joystick input. Here the success of the routine depends upon quick, regular polling of the stick position and prompt, consistent feedback of this information to the user. Feedback might be in the form of a movable blip on the screen or some other device.

In those programs where the joysticks seem imprecise or clumsy to manipulate, as is the case with most Color Computer software currently on the market, the cause is often nonlinearity. That is, the program is not checking the joystick position at evenly spaced time intervals, thus the hapless user sometimes overshoots or undershoots the desired position. Of course it is important that the program execute quickly so it can determine the stick position as rapidly as possible, but the user can accommodate a slow, evenly spaced sequence of input windows better than a fast, erratic one.

A program with a time structure that causes input errors contains a bug just as surely as if it had contained a flaw in listed structure causing output errors.

Most debugging aids and utilities concentrate exclusively on the listed sequence. But to properly design a program, the writer must have a solid sense of its timing.

To develop this intuition you must learn the execution times of lines in the listing. A good tool is a debugging aid like the trace function **TRON**. Only instead of tracing positions in the sequential flow by line numbers, it should give positions in elapsed time.

Because **TIMER** is relatively fast, with about 60 counts per second, it can approximate such a function. There are two ways to do this: the static and the dynamic.

Static Test Timer

Many Basic manuals say operations on variables run faster than operations on constants. But how much difference can this make? Is it worthwhile to convert a routine such as:

```
10 FOR X=1 TO 100
100 Y=X*3.14159:NEXT
```

to

```
5 PI=3.14159
10 FOR X=1 TO 100
100 Y=X*PI:NEXT
```

It's easy to find out by adding a timer to both routines:

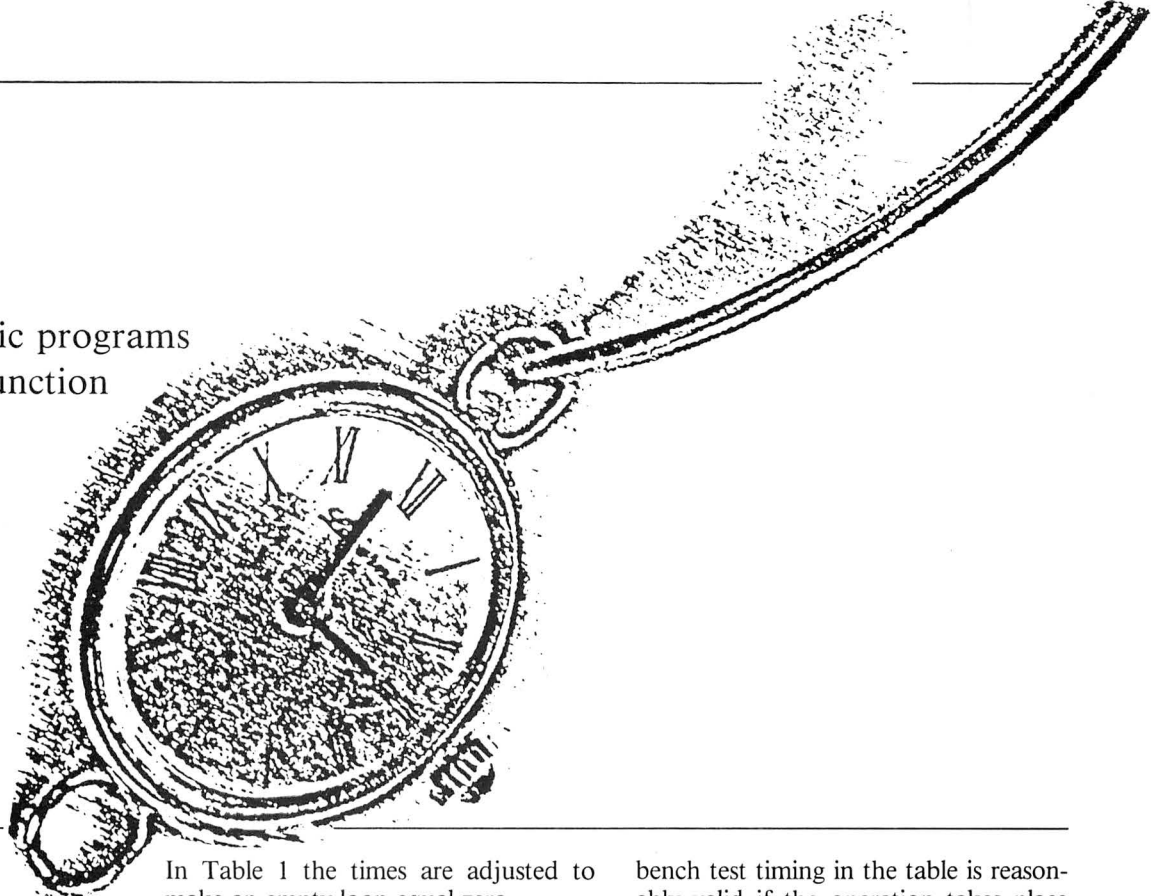
```
10 TIMER=0: FOR X=1 TO 100
100 Y=X*3.14159:NEXT
: PRINT TIMER
```

and

System Requirements

Color Computer
Extended Color Basic

Fine tune your Basic programs with the TIMER function to make them run better and faster.



```
10 TIMER=0: PI=3.14159
:FOR X=1 TO 100
100 Y=X*PI: NEXT
: PRINT TIMER
```

When I run these routines on clean memory I get timings of 197 for the loop containing the constant operation and 49 for its variable counterpart, which is quite a saving—about four times faster.

Since there are 100 loops in the routine and approximately 60 timer increments every second, you can estimate the real time per loop by dividing the raw timing by 6,000.

$197/6,000 = .0328$ seconds

and

$49/6,000 = .008$ seconds

Further armed with knowledge that the processor normally runs at 0.894 million cycles per second, you can get a rough idea of how many machine cycles the Basic routines use. This information is valuable when trying to determine what, if any, portion of a Basic program ought to be converted to machine language. In these examples 0.033 seconds multiplied by 894,000 equals 29,502 cycles, and 0.008 seconds equals 7,152 cycles. The values are approximate. A large source of error is the fact that the timer is not exactly 1/60 of a second and varies with different computers.

By substituting various operations or subroutines into the loop in place of $Y=X*PI$, it is easy to see how long it takes to do things by different methods.

In Table 1 the times are adjusted to make an empty loop equal zero.

There is a longer table, but the point is that the reader can easily make the timings for any operations or routines he might contemplate. It is interesting to note that PEEKs or POKEs specified in hexadecimal format are quite a bit faster than those evoked in decimal. And multiplication can be nearly 15 times faster than an equivalent exponentiation.

Pitfalls

The Heisenberg Uncertainty Principle applies to the timing of programs. That is, to make a measurement it is necessary to change the thing being measured. To time a program by this method it is necessary to change the program by adding the timing routine, so you can never know exactly how fast it would have run without the timer. But common sense and some knowledge of the pitfalls make it possible to get a timing to just about any desired accuracy.

Deceptive Loops

TIMER's 60 counts per second is not so fast compared to the 894,000 counts per second of the microprocessor clock. Since most operations are faster than 1/60 of a second, it is often necessary to repeat code segments in loops to get sufficiently accurate timings. This practice can be deceptive to the unwary. The comparison between the speed of multiplication by the number constant 3.14159 versus multiplication by the variable PI is an example. The static

bench test timing in the table is reasonably valid if the operation takes place numerous times in the program. But what if it only takes place once during execution? That situation can be better approximated by moving the definition of the variable inside the loop, as in:

```
10 FOR X=1 TO 100:
PI = 3.14159
```

Now the routine gives a timer value of 212, which makes it even slower than multiplication by the numerical constant. The moral? The time-use efficiency of a routine can vary with repetition, particularly one which has an initialization or definition portion such as the $PI=3.14159$ statement in this one.

Searching for Variables

Note that the static bench test routines that created Table 1 were run on clean memory; there were no other routines or variables coresident in memory when the tests were run.

When a variable is defined (such as $PI=3.14159$), its value is placed in memory in a variable table. If a later part of the program needs to know the value, it searches the table from the earliest to the last defined position. The more variables in a program, the longer it takes to find the later ones. This suggests one more strategy for speeding up programs: Identify the most frequently used variables in time-critical routines and define them near the beginning of the program sequence so they will be among the first found in the variable table.

Operation	Timer	Seconds	Cycles	Improvement
Empty Loop	11			
X*3.14159	197	.031	27714	
X*PI	49	.006	5662	389%
X EXP(2)	363	.058	52448	
X*X	36	.004	3725	1308%
X EXP(5)	363	.058	52448	
X*X*X*X*X	76	.011	9685	441%
POKE 16000,0	59	.008	7152	
POKE &H3E80,0	38	.0045	4023	77%
POKE X,O	32	.0035	3129	128%

Table 1. Run Times for Various Functions

GOTOs and GOSUBs

When searching for a line number, Basic starts at the first line in the listing, creating much the same situation as with the variable searches. Frequently called subroutines should be located near the beginning. This effect is dependent on the number of lines in the program. There are some utility packages available for the Color Computer that include MOVE commands for moving subroutines or blocks of code while automatically renumbering references to the lines being moved. Used with the dynamic timer described below, these utilities let the program designer conveniently restructure the listing while observing effects upon the execution speed.

Garbage Collection

Sometimes a program seems to slow down as it runs, or it pauses for no apparent reason. If this happens during key input, it will probably miss some characters. What has probably happened is that instead of paying attention like it should, the computer has gone off to keep house and collect garbage.

When string variables are manipulated and redefined during the course of a program, the space reserved in memory for string storage is gradually filled up. When it is full, the computer goes through and eliminates any outdated information to free more string space (garbage collection). The housekeeping operation can occur in the blink of an eye, or it might take many seconds in programs doing extensive string manipulation.

To a person attempting to build a well-controlled time structure, garbage collection is annoying because it is so difficult to predict when it will happen or how long it will take.

A simple rule of thumb is to eliminate unnecessary string manipulations, particularly those that redefine the vari-

ables. The program should be designed so that necessary manipulations are at a minimum and any unavoidable house cleaning doesn't occur right in the middle of sensitive input routines. A line like

```
10 A$=INKEY$:IF A$="K" THEN 99
```

is a big trouble maker.

```
10 IF INKEY$="K" THEN 99
```

is better.

Housekeeping is detected during program timing by inconsistent or unrepeatable results such as long routines taking longer than the sum of their parts. One way to deal with housekeeping is to track it down with the dynamic timer described below. Then the routines and the amount of cleared string space can be changed around while monitoring the timing until an optimum mix is found.

Dynamic Timers

Bearing in mind the pitfalls and limitations, you are now ready to use timing routines to probe the operation of a program while it runs. (See Program Listing.)

The Listing has three dynamic timers (lines 1000, 2000, and 3000) inserted into the body of the program, but more could be used. Variables used in the dynamic timers are defined on line 0. Line 60000 is an optional display or printout.

The timing routines and their variables take up memory and increase the length of the variable tables, causing some lengthening of line searches in the rest of the program. And naturally the timing routines themselves eat up time, but this effect is minimized by reading the clock as the very first step in the routine and setting it back to zero at the very last.

When a series of these routines are inserted in a program, each one gives the

```

0 T1=C1=T2=C2=T3=C3
-
-
-----
633 TIMER=0
-
-
(program segment 1)
-
-
1000 T1=T1+TIMER:
C1=C1+1:TIMER=0
-
-----
-
-
(program segment 2)
-
-
2000 T2=T2+TIMER:
C2=C2+1:TIMER=0
-
-
-
-
(program segment 3)
-
-
3000 T3=T3+TIMER:
C3=C3+1:TIMER=0
-
-
-----
60000 ?#PR,"segment 1"
T1/C1"segment 2" T2/C2
"segment 3" T3/C3
-----

```

Program Listing. Use of Dynamic Timers

average time used by the section of program between itself and the next higher up. The flexibility of this scheme is increased by the ease with which resets (such as line 633) can be moved around.

If you want to know the average timing of, say, the second program segment, you could interrupt execution with the break key and then type ?T1/C1. This prints total time divided by the number of instances. Resume execution with CONT. Notice that the variable C2 tells how many times that particular timer has been run. This information is handy because the parts of the program executed the most are the most critical to the time structure.

Display Window

A neater and more formal way of getting information from the dynamic timers is to put a display routine as the last line in the program. For example:

```
60000 ?#PR,"average
time #1" T1/C1 "#2" T2/C2
"#3" T3/C3:RETURN
```

When the variable PR is equal to -2, the timings are printed out. If it is zero they appear on the screen. For some applications it might be desirable to also display the instance counters (the C variables).

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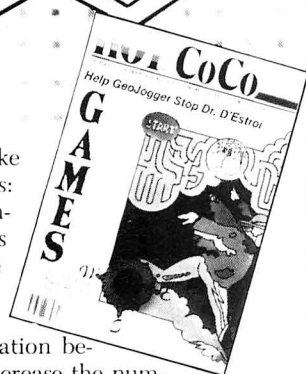
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SYNERGETIC SOLUTIONS



When starting a new program, a display routine ought to be the first thing put into memory. This way the programmer has easy access to timing information from the very start and can guide the temporal structure of the program as it develops. It is useful to have three to five dynamic timers available, which you can move around to areas being worked on.

One technique useful when memory size permits is to build alternative versions of sections of the program side by side. Then the timers can help determine survival of the fittest.

With these methods you can accomplish speedups otherwise impossible without using machine language. In fact, it is possible to fine tune some types of Basic routines so well that they can't be improved at all by conversion to machine language.

Human Engineering

If those joystick and keyboard routines that demand highly regular pacing represent one extreme, there is an opposite pole where extreme nonlinearity amounting to complete unpredictability is called for. A large category of interactive programs is designed to produce an

illusion of change, intelligence, or even personality.

Almost all games played against the computer come under this heading. A good chess game should not always respond the same way to the same situation. Objects in adventure games might need to be hidden in new places with the start of each game. Cards should be dealt in unpredictable sequence in poker or blackjack. Arcade-game aliens ought to pop out of hyperspace at unexpected times in unexpected places.

The problem common to all these cases is the need to come up with an unpredictable or random value for a variable. The difficulty is that no closed routine or algorithm can actually produce a number at random. The Basic RND function and other routines of the sort are pseudo-random-number generators. They give perfectly predictable sequences of numbers which only seem random because you don't know how the sequence is generated. When these functions are used in games to provide an element of chance, their hidden predictability emerges. After a while, the user recognizes the pattern. The game is a dud.

A program cannot generate chance

internally. What it can do, however, is steal some randomness from outside the universe. For instance, it might ask somebody to flip a coin.

Better, it could surreptitiously measure the time span of some apparently unpredictable external event. Then it could use the value recorded on its timer to reseed the pseudo-random-number generator.

```
10 TIMER=0
12 IF INKEY$="" THEN 12
14 X=RND(-TIMER):RETURN
```

This is actually a hidden input. Unbeknownst to the player the computer is timing his responses and using this information to make the next number generated less predictable.

So the window to the fourth dimension provided by TIMER is a two-way conduit. It can measure events internal to the program or events in the outside world. Since it is an input/output function, it can pass information both ways. ■

Address correspondence to Philip McLaughlin, 510 Fort Worth Drive, Denton, TX 76201.

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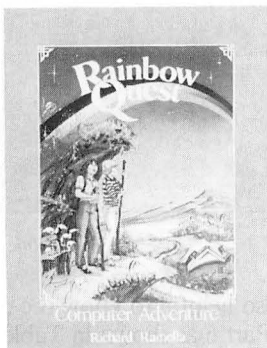
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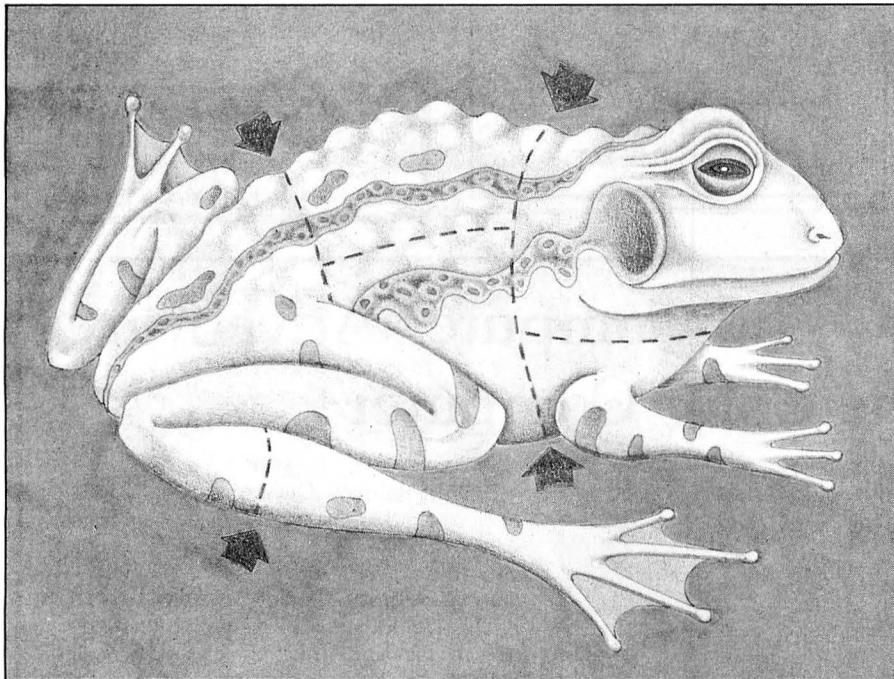
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ANATOMY OF AN ASSEMBLY-LANGUAGE GAME



Annie Gusman

In this final installment of the series you'll enter the final part of Croaker and patch everything together for the complete game. Part 6 ties the rest of the parts together and includes the checking of the frog to determine if it has hit an obstacle.

First, Part 6 (Program Listing 1) shows the title screen and plays the title music. It switches to the score screen and asks for the number of players and whether they are using the keyboard or the joystick, then begins the game.

You need to know the addresses contained in Table 1 in order to follow the listing.

It is also helpful to know the routines used in Part 6 as shown in Table 2.

After typing in Part 6 and assembling it on cassette, you should have the object (machine-language) codes for Parts 1-6. You are now ready to patch them together. In case you need them, here are the start, end, and execute addresses for Parts 1-6:

Part 1: \$600, \$1DFF, \$600
 Part 2: \$1E00, \$256E, \$1E00
 Part 3: \$256F, \$2B7A, \$256F
 Part 4: \$2B7B, \$2E70, \$2B7B
 Part 5: \$2E71, \$3579, \$2E71
 Part 6: \$357A, \$3C9C, \$357A

If you're using a cassette system, follow these steps to patch the program together:

- Turn the computer off and back on again.
- CLOADM the object (machine) codes for Parts 1-6 consecutively.
- Save the whole program on cassette by typing CSAVEM "CROAKER", &H600,&H3C9C,&H357A.

If you're going to save the program on disk, type in Disk Append and it will load in the different parts and automatically save the program on disk. (Note: The DATA statements in lines 240-270 are crucial. Check them carefully.)

Croaker is now ready to load and play. The rules are simple: Move the frog around the screen using the arrow keys or the joystick, avoid the cars and jump on the logs, and place five frogs in the ports at the top of the screen to advance to the next skill level. When using the joystick, position it to where you

System Requirements

32K RAM
Disk or Extended Color Basic
Editor/Assembler
Joysticks optional

PART VI

*This is your last chance to dissect
the inner workings of Croaker—and to assemble the game.*

want to jump and press the button to move.

If the game does not work correctly, review your source codes to see if you made any typing mistakes. Also make sure you appended the parts together correctly.

If you want to see some interesting colors, load the program and type POKE &H2634,248 for cassette or POKE &H5034,248 for disk. Then execute the program.

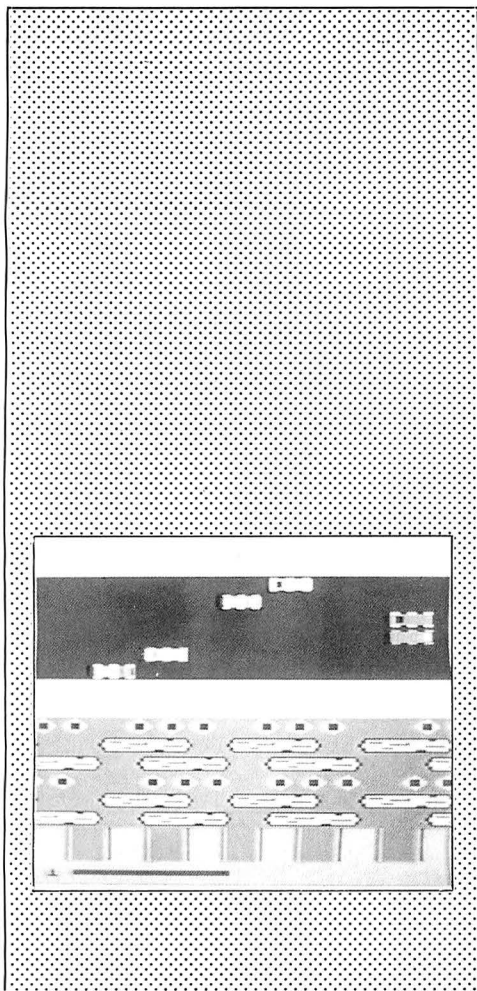
Also, if you're using the CoCo 2, you will find that the keyboard control doesn't function correctly. To remedy this, load the program and type POKE &H2A63,&HCB for cassette or POKE &H5463,&HCB for disk. Then execute the program.

That finishes the series. Those of you who haven't typed in the program, but wish to have it, may buy the fully assembled, ready to run version of Croaker, along with another Croaker-type game entitled Voyagers from me for \$9.95. Please make checks payable to Michael Meehan. Questions and comments are, as always, welcome. Please include a SASE for responses. ■

Address correspondence to Mike Meehan, 1300 Fairfield Drive, Clearwater, FL 33546.

\$88: A 16-bit value such that when the ROM routine \$A1B1 is called, the cursor is placed at that position
16227: A zero under normal circumstances; if the timer runs out in Move routine, it will change to a one and the frog will die
16230: Number of frogs player 1 has left
16231: Number of frogs player 2 has left
16232: Number of frogs player 3 has left
16233: Number of frogs player 4 has left
16237: Number of frogs player 1 has in score ports
16238: Number of frogs player 2 has in score ports
16239: Number of frogs player 3 has in score ports
16240: Number of frogs player 4 has in score ports
16241: Scratch for CHECK3
16243-16247: Ports player 4 has frogs in
16248-16252: Ports player 3 has frogs in
16253-16257: Ports player 2 has frogs in
16258-16262: Ports player 1 has frogs in
16263: Test to see if car is approaching the frog; equal to one if the car is next to the frog; equal to two if the car is on the frog (frog dies); else equal to 0
16264: Scratch for the frog that's jumping to bad area
16287: Up/down position of the frog
16288: Current type of frog (16 bit)
16290: Left/right position of the frog
16291: Current location of the frog (in memory)
16293: Test for second set of turtles (see Part 5)
16294: Test for first set of turtles (see Part 5)
16295: Current location of second set of turtles (16 bit)
16297: Current location of first set of turtles (16 bit)
16301: Contains one for keyboard play; else two for joystick play
16325: Skill level of the current player
16326: Skill level of player 1
16327: Skill level of player 2
16328: Skill level of player 3
16329: Skill level of player 4
16330: Contains a 1-4 indicating the current player
16331: Contains a 1-4 indicating the number of players
16332-16337: Score of player 4
16338-16343: Score of player 3
16344-16352: Score of player 2
16353-16358: Score of player 1
16359: A 16-bit value indicating the beginning of a song for the music routine
\$A1B1: A ROM routine where the computer waits for keyboard input with cursor then returns; cursor position is stored at \$88

Table 1. Addresses Used in Part 6



WFROG: The data for all the frogs on white backgrounds (Part 2)
 BFROG: The data for all the frogs on blue backgrounds (Part 2)
 RFROG: The data for all the frogs on red backgrounds (Part 2)
 NPLAY: The codes for "Number of Players?" (Part 2)
 KEY: The codes for "Keyboard or Joystick (K or J)?" (Part 2)
 MUSIC: Music routine (Part 3)
 SONG1: Title music (Part 2)
 SONG3: Sound effect (Part 2)
 SONG4: Sound effect (Part 2)
 SONG5: Blank area for sound effects (Part 2)
 SWICH1: Switch to graphics screen (Part 3)
 SWICH2: Switch to score screen (Part 3)
 MOVER: Move the frog one place to the right (Part 3)
 MOVEL: Move the frog one place to the left (Part 3)
 MOVEU: Move the frog one place up (Part 3)
 MOVED: Move the frog one place down (Part 3)
 DMOVEU: Move the frog one and a half places up (Part 3)
 DMOVED: Move the frog one and a half places down (Part 3)
 GETK: Get keyboard for up/down/left/right movement (Part 3)
 GETJ: Get joystick for up/down/left/right movement (Part 3)
 MOVE: Move obstacles on the screen and update timer (Part 5)
 SETUP1: Set up score screen (Part 4)
 SETUP2: Set up graphics screen (Part 4)
 GOON: Ask player to press button or space-bar to continue (Part 3)
 PUT: Put background area on screen (Part 3)
 SCORE: Add to score (Part 3)
 BFROGF: The codes for a frog in a port (Part 2)
 PFROG: Put a frog on the screen (Part 3)
 GET: Get background area from screen (Part 3)
 BSKULL: The codes for a skull on a blue background (Part 2)
 WSKULL: The codes for a skull on a white background (Part 2)
 PSKULL: Puts a skull on the screen (Part 3)

Table 2. Routines Used in Part 6

Program Listing 1. Croaker

357A	2224	00190	ORG	\$357A		3599	7F	3F67	00630	CLR	16231			
	22C4	00200	WFROG	EQU	\$2224	359C	7F	3F66	00640	CLR	16230			
	2184	00210	BFROG	EQU	\$22C4	359F	17	F5D9	00650	ENDD	LBSR	SETUP1		
	1F32	00220	RFROG	EQU	\$2184	35A2	17	F094	00660	LBSR	SWICH2	GET NUMBER		
	1F5A	00230	NPLAY	EQU	\$1F32	35A5	108E	1F32	00670	LDY	#NPLAY	OF PLAYERS		
	256F	00240	KEY	EQU	\$1F5A	35A9	8E	05A6	00680	LDX	#1446			
	1E00	00250	MUSIC	EQU	\$256F	35AC	A6	A0	00690	LOOP4	LDA	,Y+		
	1F10	00260	SONG1	EQU	\$1E00	35AE	A7	80	00700	STA	,X+			
	1F1B	00270	SONG3	EQU	\$1F10	35B0	81	3F	00710	CMPA	#\$3F			
	1F26	00280	SONG4	EQU	\$1F1B	35B2	26	F8	00720	BNE	LOOP4			
	2614	00290	SONG5	EQU	\$1F26	35B4	108E	05B8	00730	LDY	#1464			
	2639	00300	SWICH1	EQU	\$2614	35B8	109F	88	00740	STY	\$88			
	2825	00310	SWICH2	EQU	\$2639	35BB	BD	A1B1	00750	LOOP5	JSR	\$A1B1		
	2887	00320	MOVER	EQU	\$2825	35BE	80	30	00760	SUBA	#48			
	28E9	00330	MOVEL	EQU	\$2887	35C0	81	00	00770	CMPA	#0			
	2947	00340	MOVEU	EQU	\$28E9	35C2	27	F7	00780	BEQ	LOOP5			
	29A5	00350	MOVED	EQU	\$2947	35C4	81	04	00790	CMPA	#4			
	2A03	00360	DMOVEU	EQU	\$29A5	35C6	22	F3	00800	BHI	LOOP5			
	2A61	00370	DMOVED	EQU	\$2A03	35C8	B7	3FCB	00810	STA	16331			
	2A8F	00380	GETK	EQU	\$2A61	35CB	86	01	00820	LDA	#1			
	2E71	00390	GETJ	EQU	\$2A8F	35CD	B7	3FCA	00830	STA	16330			
	2B7B	00400	MOVE	EQU	\$2E71	35D0	8E	3F66	00840	LDX	#16230	RESET NUMBER		
	2C29	00410	SETUP1	EQU	\$2B7B	35D3	C6	03	00850	LDB	#3	OF FROGS		
	2788	00420	SETUP2	EQU	\$2C29	35D5	4F		00860	CLRA				
	27AE	00430	GOON	EQU	\$2788	35D6	E7	80	00870	LOOP6	STB	,X+		
	2390	00440	PUT	EQU	\$27AE	35D8	4C		00880	INCA				
	2738	00450	SCORE	EQU	\$2390	35D9	B1	3FCB	00890	CMPA	16331			
	2762	00460	BFROGF	EQU	\$2738	35DC	26	F8	00900	BNE	LOOP6			
	237A	00470	PPROG	EQU	\$2762	35DE	8E	3FCC	00910	LDX	#16332	RESET SCORE		
	2364	00480	GET	EQU	\$237A	35E1	6F	80	00920	LOOP7	CLR	,X+		
	2804	00490	BSKULL	EQU	\$2364	35E3	8C	3FE7	00930	CMPX	#16359			
	357A	00500	WSKULL	EQU	\$2804	35E6	26	F9	00940	BNE	LOOP7			
	357D	00510	PSKULL	EQU	\$2804	35E8	BD	2B7B	00950	JSR	SETUP1	RESET SCREEN		
357A	17	F097	00520	BGIN	LBSR	SWICH1	SHOW SCREEN AND	35EB	108E	1F5A	00960	LDY	#KEY	GET KEYBOARD
357D	CC	1E00	00530		LDD	#SONG1	PLAY TITLE SONG	35EF	8E	05A0	00970	LDX	#1440	OR JOYSTICK
3580	FD	3FE7	00540		STD	16359		35F2	A6	A0	00980	LOOP50	LDA	,X+
3583	17	EFE9	00550		LBSR	MUSIC		35F4	A7	80	00990	STA	,X+	
3586	8E	3FCC	00560		LDX	#16332	CLEAR SCORES	35F6	81	3F	01000	CMPA	#\$3F	
3589	6F	80	00570	LOOP3	CLR	,X+		35F8	26	F8	01010	BNE	LOOP50	
358B	8C	3FE7	00580		CMPX	#16359		35FA	8E	05BE	01020	LDX	#1470	
358E	26	F9	00590		BNE	LOOP3		35FD	9F	88	01030	STX	\$88	
3590	7F	3F6A	00600		CLR	16234		35FF	BD	A1B1	01040	LOOP51	JSR	\$A1B1
3593	7F	3F69	00610		CLR	16233	CLEAR NUMBER	3602	81	4A	01050	CMPA	#74	CODE FOR 'J'
3596	7F	3F68	00620		CLR	16232	OF FROGS							

Listing 1 continued

Listing 1 continued

```

3BFF 26 04 06810 BNE NQU10
3C01 86 05 06820 LDA #5
3C03 20 12 06830 BRA EEQU
3C05 81 02 06840 NQU10 CMPA #2
3C07 26 04 06850 BNE NQU11
3C09 86 04 06860 LDA #4
3C0B 20 0A 06870 BRA EEQU
3C0D 81 03 06880 NQU11 CMPA #3
3C0F 26 04 06890 BNE NQU12
3C11 86 02 06900 LDA #2
3C13 20 02 06910 BRA EEQU
3C15 86 01 06920 NQU12 LDA #1
3C17 B7 3F71 06930 EEQU STA 16241
3C1A C6 00 06940 LDB #0
3C1C 8E 0000 06950 LOOP11 LDX #0
3C1F 30 01 06960 LOOP10 LEAX 1,X
3C21 8C 0800 06970 CMPX #800
3C24 26 F9 06980 BNE LOOP10
3C26 5C 06990 INCB
3C27 F1 3F71 07000 CMPB 16241
3C2A 26 F0 07010 BNE LOOP11
3C2C 39 07020 RET RTS
3C2D FC 3FA9 07030 CHECK4 LDD 16297 CHECK IF FROG
3C30 83 0140 07040 SUBD #320 IS JUMPING ONTO
3C33 8E 3FA3 07050 LDX #16291 SET OF TURTLES
3C36 10A3 84 07060 CMPD ,X UNDERWATER AND
3C39 22 1F 07070 BHI CHECK5 ACT ACCORDINGLY
3C3B C3 0007 07080 ADDD #7
3C3E 10A3 84 07090 CMPD ,X
3C41 25 17 07100 BLO CHECK5
3C43 B6 3FA6 07110 LDA 16294
3C46 81 08 07120 CMPA #8
3C48 22 0A 07130 BHI SAFE4
3C4A 81 04 07140 CMPA #4
3C4C 25 06 07150 BLO SAFE4
3C4E BD 2947 07160 JSR MOVED
3C51 7E 3AA1 07170 JMP LOSE
3C54 BD 2947 07180 SAFE4 JSR MOVED
3C57 7E 3645 07190 JMP MLOOP
3C5A FC 3FA7 07200 CHECK5 LDD 16295
3C5D 83 0140 07210 SUBD #320
3C60 10A3 84 07220 CMPD ,X
3C63 1022 FB46 07230 LBHI ECHCK4
3C67 C3 0007 07240 ADDD #7
3C6A 10A3 84 07250 CMPD ,X
3C6D 1025 FB3C 07260 LBLO ECHCK4
3C71 B6 3F87 07270 LDA 16263
3C74 81 08 07280 CMPA #8
3C76 22 0A 07290 BHI SAFE5
3C78 81 04 07300 CMPA #4
3C7A 25 06 07310 BLO SAFE5
3C7C BD 2947 07320 JSR MOVED
3C7F 7E 3AA1 07330 JMP LOSE
3C82 BD 2947 07340 SAFE5 JSR MOVED
3C85 7E 3645 07350 JMP MLOOP
3C88 A6 89 0082 07360 CHECK8 LDA 130,X CHECK TO SEE
3C8C 81 00 07370 CMPA #0 IF AREA NEXT TO
3C8E 26 09 07380 BNE NSAFE WHERE THE FROG
3C90 A6 88 7F 07390 LDA 127,X IS CONTAINS
3C93 81 00 07400 CMPA #0 A CAR
3C95 26 02 07410 BNE NSAFE
3C97 20 03 07420 BRA SAFE6
3C99 7C 3F87 07430 NSAFE INC 16263
3C9C 39 07440 SAFE6 RTS
357A 07450 END BGIN
00000 TOTAL ERRORS

```

```

NEQU76 37E9
NEQU77 37E6
NEQU78 3839
NEQU80 388A
NEQU82 38DA
NEQU83 38D7
NEQU84 390B
NEQU85 3908
NEQU86 3836
NEQU87 3887
NEQU88 375F
NEQU89 375C
NEQU90 37CA
NEQU91 37C7
NEQU92 3822
NEQU93 3874
NEQU94 38BB
NEQU95 392C
NEQU96 3935
NEQU97 393E
NEQU98 3959
NEQU99 396B
NPLAY 1F32
NQU10 3C05
NQU100 397D
NQU101 3BD0
NQU105 3A84
NQU106 3A59
NQU107 3A62
NQU108 3A6B
NQU11 3C0D
NQU116 3AB2
NQU117 3B00
NQU118 3B13
NQU119 3B22
NQU12 3C15
NQU201 398F
NSAFE 3C99
PFROG 2738
PSKULL 2804
PUT 2788
RET 3C2C
RFROG 2184
SAFE1 3B75
SAFE2 3BA6
SAFE4 3C54
SAFE5 3C82
SAFE6 3C9C
SCORE 27AE
SETUP1 2B7B
SETUP2 2C29
SONG1 1E00
SONG3 1F10
SONG4 1F1B
SONG5 1F26
START 3638
SWICH1 2614
SWICH2 2639
WAIT 3BF6
WFROG 2224
WSKULL 2364

```

END

```

BFROG 22C4
BPROGF 2390
BGIN 357A
BSKULL 237A
CHECK1 3B4A
CHECK2 3B7B
CHECK3 3BAC
CHECK4 3C2D
CHECK5 3C5A
CHECK8 3C88
DMOVED 2A03
DMOVEU 29A5
ECHCK1 3742
ECHCK2 38A3
ECHCK3 3716
ECHCK4 37AD
EEQU 3C17
ELP123 3AE0
ELP321 3A39
EMLOOP 391A
END 3B3D
ENDD 359F
EQU13 3613
EQU29 3899
EQU30 38E9
EQU31 3713
EQU33 366F
EQU34 381F
EQU35 3871
EQU36 38B8
EQU37 39A1
EQU38 3941
EQU40 3A6E
EQU44 3AB9
FFROG 3920
GET 2762
GETJ 2A8F
GETK 2A61
GOON 2AE4
KEY 1F5A
LOOP1 363B
LOOP10 3C1F
LOOP11 3C1C
LOOP3 3589
LOOP4 35AC
LOOP5 35BB
LOOP50 35F2
LOOP51 35FF
LOP123 3AC4
LOP213 3A1D
LOP321 3A0E
LOP6 35D6
LOP7 35E1
LOP8 3B40
LOSE 3AA1
LOSED 3B37
MLOOP 3645
MOVE 2E71
MOVED 2947
MOVEL 2887
MOVER 2825
MOVEU 28E9
MUSIC 256F
NEQU1 3618
NEQU52 36A5
NEQU53 36A8
NEQU54 3788
NEQU55 37F8
NEQU56 3848
NEQU61 36B5
NEQU62 36BF
NEQU63 36C9
NEQU64 36D3
NEQU65 36DD
NEQU66 36E7
NEQU67 36F1
NEQU68 36FB
NEQU69 3705
NEQU70 370F
NEQU71 3699
NEQU72 3682
NEQU73 367D
NEQU74 3779
NEQU75 3776

```

```

10 *****
20 *****CROAKER*****
30 *****BY: MIKE MEEHAN*****
40 *****COPYRIGHT 1983*****
50 ***COLOR HORIZONS SOFTWARE**
60 *****
70 *****DISK APPEND*****
80 *****
90 CLS:PRINT " CROAKER
"
100 PRINT " DISK APPEND
"
110 PCLEAR 1: CLEAR200, &H2000
120 FOR X=1 TO 6
130 PRINT:PRINT
140 PRINT"FILENAME OF PART";X;
150 INPUT A$
160 CLOADM A$, &H2A00
170 PRINT:PRINT"PART"X"LOADED"
180 NEXT X
190 CLS: FOR X=&H669D TO &H66B7
200 READ A$:A=VAL("&H"+A$)
210 POKE X,A:NEXT X
220 PRINT"PRESS <ENTER> WHEN REA
DY TO SAVE TO DISK";:INPUT A
$
230 SAVEM"CROAKER", &H3000, &H66B7
&H669D
240 DATA0F, 71, 8E, A9, B3, BF, 01, 0D
250 DATA8E, 30, 00, 10, 8E, 06, 00, A6
260 DATA80, A7, A0, 8C, 66, 9D, 26, F7
270 DATA 7E, 35, 7A
280 END

```

Program Listing 2. Disk Append

6809 On Line

Since the beginning of time, man has attempted to communicate faster and faster. The Pony Express is not remembered for being slow. The Pony Express is remembered for being innovative and useful in the expanding territories and technologies of the past. I think that many CoCo users will find MCI Mail equally innovative and useful in today's world of telecommunicating.

CoCo owners are tough customers, as evidenced by the great deal you get for your money buying a Color Computer and related products. I like to think that CoCo users are bargain hunters with a sharp eye for value. MCI Mail, being the economical alternative to overnight service and faster than the U.S. Postal Service, warrants a closer look from CoCo lovers.

MCI Mail's economical variety of services will appeal to just about all owners of home computers, especially the CoCo owner. Unlike CompuServe's EMail, MCI lets you send paper copies in addition to electronic messages. MCI appeals to the small-scale user, since you pay no connect fees, no on-line fees, and you don't need a word processor or printer to generate single or bulk mailings via conventional mails.

If the person on the receiving end has a terminal or word processor and an MCI account, then your message is posted instantly, electronically to their "inbox." There are many other features of MCI Mail, including personalized letterhead, signature duplication, text storage, and business-reply envelopes. The service is easy to use, plus most services are provided on a pay-as-you-use system allowing affordable access to everyone.

MCI MAIL— TODAY'S PONY EXPRESS

by Bobby Ballard

"The people who brought you alternative long-distance communications offer four alternatives for sending mail. These four basic selections are available to all MCI subscribers."

The people who brought you alternative long-distance communications offer four alternatives for sending mail. These four basic selections are available to all MCI Mail subscribers. Speed of delivery and price vary, but all the paper mail is delivered in bright orange envelopes that attract your recipient's attention. The following selections are offered, via menu, after composing your letter:

● Instant Letter: This choice posts the letter electronically in the recipient's inbox for immediate retrieval when he or she signs on. The cost is \$1 per letter, and the recipient must have a ter-

terminal and an MCI account.

● MCI Letter: Anyone without a terminal can receive an MCI Letter from you through the mail. When you post a letter under this selection, MCI prints a laser copy of your letter and drops it in the nearest major post office for, often, next-day delivery. The cost, including U.S. postage, is \$2.

● Overnight Letter: This selection gets your letter hand delivered by noon the next day for the nominal fee of \$6. This service is available in over 20,000 continental U.S. cities.

● Four-Hour Letter: This service delivers your letter in four hours or less on business days, and MCI charges only \$25 for this service. Many overnight couriers charge \$25 or more for an overnight delivery anywhere in the U.S. The Four-Hour Letter is available in only about 15 major cities and surrounding areas.

The above prices are for an MCI Mail ounce, which is equal to 7,500 characters or three to five typed pages. Additional ounces are only \$1 each including the Four-Hour Letter.

MCI provides a return receipt at no extra charge. To obtain a receipt you type "(Receipt)" after the addressee's name, making sure to include the parentheses. The receipt is delivered electronically, and each of the above options generates a different type of receipt. You are notified when your letter is read with the Instant Letter. Hand delivery of the Four-Hour Letter will get you a receipt showing the date, time, and who signed for it. The letters prepared for the U.S. mail (MCI Letter and Overnight Letter) return a receipt showing when your letter was prepared for delivery.

A fifth option of sending mail lets you access Telex or TWX numbers

worldwide. The rates vary depending on distance, message length, and current exchange rates. With the Telex option, a receipt is generated automatically when you send the letter to the recipient's terminal. For a list of cities, countries, and prices, type "Help Telex" while on line.

In addition to these basic services, you can sign up for Advanced Service. This set of services is available for an additional \$10 a month. Note that the basic services are provided at a cost incurred only when used, whereas the Advanced Service is a monthly fee regardless of use frequency. Advanced Service lets a businessman, for example, register the company letterhead or several letterhead styles, along with signatures and business forms, purchase orders, invoices, and contracts. MCI Mail, using laser printers, then generates these forms or signatures where and when you or the appropriate people authorize them.

If you need bulk mailings, MCI Mail also has help. MCI Volume Mail allows for thousands of people to receive your letter, and MCI will store the names and addresses of your mailing list along with your text for repeated mailings. This volume mail service lets you personalize each letter to each addressee, and it provides business-reply envelopes when appropriate. A minimum of 500 pieces constitutes a volume mailing, and prices vary depending on volume and other options selected.

Another service arriving soon from MCI, Document Plus, lets the user compose letters with an in-house word processor and upload to MCI for distribution. By the time this column reaches print, Document Plus should be available as well as other new features that MCI Mail is constantly adding to their service.

You can send just one letter in a month and your MCI Mail bill would be only \$2 even if you took an hour or more to compose it on line. So, with a CoCo, modem, and terminal program, you can junk-mail Congress your opinion for a change, shake up a few overdue accounts with an impressive delivery system (including orange envelopes), or save wear and tear on your printer for bulk mailings.

You can also simply impress friends and speed your own personal communications. The amount you spend is

determined by the amount you use in "postage" only. This makes it economical to check your mail every day without incurring any fees. Signing up is free. You just call a toll-free number and type "Register" at the name and password prompts. In a few days, your MCI Welcome Kit, *Service Guide*, and password arrive. That's it. If you have Dow Jones News/Retrieval, then you've got an account already. Call your usual number for the Dow and type "//MCI" at any prompt.

MCI Mail makes editing messages easy with an easy-to-use menu system

"Using the system is almost easy enough without any instructions, but I recommend a look at the service guide you receive."

and commands that are clear and simple. Using the system is almost easy enough without any instructions, but I recommend a look at the service guide you receive. All the documentation from MCI is clear and impressively printed.

How does it work? I'll briefly describe some of the commands and menus to get you started or just give you an idea of the software that's running. To sign on, you call the MCI number in your area supplied with your password after registering. Follow instructions for your particular software and modem to access the supplied number. Once connected you press the enter key once for 1,200 baud, and for 110 to 300 baud you press enter twice.

Supply your user name at the prompts and then your nonprinting password at the next prompt. MCI will assign you a port and a welcome message scrolls up. Next, the Dow

Jones News/Retrieval headlines of the day scroll into view followed by a mail check. Following the above information, a menu appears with the following selections:

Scan	for a summary of your mail
Read	to read messages one by one
Print	to display messages nonstop
Create	to write an MCI Letter
Dowjones	for Dow Jones News/Retrieval
Account	to adjust terminal display
Help	for assistance

The above commands can be shortened to two letters in most cases, although I've had difficulty getting this feature to work consistently. If typing RE for READ does not work, just go back to typing the entire command.

Your MCI Mail account is organized like you would organize your desk. In fact, "desk" is a command that calls up letters you've read from your inbox but not yet acted upon. Two other areas of your mailbox or account are "outbox," for letters you have sent, and "draft," for the letter you're working on. Letters appear in your outbox only if you send a copy (cc:) to yourself. So, your mailbox is like a desk, with an inbox, outbox, and folder marked "draft."

Entering "Create" from the first menu also takes you to familiar prompts that resemble creating a letter. For example, the first prompts are for the envelope and include to:, cc:, and subject:, followed by the text: prompt. Equally clear are the editor commands and prompts as well as the message options menu. One note about the editor option, format: Use this feature before sending your message as it spots wordwrap problems and gives you an opportunity to scan your message's layout on paper. Before adding the format command, MCI had problems with letters having chopped words and improper wordwraps. I suggest you use format liberally.

MCI Mail, upon your registration, sends you a *Basic User's Guide* plus a Welcome Kit and *Service Guide*. The *User's Guide* instructs you on using the commands I've touched upon above. The Welcome Kit includes a sticker for your phone to post your local access number, a quick desk reference card, and a wallet-size reference card for those who travel with their computers. The *Service Guide* is an

6809 On Line

up-to-date list of zip codes serviced by Four-Hour Letter and Overnight delivery.

Are there any problems with MCI Mail? The biggest problem with MCI Mail is not their problem at all. Eventually, with paper mail, your message ends up in the hands of the U.S. Post Office and therein lies the rub. The U.S. mails are impressive when compared to the rest of the world, but in New York City where I live, MCI letters have taken four days to cross the river from one borough to the next. MCI seems to be fighting this slow delivery with larger envelopes (8½ by 11 inches) with \$.29 postage and first-class stamps on the outside.

The availability of Document Plus will solve the other problem I've had using MCI Mail. If you compose your correspondence before signing on line, it is possible to make in-house electronic copies for your own keeping. At this writing, you must send yourself an electronic copy, download it with a smart-terminal program, then copy it to tape. Document Plus will solve this problem and I'll bring you more about it as soon as details are available. All in all, MCI Mail seems to keep on top of changes needed to make their service more useful to more people. If you have a problem, you can call or write MCI free for a quick response. They are constantly adding new features and services.

In general, MCI Mail is a useful tool for many people, especially small businesses. Large businesses also will find MCI helpful with bulk mailings. I would think that clubs, civic organizations, and other groups might find help with an MCI Mail account as a part of their organizational tools. If you are interested in knowing more about MCI Mail or obtaining an account, contact them at:

MCI Mail
Box 1001
1900 M Street, NW
Washington, DC 20036

Register by phone by calling: 800-MCI-2255, 833-8484 in Washington, DC. Register using your CoCo by calling: 800-323-7751. ■

Address correspondence to Bobby Ballard, c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.

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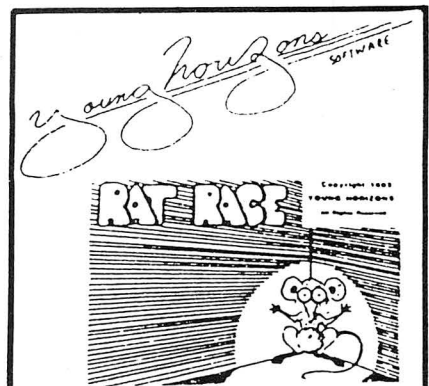
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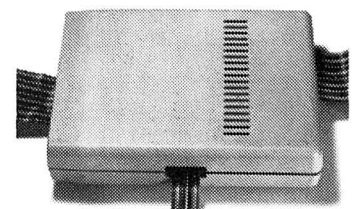
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The DOSsier

UPDATES, PATCHES, AND FIRST IMPRESSIONS OF DYNASTAR

by Scott L. Norman

My August column had a couple of snags. First, in describing one approach to modifying applications software I categorized the Fix utility as part of the original TSC (Technical Systems Consultants) Flex package. In fact, Fix was not done by TSC at all, but was produced by Southwest Technical Products (SWTP), one of the early Flex licensees.

The second lapse was merely a result of lead time. August's readers might have justifiably inferred that there was no software patch allowing OS-9 users to sample the 80-column joys of PBJ's Word-Pak, when in fact such a product does exist. PBJ will sell it to you, as will Great Plains Computer, and heaven knows who else. Unfortunately, I had to submit the August column in mid-April and thus preceded the introduction of the OS-9 routine.

Powers' Patches

Despite my obvious troubles with software lineage, I'm going to try again. I believe that the two patches I'm going to present now were written by Colette Powers, formerly a programmer at the Frank Hogg Laboratory.

Let me hedge a bit: I really mean that I first saw them in Colette's column in *SoftNews*, the freebie newsletter-cum-advertising brochure that you get when you purchase something from FHL. Original or not, they're pretty nifty and might be of interest to you; my thanks to Jeri Colella at FHL for permission to pass them along.

Since the CoCo keyboard lacks a

control key, different pieces of software have resorted to different strategies to perform the control function (e.g., subtracting 64 from the ASCII code of the next key pressed); Flex uses the shifted up-arrow combination.

The necessity of two keystrokes can be annoying when you must use a lot of control-something combinations—as you must in DynaStar, my primary subject this month. Colette's patches convert either the down-arrow or the clear key to control, thereby eliminating one keystroke—a modest but thoroughly worthwhile improvement.

These modifications require changing the contents of nine or ten memory

Change	For Control = Clear Key	For Control = Down-Arrow Key
	To	To
C7DA	—	7D
C7F6	7D	—
C808	03	03
C80D	40	—
C810	2B	2E
C812	06	06
C816	7C	7C
C817	C7	C7
C818	FC	FC
C819	35	35
C81A	82	82

Table 1. Colette's Memory Modifications

locations (Table 1), and are best installed via a SETUP M(emory) command in a STARTUP file. For some reason, I have had no luck using such a command in a file appended to Flex itself.

I'll return to this, but first here are the patches themselves. Both addresses (left column) and the data they contain are in hex, and dashes mean that you aren't to change a given location. With these changes, the shifted clear and shifted down-arrow combinations become the respective "super-shift" keys.

To use clear as the control key, you should first construct a STARTUP file incorporating the appropriate instructions:

```
+ + +BUILD STARTUP
      =SETUP MSC7F6,7D,SC808,03,
      . . . ,SC81A,82,
      =#
```

Be sure to include the final comma in the SETUP line. Check your Flex manual if you're not familiar with the syntax of the SETUP M(emory) command.

At present, I don't know why this doesn't work when incorporated into a binary file and appended to Flex; I do this with other SETUP options all the time. At any rate, STARTUP has the same effect: When I fire up my DynaStar working disk I get the usual date prompt and drive noises, and when the system finally settles down I am the proud owner of a control key. It just happens to be labeled "clear."

DynaStar at Last

There's an old joke about a drunk

who loses his watch in a dark alley and is still searching for it hours later under the streetlamp a block away—because the light is better there. In the same spirit, I am going to spend some time describing the CoCo Flex version of DynaStar, even though the OS-9 edition is a more polished product.

Frank Hogg, who sells them, and Allan Jost, who wrote them, both say so. The problem is that I only have the Flex program on hand, so I'll have to go with it. I will try to indicate where the OS-9 product differs, however.

DynaStar is a text editor that Jost wrote in his own p-code subset of Pascal. The distribution disk includes the Dynasoft p-code interpreter, so you needn't be concerned about having to go out and buy an additional language just to do word processing.

You *will* need something else, though. DynaStar is an editor, meaning that it prepares text but does not produce hardcopy. Printing, including the interpretation of a full set of imbedded control commands, is the province of another program: DynaForm.

Why bother to split them up? Probably because DynaStar itself could be a useful, economical full-screen editor for programmers who might be satisfied with raw printouts of their code. Both programs are necessary for the production of conventional text, however, and anyone interested in general-purpose writing should anticipate buying the pair.

DynaStar's operation is very reminiscent of WordStar, but without many of the latter's most infrequently used options. This means that DynaStar is somewhat less powerful than the CP/M standard—in theory—but considerably easier to use.

Novices can have an appropriate command menu on the first five or six lines of the display while editing, and the more experienced user can toggle the menus off and thereby gain additional space for text. A ruler line depicting the current margins and tab stops is always present, as is a status line that tells you which major options are in effect: Word-wrap, justification, and text insertion versus overtyping at the cursor position.

By way of comparison, WordStar

“...the combination of DynaStar and DynaForm can handle typical word-processing tasks, including index generation and mail merge...”

offers *three* selectable levels of detail in its help scheme. That sounds flexible as all getout, but actually the vast number of commands in the WordStar repertoire make it necessary.

DynaStar has six menus in all. It powers up with the Files menu showing: This is home base, and cannot be switched off. It lets you specify whether to edit a new or an old file (i.e., one already on disk), write a file from RAM to disk, exit to Flex, return to editing, toggle the menus, and make other weighty decisions. You make file menu selections with a single key.

You actually create and edit text in the Edit mode, and it's here that you insert the imbedded “dot commands” that DynaForm interprets when establishing the layout of the printed page. DynaStar is a full-screen editor, and to a large extent what you see is what you get. It centers or justifies lines on the screen as they will be in print, for example.

You don't use the arrow keys to maneuver the cursor. Control and various letter keys from the left side of the keyboard do the job instead. I'm going to use the caret (Δ) to denote the control function, whether performed by Flex's usual pair of keystrokes or by a single key following one of the patches I presented earlier.

You can use Δ S, Δ D, Δ E, or Δ X to move the cursor a single space in any direction. Similar combinations move or delete words or lines. You can also scroll through the display one line at a time or by an entire screen.

Still other control sequences summon subsidiary menus. Δ Q brings up supplementary cursor-movement

commands, including those for jumping to the beginning or end of the current text file, and for finding and replacing strings.

You use the Δ B commands for marking, moving, copying, and deleting blocks of text; the Δ K series governs justification, centering, and the setting of tabs and margins, while the Δ Ps are involved with print control. The Δ P menu provides a guide to DynaForm's dot commands for setting margins, line spaces, headers and footers, and so on.

All this should make you appreciate that the control function gets quite a workout when you are editing a manuscript. That's why I presented Powers' single-key patches this month: to offer you a way to avoid three-finger splits during cursor movement.

Incidentally, you may have noticed the implication that you can freely mix text entry and cursor movement operations. You can. In contrast, Stylograph (which has many good qualities of its own) forces you to leave the text entry mode if you get a sudden inspiration and want to move the cursor around.

Much of DynaStar's command syntax is very similar to WordStar's: Δ R moves the cursor up by one screen, Δ Q-R pushes it to the top of the entire text file, and so on. There are differences in several of the prefixes, but someone trained in one product can quickly learn the other.

DynaStar is easy to learn from scratch, even if you're not a word-processing pro. Allan Jost has said that his goal was to make the manual unnecessary, and while he hasn't quite done that, he has produced a product that you can put to work in a relatively short time.

In general, the combination of DynaStar and DynaForm can handle typical word-processing tasks, including index generation and mail-merge, with aplomb.

There are a few problems, though. You can fix some with a few lines of explanation, but others seem to be genuine deficiencies of the Flex version of DynaStar—at least in its present guise. Let me dispose of a couple of easy ones first.

Embarrassing though it might be, I must admit that in the early going I had difficulties with the way DynaStar

handled disk files. I would have trouble writing to a work disk on drive 1, or else I couldn't read a disk file back into RAM—really elementary stuff.

It seems that I've been spoiled by DynaCalc and a few other programs that automatically furnish default extensions and let you specify drives on the fly when you read and write files. In contrast, DynaStar wants you to be straight and inform it of the working drive at the outset: Use an `ASN,W=1` line in the STARTUP file if you keep your text disk on drive 1, for instance. In the same vein, the program seems to require that you specify file names *and* extensions when you want to read in a disk file—even if the extension is the default, TXT.

The manual is less than explicit on the topic of temporarily indenting text lines and then expanding them—the sort of thing you often do for long quotations or for tabular material.

The trick is to use the conventional `AK-R` command to set the shortened right margin, and `AK-V`, the “wordwrap to here” command, for the left one. (The cursor has to be at the right spot when you enter each command.)

To bring the margins back to their original settings, you must toggle wordwrap off with `AK-W`, then move the cursor manually and use `AK-R` and `AK-V` again. The use of the wordwrap command is the crucial point; you can turn it on again once you have reestablished your margins. I prefer Stylograph's imbedded commands for changing the left margin and line length in the middle of a document.

The CoCo Flex version of DynaStar does not keep you informed of either the current text-file size or the amount of memory remaining; all it can do is tell you when you are about to run out of RAM.

This is a troublesome omission for those of us who are supposed to write under a length limitation. The general (non-CoCo) Flex version is supposed to have a memory-size indicator, and I believe the OS-9 edition does as well.

You can store your current file on disk at the warning, of course, provided you have the room. Because the program requires disk space for

“The bottom line on DynaStar: generally competent and friendly to use, but the stock Flex version is a better programming editor than word processor. OS-9 should be better though...”

a scratch file as well as the “real” one, the longest document you can work on is one that takes up half a disk (about 74,000 characters). Obviously, that won't fit into memory, but there is a “more” command that lets you edit a large file, one RAM-full at a time.

The program has a speed limitation. You won't lose typed characters while filling up an initially blank screen, but there's a danger of a fast typist doing so when working on the last line of the display.

The line feed at the end of the last line rewrites the entire screen, of course, and DynaStar takes its time. It is significantly slower than Stylograph and far, far slower than Telewriter-64, my old RS DOS standby.

There just might be a classy way out of this, but for now I recommend the following quick fix. Whenever I get near the bottom of a screen, I issue a screen-down command followed by a screen-up. The way DynaStar resets things, I wind up with the last cursor position near the top of the display, so that I have most of an empty screen to type into.

Awkward, isn't it? I have a strong suspicion that fixing the vertical scrolling rate once and for all will require modification of a program module called GOTOXY, which specifies cursor addressing and other terminal parameters.

I'm going to have to dig into GOTOXY anyway, because of yet another limitation—perhaps the most significant of all. As things stand, CoCo Flex DynaStar will not display lines more than 51 characters long; you cannot scroll horizontally over a

longer line, as you can with Stylograph, and it does you no good to use FHL's 64-by-24 display mode. That's not good enough for general-purpose writing.

It looks as though it will be pretty simple to modify and reassemble GOTOXY; I'll report on this next month. Maybe I'll even have DynaStar running with the Word-Pak by then. Once again, this is strictly a Flex problem. OS-9 DynaStar is meant to work with FHL's O-Pak, so you get higher-density displays from day one.

The bottom line on DynaStar: generally competent and friendly to use, but the stock Flex version is a better programming editor than word processor. OS-9 should be better, though, and I remain optimistic.

Literature

A much-needed item has arrived: Dale Puckett has brought forth *The Official Basic-09 Tour Guide*. It covers the general version of the language; you'll still need the Radio Shack manuals for graphics, joystick functions, and other machine-specific details.

Still, Puckett writes gracefully and knows what he's talking about, so the *Tour Guide* could be a welcome addition to your bookshelf. I've had a quick read, and while there are a few typos (as always!), this seems to be a good book for self-instruction. We need more of those. ■

Products and vendors mentioned in this month's DOSsier

OS-9 Patch for Word-Pak PBJ Inc.

P.O. Box 813
North Bergen, NJ 07047
201-330-1898
\$19.95

DynaStar and DynaForm
Frank Hogg Laboratory
The Regency Tower, Suite 215
770 James St.
Syracuse, NY 13203
315-474-7856
\$99.90 (Flex or OS-9 versions)

The Basic-09 Tour Guide
Microware Systems Corp.
1866 NW 114th St.
Des Moines, IA 50322
\$18.95

The Educated Guest

EDUCATION THE ARCADE WAY

by Charles H. Santee

The educational arcade game can be a powerful learning tool. Basically, it is drill and practice software, which if done well provides an alternative to the educational adventure game. The arcade game is especially useful for those students who have trouble learning through the discovery process.

Let's look at those elements of an arcade game that enhance learning. Most adults would agree that many children find arcade games motivating. This is their primary (if only) strength. I see these elements (many of which can be used in other types of educational software) as the source of motivation:

- Arcade games provide a vent for aggression.
- They provide a competitive arena using elements that are less threatening than other forms of competition.
- They are novel because of their constantly changing auditory and visual stimuli.
- They provide reinforcement on a semirandom schedule that increases with time.

The arcade game often makes use of the fact that novel stimulus attracts attention. If you are interested in a theoretical and technical explanation of this theory, read about the reticular activating system and brain research.

Some of the attention-getting devices that arcade games use include random or unusual movement patterns. They also create the impression of two or more things happening at the same time.

In addition, the better arcade games provide easy, but unpredictable payoff. As the games progress they provide glorious new screens that are increasingly more difficult to achieve.

The unknowing player is hooked by a powerful and well-programmed schedule of reinforcement. If you produce educational software, notice the way in which arcade games create a gambling-like atmosphere through the use of sight and sound.

The Darker Side

The educational arcade game does have its detractors. Some say that while these games are motivating, the students spend more time maneuvering joysticks than selecting the correct answer. They also stress that children can never win in an arcade game. The games simply keep getting harder and harder, which for some students is very frustrating, especially if they have poor eye/hand coordination.

Another common fault is that the games, in their drill-and-practice format, provide only a single-dimensional learning experience. Others are concerned that the arcade game encourages aggression.

These points are well taken. One method of teaching, or playing, is not always effective or fun for everyone. Overall, I feel that an arcade game's strengths outweigh its faults, but it is just one avenue for an educational programmer.

The matter of aggression is a tough one. Although I do not advocate the venting of aggression, I realize that aggressively pursuing the rights of others or aggressively implementing a new idea is appropriate. Perhaps a reader has the definitive software for teaching the appropriate use of aggression.

Spellgame

This month's program, Spellgame,

demonstrates some, but not all of the possible applications of an arcade game. The most important aspect of this game is the use of new screens that not only increment the level of difficulty, but also introduce new learning requirements. The game is a spelling game.

In the first screen, the player must type in a missing word in a sentence. The word required to complete the sentence appears in a list of words that move across the top of the screen. The potential score is shown at the bottom of the screen along with a bar graph that gets smaller as time progresses. In other words, the faster the student completes the answer, the higher the score. This screen requires recognition of the correct answer.

After completing several words a new screen appears that is identical except that the correct answers do *not* appear. This screen requires recall.

The final screen is quite different. A "word phaser" appears on the right of the screen. Use the up and down arrows to move the phaser. Move the phaser in the row of a misspelled word and press the space-bar to erase the misspelled words. After erasing all misspelled words you can move to the row of correctly spelled words to catch the words for bonus points. If you attempt to erase a correctly spelled word or allow an incorrectly spelled word to land, you loose points.

This screen teaches discrimination of correct and incorrect spelling.

You can change the content of this game by modifying the DATA statements at the beginning. The first item is a sentence used in the first two screens. The sentence is marked with a beginning asterisk. The word to be spelled is also marked with an asterisk. The remaining items are misspelled words. The last item is a single asterisk that marks the end of data.

The program uses a unique trick to define sequence of presentation. In line 190 the variable R defines the number of times each item is to be repeated. You can change the number of

System Requirements

16K RAM
Extended Color Basic

repetitions by changing the value of R. The program counts the number of items included in the game by reading the variable S. Line 190 creates a string of sequenced characters whose length is equal to the defined number of repetitions times the number of items to be presented (R*S). For example, if the game contained three items, which would be repeated two times, the string would be:

```
"ABCABC"
A= item 1
B= item 2
C= item 3
```

Lines 200-240 mix the characters in the string into a random sequence. The results might be something like CABBCA.

The program then picks each character from the string one at a time, converts the character to a numeric value, and selects the item for presentation that corresponds to that number.

I used another unusual trick to find the location on the screen where the student answer is placed. The sentence is printed on the screen with a series of dashes to indicate the appropriate place for an answer. Lines 360 and 370 PEEK at consecutive screen locations until a dash [CHR\$(109)] is found in the answer box.

A Critique

While this game incorporates an essential element of a good educational arcade game, it lacks several important ones. It uses at least three methods of learning the same content. To a modest degree, this program contains some elements of an arcade game. Several things are happening on the screen while the game waits for a response. The program uses different screens as the game progresses.

However, high-resolution graphics are required to improve the game and without the use of machine language the key response and action on the screen is simply too slow.

The first two screens require a greater degree of fantasy or arcade-style action to enhance motivation. The game does have a predefined ending point and thus overcomes to some degree the problem of continuing an activity beyond its educational value. However, the first two screens end after a predefined repetition of con-

"Creating a good educational arcade game requires an uncommon amount of skill."

tent, and the last screen ends after a predefined time.

A better method would be to progress from one screen to the next as the player obtains a desirable level of mastery. Perhaps the score should have a predefined upper limit based on how fast the player can achieve mastery. For example, the player who progresses through all three screens with X percent mastery in less than X minutes time is given a screen that declares the player is the "Master of the Spelling Universe," ready to challenge new horizons.

The game contains a score that is meaningful in a game sense, but not for evaluation purposes. It would be desirable to have a report of progress that indicates the words missed, the rate of response, and perhaps a diagnosis of the type of errors made.

Create the Ultimate Educational Game

Creating a good educational arcade game requires an uncommon amount of skill. The programmer must combine the animation, multiple screens, and fast action with a well-planned attack on presenting educational material. The aggressive elements of the game must be maintained without creating a program that teaches inappropriate aggression.

It takes a great deal of imagination to come up with a game format that is fun while the balance of time spent on the game is directed toward acquiring new skills. I think that such a program is feasible, but I have not seen it yet.

I would like you readers to suggest formats that would result in such a program. I would also like to hear readers' suggestions as to which game already on the market approaches the guidelines I have presented in this column. ■

Address correspondence to Dr. Charles Santee, 8 S. 045 Grant St., Westmont, IL 60559.

Program Listing. Spellgame

```
10 DATA "YOU MUST *STOP AT A ST
REET SIGN",STP,STAP
20 DATA "USE *SOAP TO WASH YOUR
FACE",WSH,WAUSH,WALSH
30 DATA "PLEASE *WALK ACROSS TH
E STREET SLOWLY",WAK,WLAK
40 DATA "READ ALL THE *NEWS IN
THE PAPER",NEEWS,NUZ,MEWS
50 DATA "A PUPPY IS VERY *SMALL
",SMLL,SMAL,SMOL
60 DATA "IT IS HOT IN THE *SUMM
ER",SMMER,SUMER,SOMMER
70 DATA "THE TOP SHELF IS *ABOV
E THE BOTTOM SHELF",ABV,ABOV,ABU
F
80 DATA "WAIT YOUR *TURN",TARN,
TRN
90 DATA "THE FIRST MONTH OF SUM
MER IS *JUNE",JUN,JEUN
100 DATA "*"
110 CLEAR 2000:CLS
120 DIM HH$(50)
130 BX$=CHR$(142)+STRING$(30,140
)+CHR$(141)
140 FOR A=1 TO 5:BX$=BX$+CHR$(1
38)+STRING$(30,32)+CHR$(133):NEX
T
150 BX$=BX$+CHR$(139)+STRING$(30
,131)+CHR$(135)
160 READ T$:IF T$="" THEN 190
170 IF LEFT$(T$,1)<>"*" THEN MS=
MS+1:HH$(MS)=CHR$(128)+T$+" ":GO
TO 160
180 T$=T$+STRING$(32,32):S=S+1:T
T=S:LL=INSTR(2,T$,"*"):L2=INSTR(
L1+1,T$, " "):W$(S)=MID$(T$,L1+1,
L2-L1-1):S$(S)=MID$(T$,L1-2)+S
TRINGS(L2-L1-1,"-")+MID$(T$,L2M3
2):GOTO 160
190 NS=S:R=2:FOR A=1 TO R:FOR B=
1 TO NS:SL$=SL$+CHR$(B+64):NEXT
B,A
200 FOR A=LEN(SL$) TO 2 STEP -1
210 RN=RND(A):IF RN=A THEN 240
220 IF RN=1 THEN SL$=RIGHT$(SL$
,LEN(SL$)-1)+LEFT$(SL$,1):GOTO
240
230 SL$=LEFT$(SL$,RN-1)+RIGHT$(S
L$,LEN(SL$)-RN)+MID$(SL$,RN,1)
240 NEXT A
250 FOR A=1 TO NS:WPS=WPS+STRING
$(3,175)+W$(A):NEXT A:WPS=WPS+ST
RINGS(3,175):PRINT@0,STRING$(160
,175);
260 FOR Z=1 TO 2
270 PLAY"20L2001CDEFGABO2CDEFGA
BO3CDEFGAB"
280 IF Z=1 THEN PRINT@41,"recogn
ition"; ELSE PRINT@41,STRING$(3,
175)+ "recall"+STRING$(3,175);:WP
$="":FOR A=1 TO 30:WPS=WPS+CHR$(
159)+CHR$(223):NEXT
290 FOR Q=1 TO LEN(SL$)
300 S=ASC(MID$(SL$,Q,1))-64
310 SC=31
320 P$=S$(S):H=3:V=7:LB=26:PRINT
@160,BX$;
330 REM
340 GOSUB 590
350 PRINT@386,"YOUR TOTAL SCORE
IS ";TP;
360 X=1248
370 IF PEEK(X)<>109 THEN X=X+1:G
OTO 370
380 L=X-1024:WL=1
390 X$=INKEY$:PRINT@L,CHR$(128);
:IF X$="" THEN 510
400 IF MID$(W$(S),WL,1)<>X$ THEN
PRINT@L,CHR$(191);:PLAY"4L4O2G
EC":SC=ABS(SC-2):GOTO 510
410 PRINT@L,MID$(W$(S),WL,1);:IF
WL<LEN(W$(S)) THEN WL=WL+1:L=L+
1:GOTO 390
420 TP=TP+TS
430 PLAY"04T4L8CCECEL2G"
```

Listing continued

Listing continued

```

44Ø NEXT Q
45Ø NEXT Z
46Ø GOTO 67Ø
47Ø FOR A=Ø TO LEN(W$(S))-1
48Ø PLAY"TL2L2":POKE L+A+1Ø25-WL,
ASC(MID$(W$(S),A+1,1))-64:PLAY S
TR$(A+1)
49Ø NEXT A
50Ø GOTO 44Ø
51Ø WP=WP+1:IF WP>LEN(WP$) THEN
WP=1
52Ø IF WP+32<LEN(WP$) THEN PRINT
@96,MID$(WP$,WP,32); ELSE PRINT@
96,RIGHT$(WP$,LEN(WP$)-WP)+LEFT$(
WP$,32-(LEN(WP$)-WP));
53Ø SB=SB-1:IF SB>-1Ø THEN 56Ø E
LSE SB=Ø
54Ø PRINT@448,STRING$(SC,154)+ST
RING$(32-SC,128);:SC=SC-1
55Ø TS=SC
56Ø PRINT@482,"SCORE =" ;SC;
57Ø IF SC<1 THEN GOTO 47Ø
58Ø GOTO 39Ø
59Ø '(1) PRINT ROUTINE"*****"
***** (H,V,LB,P$)*****
60Ø P$=P$+" "
61Ø TB=LB:IF V>15 THEN PRINT:V=1
5
62Ø IF TB > LEN (P$) THEN PRINT@
(H+32*V),P$;:RETURN
63Ø IF LEFT$(P$,1)=" " THEN P$=R.
IGHT$(P$,LEN(P$)-1):GOTO 61Ø
64Ø T$=LEFT$(P$,LB):IF INSTR(T$,
" ")=Ø THEN PRINT@ (H+32*V),T$;:P
$=RIGHT$(P$,LEN(P$)-TB):V=V+1:GO
TO 61Ø
65Ø IF MID$(P$,TB,1)<>" " THEN I
F TB>1 THEN TB = TB - 1:GOTO65Ø
66Ø PRINT@ (H+32*V),LEFT$(P$,TB)
;:P$=RIGHT$(P$,LEN(P$)-TB):V=V+1
:GOTO 61Ø
67Ø G$(Ø)=CHR$(213):G$(1)=CHR$(1

```

```

51):G$(2)=CHR$(149):G$(3)=CHR$(1
57):G$(4)=CHR$(213):L=Ø:SC=TP
68Ø M$="correct"+CHR$(128)+"spe
lling"+CHR$(128)+"LOOSE"+CHR$(12
8)+"5"+CHR$(128)+"POINTS":P1$="O
2T4L4CP8CP8L8CP8L4CP8L8EP8DP8DP8
CP8CO1BO2P8L2C"
69Ø M1$="BAD WORD LANDED"+CHR$(1
28)+"loose 2Ø points"
70Ø TIMER=Ø
71Ø Z$="":FOR A=Ø TO 9:Z$=Z$+CHR
$(A+64):H$(A)=H$(RND(MS)):LS(A)
=Ø:NEXT
72Ø CK$=""
73Ø FOR H=1 TO 3
74Ø CH=RND(1Ø)-1:H$(CH)=CHR$(128
)+W$(RND(TT))+" ":CK$ = CK$+H$(C
H)
75Ø NEXT H
76Ø CLS Ø
77Ø FOR A=Ø TO 13 :PRINT@A*32+31
,CHR$(213);:NEXT:PRINT@32,STRIN
G$(31,175);:PRINT@12*32,STRING$(3
1,175);CHR$(213);
78Ø GOSUB 84Ø
79Ø X$=INKEY$:GOSUB 88Ø:IF X$=""
THEN 79Ø
80Ø IF X$=CHR$(1Ø) AND L<9 THEN
L=L+1
81Ø IF X$=CHR$(94) AND L>Ø THEN
L=L-1
82Ø IF X$=CHR$(32) THEN IF H$(L)
="" THEN 79Ø ELSE GOTO 94Ø
83Ø GOSUB 84Ø:GOTO 79Ø
84Ø FOR G=Ø TO 4
85Ø PRINT@G*32+31+L*32,G$(G);
86Ø NEXT
87Ø RETURN
88Ø ZZ=RND(LEN(Z$)):Z=ASC(MID$(Z
$,ZZ,1))-64:PRINT@Z*32+64+LS(Z),
H$(Z);
89Ø PRINT@2,"SCORE"+CHR$(128)+"=
"+CHR$(128);SC;CHR$(128);"TIME L
EFT";CHR$(128);INT((18ØØØ-TIMER)

```

```

/6Ø);
90Ø IF TIMER>1794Ø THEN 1Ø9Ø
91Ø LS(Z)=LS(Z)+1
92Ø IF (LS(Z)+LEN(H$(Z)))>31 THE
N GOTO 1Ø4Ø
93Ø PLAY"P128":RETURN
94Ø REM
95Ø FOR X=1 TO 32-LS(L)-LEN(H$(L
))
96Ø PRINT@L*32+95-X,CHR$(182);
97Ø PLAY"T255L255Ø1C"
98Ø NEXT
99Ø IF INSTR(CK$,H$(L))<>Ø THEN
PRINT@48Ø,MSS;:PLAY P1$:SC=SC-5
:PRINT@L*32+95-X,STRING$(X,128);
:PRINT@48Ø,STRING$(31,128);:GOTO
79Ø
1ØØØ GOSUB 11ØØ
1Ø1Ø FOR K=X TO 3Ø:PRINT@L*32+95
-K,CHR$(182);:PLAY"T255L255Ø1G":
NEXT
1Ø2Ø H$(L)="":SC=SC+1:PLAY"Ø5T8L
8CEG"
1Ø3Ø GOTO 79Ø
1Ø4Ø REM
1Ø5Ø IF INSTR(CK$,H$(Z))=Ø THEN
PRINT@48Ø,M1$;:PRINT@Z*32+95,CHR
$(191);:PLAY P1$:SC=SC-2Ø:PRINT@
48Ø,STRING$(31,128);:GOTO 71Ø
1Ø6Ø IF Z=L THEN SC=SC+1Ø:PLAY"L
8TØØ3CEGØ4CEGØ5CEG" ELSE GOTO 71
Ø
1Ø7Ø IF LEN(Z$)>1 THEN GOSUB 11Ø
Ø:GOTO 79Ø ELSE GOTO 71Ø
1Ø8Ø GOTO 71Ø
1Ø9Ø CLS:PRINT@39,"this game is
over":PRINT@1Ø1,"YOUR SCORE IS";
SC:PRINT:PRINT:PRINT:END
11ØØ ZZ=INSTR(Z$,CHR$(L+64)):IF
ZZ=1 THEN Z$=RIGHT$(Z$,LEN(Z$)-1
) ELSE IF ZZ=LEN(Z$) THEN Z$=LEF
T$(Z$,LEN(Z$)-1) ELSE Z$=LEFT$(Z
$,ZZ-1)+RIGHT$(Z$,LEN(Z$)-ZZ)
111Ø RETURN

```

END

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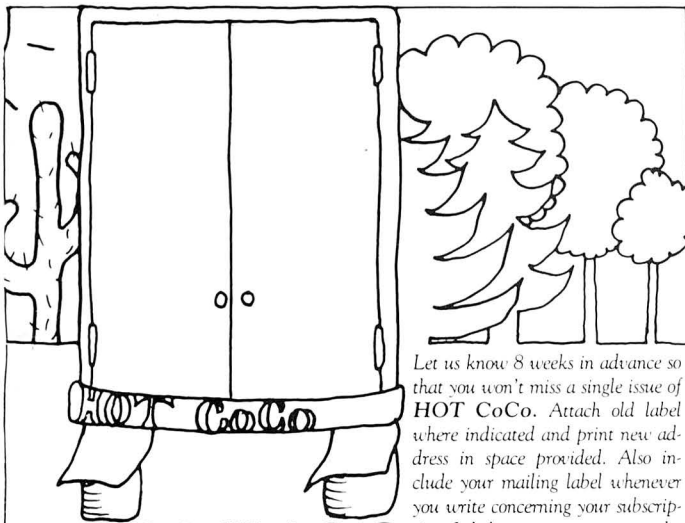
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Doctor ASCII

by Richard E. Esposito, Jesse W. Jackson, and Ralph E. Ramhoff

Q. I have an MC-10 with the 16K memory expansion. How do you use the arrow keys to edit text on the screen? All the manual says is that the arrow keys are reserved for special purposes.

Calvin Killoran
Cornwall, Ontario

A. The MC-10 does not have any built-in editing capabilities like some of its more expensive brothers. That is not to say that these keys are totally useless. Aside from the up-arrow being used for exponentiation and the left-arrow for backspace, you can use them in a sequence like the one below or the equivalent in machine language:

```
10 A$ = INKEY$: IF A$ = "" THEN 10
20 A = ASC(A$)
```

After you press one of the arrow keys, the variable A will contain a 94, 10, 9, or 8 for an up-arrow, down-arrow, right-arrow, or left-arrow, respectively.

Q. What are the differences between Color and Micro Color Basic?

Tommy Murdach
Ft. Gordon, GA

A. The CoCo and MC-10 use the same tape format, so each can load the other's tapes, but tape compatibility stops there. Once a tape from the other is loaded into either machine without modification, and LISTed, gibberish appears on the screen because the tokenization schemes for key words in the two computers are different. Dan Downard wrote a 6809 machine-language program that generates an MC-10-compatible tape from a CoCo (*Rainbow*, October 1983, p. 199). Bill Barden wrote a similar program in CoCo Basic titled "Talk Together" (*The Color Computer Magazine*, September 1983, p. 60). Whether you are using a CoCo tape from a converter or working with a printout, you need to be aware of which commands are unique to each system.

The MC-10 has the following commands that are not supported by the CoCo:

CSAVE*, CLOAD*, LPRINT

The MC-10 also has the following Extended Basic commands:

COS, EXP, LET, LOG, SQR, TAN, VARPTR, up-arrow

The Color Basic CoCo has the following commands that are not supported by the MC-10:

AUDIO ON, AUDIO OFF, CLOSE, CSAVE,A, DLOAD, ELSE, EOF, JOYSTK, MOTOR ON, MOTOR OFF, OPEN, USR, ' (when used instead of REM)

The Extended Color Basic CoCo has the following commands that are not supported by the MC-10:

ATN, CIRCLE, COLOR, DEF, DEL, DLOADM, DRAW, EDIT, FIX, FNx, GET, HEX\$, INSTR, LINE, PAINT, PCLEAR, PCLS, PCOPY, PLAY, PMODE, POS, PPOINT, PRESET, PSET, PUT, RENUM, SCREEN, STRING\$, TIMER, TROFF, TRON

Q. I have a 20K MC-10. I read March's issue and in it found two ads for machine-language programs for the MC-10. I am interested in programming in machine language. How do you do this without a CSAVEM command? Where can I get a list of MC6803 op-codes and mnemonics? Can you add to March's memory map?

Ben Ciaccio
Desert Hot Springs, CA

A. There are a number of ways of saving machine-language programs to tape, but of course CSAVEM is the simplest. Alternatives include imbedding the machine language in character strings, Basic POKE routines, and tacking the machine language on to the end of a Basic program by adjusting the end-of-program pointer. A good technical article that includes the addresses of key ROM routines is "The Mighty Mite MC-10," by John Cullings, *HOT CoCo*, September 1983, p. 66. Another good one is "My MC-10 Speaks ML," by T. McFadden and D. Kelly, *The Color Computer Magazine*, November 1983, p. 83.

Machine-language monitors commercially available for the MC-10 are Humbug (\$29.95, Star-Kits, P.O. Box 209H, Mt. Kisco, NY 10549) and Micromon (\$13.95, Micro Ten Software Co., 496 Amboy Ave., Perth Amboy, NJ 08861); both give you a CSAVEM command. A program that gives you a CSAVEM command appeared in John Cullings' article.

This is the latest memory map on the MC-10:

\$0000-\$001F	Internal RAM
\$0080-\$00FF	Direct page RAM
\$0093-4	Start of Basic
\$0095-6	Start of variables
\$009B-C	Top of System Stack
\$00A1-2	Top of user RAM
\$00AD-E	Next line to be executed
\$00E8	DEVNUM
\$00EA	Reset flag
\$0100-\$3FFF	Not used
\$4000-\$41FF	Basic's screen RAM
\$4200-\$4284	System use
\$4224	Baud rate
\$421F-20	EXEC address
\$4280-1	Cursor position
\$4229	Printer width
\$4231-6	Keyboard rollover table
\$4282	Cursor character
\$4285-\$42AE	Hooks
\$42B2-\$4334	Keyboard buffer
\$4346-\$4F99	Basic area
\$4F9A-\$4FFF	System stack (4K RAM)
\$5000-\$8FFF	16K RAM upgrade area
\$9000	VDG and sound latch
\$E000-\$FFFF	Basic ROM
\$FFFDC-\$FFED	ROM subroutine entry addresses
\$FFF0-\$FFFF	Interrupt vectors

ROM Routines

\$F883 [\$FFDC]	POLCAT Key to A reg
\$F9C6 [\$FFDE]	CHROUT A reg to DEVNUM
\$FF4E [\$FFE0]	CRSDON Tape startup
\$FEB9 [\$FFE2]	BLKIN Read a block
\$FCC0 [\$FFE4]	BLKOUT Write a block
\$FFAB [FFE6]	SNDOUT Sound out
\$FCB7 [\$FFE8]	WRTLDR Write leader
\$ECE3 [\$FFEA]	GIVABF 2 bytes to Basic
\$EBC7 [\$FFEC]	INTCNV Basic retrieves 2 bytes
\$F83F	FLSCUR Flash cursor
\$F9D0	LPTOUT A reg to printer
\$FA1B	SCNOUT A reg to screen
\$FAAF	LINPUT Input line from keyboard
\$FBD4	CLS Clear screen
\$FBD6	FILSCR Fill screen with B reg value

Q. I have a 64K CoCo with one disk drive. I believe the 32-by-16 screen display will be inadequate for such programs as Elite-Calc, database managers, etc. How can I go about getting a 51-by-24 screen display or something along those lines and still use a program like Elite-Calc?

*Ernie Carlo
Santurce, PR*

A. Bruce Cook of Elite Software says that he has no plans to support a hi-res display for Elite-Calc. He felt that the 64K of RAM was better used for data. If you do not agree with him, there are two spreadsheet programs on the market that do use the hi-res display and do not require the purchase of a new DOS. They are the VIP-Calc (\$59.95, Softlaw Corp., 9072 Lyndale Ave. So., Minneapolis, MN 55420) and Dynacalc (\$99.95, Computer Systems Center, 13461 Olive Blvd., Chesterfield, MO 63017). The Dynacalc includes a graphics package that allows you to plot the information contained both on the hi-res screen and on your graphics capable printer.

Q. Would you please advise me concerning the DLOAD command? I have been trying to get it to work with another CoCo and cannot. Where can I find a table of the Basic and Extended Basic ROM routines that are accessible by use of a JSR[xxxx] for easier Assembly programming?

*Ronald Zickefoose
Wooster, OH*

A. DLOAD is only half of what you need to transfer programs between two CoCos. ML>User Software (115 Rising Sun, Ft. Mitchell, KY 41017) markets the other half as Upload for \$16.95. There are nine routines identified in the EDTASM+ manual (p. 64) for indirect addressing with Basic: BLKIN, BLKOUT, WRTLDR, CHROUT, CSRDON, GIVABF, INTCNV, JOYIN, and POLCAT. If you use indirect addressing with these routines, your machine-language programs will be ROM version independent according to Radio Shack.

Q. I would like a list of good editor/assemblers for the CoCo with prices if possible.

*Jason Debetencourt
Oak Bluffs, MA*

A. Since you did not indicate whether you have a disk system, I assume you are using cassette.

There are two generally accepted "best" editor/assemblers for a nondisk CoCo. The first is SDS-80C (\$89.95, The Microworks, P.O. Box 1110-D, Delmar, CA 92014). A book *Assembly Language Graphics*, by Don Inman (Reston/Reward, \$14.95) is very useful to have with it. Radio Shack markets EDTASM+ (#26-3250, \$49.95), and there is a book that supports it: *TRS-80 Color Computer Assembly-Language Programming*, by William Barden (RS# 62-2077, \$6.95). Both of these editor/assemblers come in ROM packs. The SDS-80C has the advantage of a screen editor, while EDTASM+ has a line editor, but a lower price. If you want the best, go with SDS-80C. If price is a concern, consider EDTASM+. A complete review of the Assembly-language books for the CoCo appeared in *HOT CoCo*, March 1984, p. 38.

Q. In the June issue, you mentioned having two 80-track, double-sided drives. I have an older Radio Shack (RS) controller that came with my drive. I would like to have a system like yours. How do I go about it?

*Lee Roberts
Oceanside, CA*

A. I have two 80-track drives and one 40-track drive for compatibility. The older RS controller works fine, but you will need a new cable. Radio Shack removes teeth from the connectors instead of putting jumpers inside their drives. If you go double sided, you can have a maximum of three drives, since the drive 3 line is used for side selection. If you keep your old Radio Shack drive for compatibility, you will need to remove the appropriate teeth from the cable connector that mates with it.

Be sure to decide whether it will be drive 0, 1, or 2 before you remove teeth. Use your old RS cable as a reference. You can use the connector with the missing teeth only with your RS drive! I have my 40-track drive configured as drive 2 and keep most of my software on 80-track disks. Note that CoCo's Disk Basic uses only 35 of the 80 tracks, and you must back up these disks to the 40-track drive if someone without an 80-track drive is to read them.

Q. Twice now you've said that the new disk controller "gets its 12 volts from the disk drive power supply."

My new RS controller doesn't need 12 volts since its Fujitsu FDC chip uses only 5 volts, and it gets that from the CoCo. It also uses a 9216 digital data separator versus the old analog with its potentiometers.

I ordered the card 8709407 Rev. A. Everything was soldered except it had sockets at U1 (24-pin ROM), U4 (40-pin FDC), and U10 (8 pin). I ordered the first two and plugged in a 9216 at U10. Total cost about \$86. It works great and it fits the old case.

*Buck Peck
Norfolk, VA*

A. I guess I'll never hear the end of this one. The rumor was so plausible. Anyway, thanks for the information.

Q. I am having a series of problems with my '285 CoCo. First, I am having problems getting Kantronic's cartridge software to receive or transmit RTTY, Morse code,

or ASCII. The program is on ROM and worked well for a week in my computer. Incidentally, it still works with other CoCos. The program autostarts, but when I attempt to get it to interpret incoming data from an interface (0-5 volt), it does not, and when I attempt to transmit, the computer locks up and must be reset.

Other problems I'm having are associated with programs in high memory (above &H7D00). When I attempt to use this memory with and without CLEAR statements, the computer locks up. Is this normal for a '285 CoCo? If not, what should I check?

*Arthur F. Clemens
Somerdale, NJ*

A. Your problems may not be related. Does your Kantronics interface have its own ports? I.e., does it need the CoCo's serial port, etc.? If it uses the CoCo's ports, do they work with printers or other peripherals? Check your CoCo's power-supply voltages with and without the Kantronics card attached. Many CoCos work fine until owners expand their systems and find that the +12v regulator is defective or that their +5v regulator heats the CoCo too much. This could cause apparent memory problems, also.

On power-up, Basic gets the stack near the top of RAM, which is \$7F00 for 32K. Do a PRINT MEM just after power-up. Do you get fewer than 24,000 bytes? If so, you have defective memory locations. At power-up, Basic reads memory, writes the opposite back to it, and reads it again to see if it changed. If it couldn't alter memory, Basic assumes it has reached the end of RAM, stops there, sets pointers in low memory to indicate where RAM ends, and sets the stack pointer slightly below the end of RAM. If you get more than 24,000 bytes free, the stack is above \$7F00, and any bad RAM there would cause Basic to crash.

You are correct about the CLEAR statement. If you enter CLEAR 500,&H3FFF, Basic reserves the area above &H3FFF, moving the stack pointer below &H3FFF, in essence giving you 16K. Some programs set their own stack while running. Therefore, Kantronics might be unaffected by the CLEAR statement. I suggest you talk to them; they'll probably be eager to help you.

The test you mentioned that reads and writes 00s and FFs can find bad cells in memory, but that is only one type of memory failure. You might have a type of memory failure that is more difficult to find. This could be an "address uniqueness" problem. This happens when you try to access one unique location in memory, but due to a decoding fault more than one location responds to that address; i.e., that address assignment is not unique. This causes outputs to oppose one another when the nonunique addresses hold different data and can cause data to be written unintentionally to other locations. The true data is not likely to be read or written.

Tests for these take very long, even in machine language. The method to test this failure is to write a background pattern (e.g., &HFF) to all memory locations, write the foreground pattern (e.g., 00) to one location, then read every other one to see if it responds to the unique change. Repeat the test for every address so that each location has held the foreground pattern, then use the opposite—background (00) and foreground pattern (&HFF)—and do it again.

Was it a 16K CoCo before the upgrade? If so, when you

upgraded, did you remove the .1μF bypass capacitors connected to pin 9 on the memory chips? On the E series CoCos there is a jumper marked "high/low". This jumper selects which 32K of the 64K RAM chips is used for Radio Shack Basic. Look for it on your board. If you find it, put it in the alternate position (while power is off). If that solves your memory problems, try the Kantronics card again; the lockups could be due to certain areas of RAM they use. If it doesn't check out, replace the following items in this order until you locate the problem:

1. U29 74LS02
2. U11 74LS138
3. The eight memory chips
4. SAM 74LS683
5. 6809

Q. I have a 16K Color Computer 2 and use it to put titles on my video travel tapes. I get a lot of line and streak interference, I guess from the computer. The method of obtaining video from the computer depends on knowing which pins will give you video and audio without RF. Can you tell me which pins to use so that I can make up the correct cable?

*J.L. Mason
Las Vegas, NV*

A. The RF method of transmitting the display is extremely prone to external noise, causing moire patterns, hash, ripples, and other annoying effects. It does have its advantage, however, in that if you have a color TV and you purchase a CoCo, you can save some bucks. Color monitors start at about \$300.

The Color Computer 2 RF modulator is U9. Radio Shack has combined the mixer and modulator into a single package for CoCo 2. Pin A is the composite video input and pin F is the audio input to the modulator. I recommend you buffer these pins before you take them out of the CoCo.

The original CoCo uses an Astec UM1285-8 module, U5, to convert composite video and audio to an RF signal for TV reception. This is the tin can located at the rear of the computer between the channel 3/4 select switch and the reset switch. The pin closest to the rear is the video input (pin 1), the second pin from the rear is the audio input (pin 2). Use a high-quality 75-ohm, low-loss coaxial cable to pick off the video signal from pin 1. Be sure to find a nice snug ground near pin 1. (The case of U5 is ground.)

If you're a hacker, there have been several articles in *HOT CoCo* and *Color Computer Magazine* on video buffers. See Marty Goodman's article, "Color-Monitor Driver," p. 98, *HOT CoCo*, April 1983, for a good buffer circuit.

Several vendors supply video buffers; some advertise solderless installation. Cheshire Cat Software sells the CoCo Audio-Video Interface (\$35, P.O. Box 115, Lafayette, CA 94594), Moreton Bay sells the Double Driver (\$24.95, 316 Castillo St., Santa Barbara, CA 93101), and Computerware sells Video Plus (\$24.95-\$39.95 depending on computer and monitor types, P.O. Box 668, Encinitas, CA 92024). Be sure to tell a vendor whether you have a CoCo or a CoCo 2! Also, check if the audio is brought out for you. ■

Reader's Forum

Basic Programs on the Word Processor

I have found a way to merge two or more programs with the aid of Color Scribes. With this ability, you can use a previously written subroutine, such as a Screen-print program, without retyping it. The steps follow:

- Renumber the line numbers of both programs so that they flow together (Program 1, lines 100- / Program 2, lines 1000-).
- Load the programs on tape in the ASCII version (CSAVE "Program 1", A / CSAVE "Program 2", A).
- Load the two programs into the cassette Color Scribes word-processing program. The lower line numbered program should be loaded first.
- Remove all blank lines.
- Set the text width to a number large enough so that wrap-around does not occur. (I use 132 columns.)
- Print (#5 on menu) the contents of Color Scribes to tape. Be sure that enough tape space is available. When the program is printed to tape in this manner it takes up about 10 times as much tape space as a CSAVE does.
- Load the program into Basic (CLOAD "Program").
- Run the program to be sure there are no errors. At this point the program can be renumbered.
- Save the program on tape (CSAVE "Program"). This will load in about one-tenth of the time as the version that was printed to tape from Color Scribes.

Using this same method, you can write Basic programs on the word processor and get full screen editing.

*Thomas C. Meiller
Rochester, NY*

Autosave

Are you saving your partial Basic program as you key it in, or do you take the chance of losing it? A good habit to get into is to SAVE it every 10 or 15 lines. By doing this, if the program in memory is lost, you already have a backup (minus the lines since your last SAVE).

I wrote Program Listing 2 to aid in saving programs. Although only one line of code is used, it contains 19 statements (operations) and is menu driven. The purpose is to save the program by typing RUN and pressing the enter key.

The utility occupies line 0 and precedes the main program being keyed in. When you run, the following occurs:

- System clock is slowed to 895KHz in the event you previ-

```
0 CLS:POKE65494,0:PRINT"AUTOSAVE
":A=PEEK(1023):IFA=0THENPRINT@22
4,"START VALUE";:INPUTA:POKE1023
,A:GOTO0:ELSEPRINT@256,"SAVE/RUN
/BOTH":EXEC44539:B$=INKEY$:IFB$<
>"R"THENK$=RIGHT$(STR$(A),2):A$=
"Z"+K$:SAVEA$:A=A+1:POKE1023,A:I
FB$<>"B"THENEND
```

ously POKEd 65495,0.

- PEEKs (1023) for a number greater than the zero at system start up. If zero is present, you will be asked for a start number (numeric suffix) that is tagged onto the end of the program name and then POKEd into memory. (I usually start at 10.)

- Prints menu. Options: The Save option saves the program only (including autosave). The Run option runs the main program and bypasses the save feature. The Both option saves then runs the main program. Typing the initial letter of any option will execute your selection. (If you do not type R or B, Save is the default.)

- Increments the numeric suffix and POKEs it into memory (Save option only).

- Runs main program if elected.

I have found this simple utility helpful in that it allows me to concentrate on my program and not on the SAVE name. It changes the name each time it is used, and with a disk utility that sorts my programs it allows me to find the most current copy.

Before using the program change the SAVE name (Z) to suit your program. (Limit it to six characters to allow for the numeric suffix.) To use with a cassette recorder change the SAVE command to CSAVE.

When you are ready to save the completed program just delete line 0 and save using a proper name.

*Kenneth McDaniel
Yonkers, NY*

Joystick Function

With the following format, you can use the JOYSTK function as part of a DEF FN call.

```
DEF FNX(X)=JOYSTK(0)
```

and subsequently:

```
X=FNX(0)
```

where (0) is a dummy argument.

It can also be used to pass arguments for the user. For example:

```
DEF FNX(X)=INT(JOYSTK(0)/63*X)
```

subsequently:

```
X=FNX(255) or Y=FNX(191)
```

This returns values of 0-255 for X and 0-191 for Y. You can use any number or variable in the function call. Use of the DEF FN in this way should simplify the writing of programs in which the joystick scale changes, or where the joysticks are called in several routines.

Don't forget, you must call JOYSTK(0) first, since this function reads the values from the other three joysticks as well.

*Neil P. Carrier
Danville, KY*

REVIEWS

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edited by Mark E. Reynolds

	ease of use	documentation	performance	error handling
10				
9				
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Application Software

CoCo Solver
JTJ Enterprises
156 Cheek Road
Nashville, TN 37205
16K
\$79.95 cassette

by **H. Lawrence Elman**

The concept behind David Jackson's CoCo Solver is so original it is difficult to describe. In a word, it writes other Basic programs, but it also does much more. It is a file manager, a spreadsheet, a mathematics-construction program, and a Basic tutorial all in one. In my 20 years of mainframe experience, I've never seen anything like it.

Performance

Once you've made a selection from a preliminary list of options, the screen displays a series of menus and prompts on its lower half and eight lines of variables on its upper half.

You first name a variable, after which you can define a relationship (using Basic commands in response to prompts), add a comment, or insert a value for that variable. You must define variables, their relationships, and

their values before CoCo Solver can operate on them.

You can also insert and delete lines in variables and send data to the printer, and all primary-control commands require only two keystrokes. The first defines the command, and the second defines the variable to which it applies.

These primary commands give you full input/output control and structure your reasoning in setting up your problem.

The CoCo Solver features an edit function that includes one of the best mechanized cursor movers I have ever seen. A machine-language driver rapidly moves the cursor forward and backward over the entries until you release the break key. However, unless your define commands are rather long, you might not realize just how effective the cursor movement is.

The program also offers a vary function that lets you vary any input value or pair of values over any desired range. For parametric studies, such a function is excellent. For example, you might vary the length of a

loan to see how payments and total interest vary for a number of different periods or for variable interest rates.

The program includes both a Basic and a machine-language file. Because the CoCo Solver takes your directions and converts them into a Basic routine appended to one end of the original Basic file, it requires space both above and below itself.

Therefore, the instructions recommend that you don't use the program in a 16K disk system, because disk-memory overhead restricts full use of some features. However, the program is fully relocatable, and there is no inherent reason why you couldn't use it in any Color Computer with at least 16K.

Ease of Use

Program author David Jackson has made a sincere effort to make the CoCo Solver easy to use. It is very logical within its own frame of reference, and therefore will become easier and easier to use the more you practice. However, I feel that it will be quite difficult for the novice to master, and learning its intricacies requires a good deal of patience.

The CoCo Solver calls for someone who is very comfortable with math concepts, including subscripting, doubly dimensioned arrays, and equivalencing of variables—someone who is not only familiar with the concepts, but who can think in such terms, much like a Fortran programmer. I'm afraid the program will be a bit too difficult for those without that ability.

Error Handling

The more I used the CoCo Solver, the more I came to appreciate the ingeniousness of using subscripts for er-

REVIEWS

ror handling, and the more I came to respect Mr. Jackson.

Because the program equivalences your variables to locations in a doubly dimensioned array, you can relate variables on one page to those on another. However, you've got to be careful if you do so in the define command and then insert or delete lines. Even though the documentation covers the process thoroughly, I found it so challenging that I avoided the practice.

This same method of subscribing let the author define the line numbers of the Basic program you generate in a very logical way: If you get a syntax error in line 13, for example, you know that you violated the Basic syntax in the define statement for page 1, variable 3.

Documentation

The CoCo Solver includes example files and a very good tutorial along with

"I should mention that David Jackson is unusually receptive to customer feedback and is cooperative."

some good documentation. But even with these aids, you might find the entire concept so novel that it will be difficult to understand, at least from a basis of past programming experience.

Conclusion

With all the superb features present in this program, what is my final assessment? I could use it to replace at least three of my other programs: a

spreadsheet, a file and database manager, and a mathematics manipulator. I probably will not.

The program, even with tremendous effort at being easy to use, simply took too much effort and concentration.

Were I teaching a college class in advanced programming techniques, I would insist on placing this program in the curriculum. It makes an excellent device for teaching Basic (and probably programming in general), and contains so many advanced concepts that it is mind-boggling.

I should mention that David Jackson is unusually receptive to customer feedback and is cooperative. Like many independent software authors, his attitude towards the user reflects intense pride of authorship. That attribute will probably result in a program so well supported that the very patient user may well receive an unusual bargain. ■

	ease of use	documentation	performance	error handling
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1				

Application Software

Sun Reporter
Sun Software
P.O. Box 7498
Wilmington, DE 19803
302-764-8328
Extended Color Basic
\$29.95 16K cassette
\$34.95 32K disk

by Steve Brown

The Sun Reporter is an affordable word processor for those who do not often need to produce long pages of text. It's a Basic program that uses machine-language subroutines to generate a text-on-graphics screen.

Performance

This word processor uses three modes. The input mode lets you enter text from the keyboard or disk/cassette; the edit mode changes written text; and the display mode manipu-

lates blocks of text, searches for and replaces text, controls the printer, and handles disk/cassette output.

The Sun Reporter lets you enter text, edit it, and print it as desired. The program supports most of the popular printer features of other word processors, such as right- and left-justification, margin controls, and imbedded printer commands. It does not, however, offer automatic headers or footers for multipage documents.

The program is also memory limited. According to the instructions, you can enter about 150 lines before you run out of memory. That translates to only three pages of text.

If you usually write only short letters or memos, that might be no limitation, but if you often create long documents, you'll have to do so in three-page chunks. The instructions do tell you how to chain these chunks together to print them as a continuous document.

Ease of Use

The Sun Reporter uses a machine-language subroutine to route keyboard entries to a graphics screen rather than to the normal text screen. Thus, you can choose an expanded screen of 42, 51, 64, or 85 characters by 24 lines.

The program has a default parameter of 64 characters, twice as large as

the normal text screen and still readable. The 85-character mode is useful for looking at blocks of text to ensure they are properly lined up for printing, although you'll need an eagle-eye and a super-sharp color set to work in the 85-character mode.

While the expanded screen is a real plus in viewing text, you'll see a "halo" of colors surrounding the letters. These artifacted colors are a phenomenon peculiar to the way the CoCo lights up pixels on the graphics screen, but you can sidestep the problem simply by turning off the color on your TV.

Sun Reporter is basically line-oriented, as opposed to screen-oriented. You enter text in a continuous flow, and the words wrap around onto the next line, as you would expect. But you make any changes to the text one line at a time.

You must edit, change words, make corrections, and so on to specific numbered lines, and that requires shifting from the text-entry mode to an editing mode. I found jumping back and forth between modes not only time consuming, but downright annoying after a while.

Error Handling

The Sun Reporter scores high in error handling. The program is not bullet-proof, and I managed to crash it a

couple of times, but the documentation clearly tells you what to do when you make an error.

Since this is a Basic program, a simple GOTO returns you to a run line and you don't lose the text.

Documentation

It took me a while to get used to the Sun Reporter, partly because it's somewhat different from the word processor I normally use, but particularly so because the documentation was not as complete as it should be.

The instructions are clear enough, but not complete enough to let me dive right in and start producing documents.

I was surprised to find many small errors in the documentation—none of which were fatal, but they did lack professionalism. A demo program would have helped greatly in learning the program's ins and outs.

Summary

The Sun Reporter does nearly all the things I would ask of a word-processing program. It can produce good-

looking copy with subscripts, superscripts, and underlining, and use all the frills on your printer. The expanded screen is nice.

But I do a lot of word processing, and for me, the program is neither large enough, nor does it allow me to edit, change, and add without the gyrations of changing command modes. However, if you do a little word processing and produce short documents, then the Sun Reporter, especially at its reasonable price, might be the program for you. ■

	ease of use	documentation
	performance	error handling
10		
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1		

Application Software

Fundfile

Parsons Software
118 Woodshire Drive
Parkersburg, WV 26101
16K Extended Color Basic
\$27.95 16K disk
\$37.95 32K disk

by Steve Brown

I believe it was Will Rogers who said, "Take some money and buy a good stock. When it goes up, sell it. If it don't go up, don't buy it." If you haven't yet perfected this method, the next best thing might be Fundfile. It will certainly help you keep close tabs on your portfolio.

Fundfile is set up to track any stock, bond, or fund investment and to generate reports that tell the financial state of the investments at any given moment. The programs let you organize and track up to 900 transactions of up to 50 securities in one account. Fundfile can produce reports on any security or on the whole package and give a picture of the net worth of your portfolio.

Ease of Use

Fundfile is menu driven from the

main program, making the system easy to use and follow. All programs are written in Basic, so you can easily make any modifications you might require, although the programs are acceptable without modification.

A separate program handles each segment of account management. For example, two programs report on transactions: One displays reports on the screen, and the other prints out the same information.

The 16K version includes programs that let you enter all account information, update transactions, and display or print out reports on any or all transactions. The 32K version has a program to produce summaries of tax information on long- and short-term capital gains, dividends, or interest.

Fundfile is easy to use, but you'll need to run through a few transactions before you're familiar with the procedures. The disk includes demo programs to step the first-timer through each phase of the system.

I found that after entering my measly little investments—12 shares of Amalgamated Buggywhip and 16 shares of the Kettledrum Fund—I could easily update file info and produce professional-looking reports that let me know at a glance how right Will Rogers was, and how far from his advice I strayed.

Performance

Fundfile can tell you virtually everything you might want to know about your investments. After setting up the original accounts, you can easily update the information with the current date and the type of transaction made: Did you buy or sell, receive or reinvest your dividends, split a stock, pay your

broker's commission, or deposit or withdraw funds?

Of particular value is the option to review and correct entries before you store or print them out.

One minor criticism of the menu-driven aspect of Fundfile: After running one of the specialized reporting programs, entering the information, and viewing the report generated, the program ends rather abruptly, without taking you back to the main menu and allowing you the choice of entering more data or ending the session. It would be nice if the authors put a "Do again?" option on the end of each program.

Entering your data is not exciting work, but once you've done so, Fundfile responds with excellent reporting. At any time, you can call up the current value of the whole account or of a specific security and review it on the screen or a printout.

You simply enter the current date and the current price per share. Fundfile then calculates the current asset value, reviews past transactions, and calculates both realized and unrealized capital gains.

The program that reports strictly to the screen has one nice feature: It displays a histogram (bar graph) of the relative dollar values of each security in your account, giving an easily grasped picture of the current holdings. Unfortunately, Fundfile doesn't print this graph on paper.

Printed reports, however, do give complete and detailed data on almost any phase of account management. The printouts include a current portfolio list, a list of transactions by security (either current or historical), dividend or interest records, a com-



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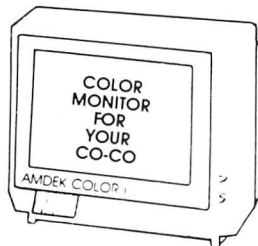
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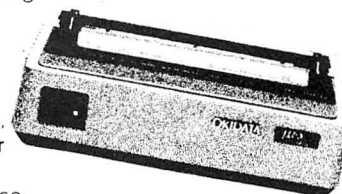
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plete balance sheet, and, for the 32K version, tax reports on dividends and account transactions.

Error Handling

Fundfile gets good marks on error handling. Everybody makes mistakes, but this program lets you correct them before you file any data permanently. There are some Basic input functions that call for a yes/no indication, but accept a default of "enter." However,

no real harm is done, except you might end up someplace you didn't intend.

Documentation

Fundfile documentation is excellent. The 38-page manual explains every step in using the program, from making a backup copy of the files to monitoring the space on a data disk to conserve it. Lots of examples and the demo programs show you just what the programs will do.

Summary

The serious investor should have Fundfile to help him plot important investment strategy; the casual investor needs Fundfile to give him solid information on whether his investments are paying off. Until I've figured out how to carry out old Will's advice, I'll keep Fundfile handy in the disk box to help me squeeze another few bucks out of Amalgamated. ■

	ease of use	documentation
	performance	error handling
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Application Software

features—they're a real treat.

Performance

Mul-T-Screen is a 4.5K program written in relocatable machine code, making it compatible with any system configuration from cassette-based, 16K Color Basic to 64K disk. However, a few options are not available in Color Basic.

The utility runs any program that prints punctuation, the alphabet (upper- and lowercase), numbers, and a few special characters. Mul-T-Screen supports most graphics commands, but will not run programs that print Color Basic's block-graphics symbols.

The program has nine different character sizes from eight characters by four lines to 32 characters by 16 lines. You also get two condensed modes. The first is a 42-by-24 display that is ideal for programs that process a lot of text on the screen at one time. The second is a 32-by-32 display that appears vertically. Tip your TV on its side and type in a line. This mode is ideal for labeling graphs and charts.

Some of the larger character sizes offer several variations of the character set. In one mode the individual characters are tall and skinny, while in another they are in reversed colors.

The utility also lets you use split screens (or limited screens, as the documentation calls them). They're useful for programming, because you can define any area of the display (from one character to the full screen) as limited, and you can define up to four limited screens at once. Therefore, you can have program instructions in one limited screen and your working display in another.

You can also have a one-line screen with which you can scroll text from left to right or from right to left at selectable speeds.

Mul-T-Screen supports printer output in two ways. If you have an Epson or Gemini printer, you can get a print-out that is identical to your screen display. With other types of printers, every text character that goes to the screen also goes to the printer.

The usual printer-control codes still work and do not appear on the screen. If both Mul-T-Screen and your printer use the same control code (CHR\$ 0-31), both the printer and the program respond to it, unless you first switch the printer off. This feature is a help when you're debugging a program with the trace command (TRON).

You can use all the Extended Color Basic colors, even if you only have Color Basic. You can have Extended Color Basic in one color set and Mul-T-Screen in the other, which lets you use four colors in the high-resolution modes.

Those without Extended Color Basic can use the same colors and high-resolution graphics as programmers with upgraded machines, but you'll have to add a few more CHR\$() codes. You can also switch between color sets, or if you set one as the primary color set, Mul-T-Screen defaults to it whenever you change text modes or sizes.

By using the normal Basic commands, or by defining the horizontal and vertical locations with the CHR\$() commands, you can have full control over the cursor.

CLS works normally, but PRINT@ works as it should only when you're using the standard 32-by-16 text size. The instructions advise you to use the CHR\$()s for most applications.

Mul-T-Screen has a few limitations. The condensed character modes crowd the lines and are somewhat difficult to read. When I modified a character set with the character-generator

Mul-T-Screen

Incentive Software

P.O. Box 323

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Port Huron, MI 48301

16K

\$24.95 cassette

\$27.95 disk

by Gary W. Clemens

Mul-T-Screen is a character-generator utility with which you can mix text and graphics, use different text sizes, expand the screen size, and use true upper- and lowercase letters. The disk version also lets you create special graphics shapes or new character sets, or you can modify the built-in character set.

You can even create foreign-language character sets and save any new sets to disk.

I looked at the disk version, which contains several machine-language programs that load according to your system configuration. The disk also has three demonstration programs, the character generator, and a program from which you print out updated instructions. The demo programs highlight the many Mul-T-Screen

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COMING NEXT MONTH

Most of us don't need an excuse to stay indoors with our Color Computers during December, but next month's *HOT CoCo* has dozens of them.

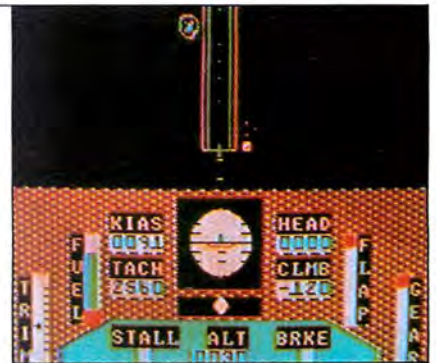
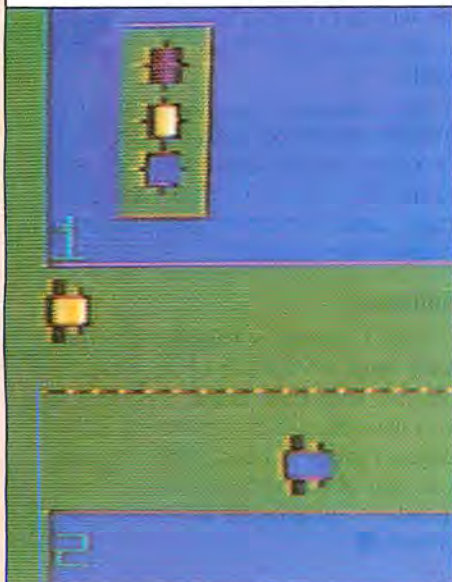
Take, for instance, Rob Ainscough's game on drag racing. Not only do you compete against another player or the computer, you build your own racer.

The more serious among you will appreciate a pair of articles on disk drives. First, Brian Alsop will give you maintenance tips, and then Mark Goodwin will provide a disk-timing utility in Assembly language.

When was the last time you saw a home-brew text editor that offered global functions? William Bonnell has written one for December that doubles as a word processor.

Tom Mix Software has a reputation as a purveyor of fine flight simulators. Next month, Scott Norman relates his journeys in *Worlds of Flight*, Tom Mix's latest. Scott will also review the *Workbase* database manager. *Workbase* might be just what you are looking for, or maybe it isn't. You'll know after reading next month's *HOT CoCo*.

Don't forget to check out our product reviews in December, either. After all, it is getting close to Christmas, and perhaps you will find some gift ideas. ■



S[ave] Save a file to a device

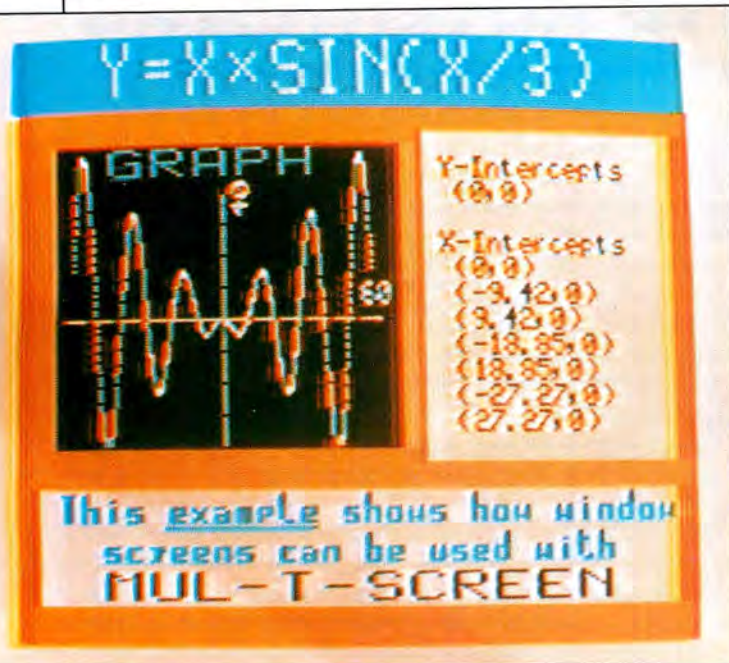


Photo 1. An example of Mul-T-Screen's windowing ability and different character-size combinations.



Photo 2. An example of Mul-T-Screen's ability to represent longer graphic characters and their colors and change the background color.

program, the condensed mode ignored the modifications. You can't underline in the condensed mode, either.

Those of you with 16K systems might find that the lack of free memory available for other programs is a problem. Mul-T-Screen takes 4.5K and requires the graphics pages. The documentation tells you how to overcome some of these limitations, but warns that you will have to give up some of the extra features.

Those with 64K machines will also have a problem: If your program hangs up and you press the reset button, you lose everything. You'll have to reload the program.

Since every Mul-T-Screen command requires one or more CHR\$() statement, it would have been convenient if the author had included a key sequence to generate these statements.

I also found that Incentive Software's copy-protection format significantly limits their program's usefulness. It's inconvenient to load Mul-T-Screen and then load my working program. I'd like to put the utility on every disk holding programs that use it.

Ease of Use

Although it's not the best imaginable, Mul-T-Screen is smooth and dependable. Once you have installed it,

you can forget it. Programs generated with the utility run as well as programs that don't use Mul-T-Screen.

Typing the extra lines of control codes to interface with the utility requires a little work on your part, but the end result is worth the extra effort.

Mul-T-Screen (or any character generator) is slow printing text on the screen. It takes time to generate the graphics, and the decreased speed is noticeable when you print much text at once.

Getting the utility up and running is almost effortless. The Basic loader that checks for Color Basic or Extended Color Basic and the available memory does all the work. You just have to answer a few prompts.

Once you've installed Mul-T-Screen, its commands are easy to use in another program as any of the Basic commands. Using it in the direct mode, however, requires more effort, because you must use so many CHR\$() statements.

Using the character editor (disk version only) is also easy. The screen prompts you at each step as you modify the existing characters or create new ones.

Error Handling

I have yet to find a way to crash Mul-T-Screen. Of course, you can type in mistakes that will crash the

programs on which you're working, just as in normal programming, but that's all. Any errors I've found using this utility were my own fault.

Documentation

Mul-T-Screen comes with 16 clearly written pages that cover all its features. You also get a chart showing the different character sizes and the CHR\$() codes you need to call them. It doesn't show you what each character size looks like, though, and I would have appreciated that addition.

The explanation of each feature is adequate, but perhaps a bit brief, especially for those who aren't quite up to speed with their Basic programming skills.

You also get an explanation for relocating modified character sets to fit in other size systems, memory locations for cursor control, the video page, and a memory map of some parts of the program.

Summary

Mul-T-Screen is valuable for those who want to improve upon what they can do with their Basic programs. If you have enough programming knowledge to modify other Basic programs, you can also add Mul-T-Screen commands to enhance the original author's efforts. ■

	construction quality	documentation	performance	ease of use
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Hardware

EPROM Programmer v. 2.5

Intronics

Box 13723

Edwardsville, KS 66113

distributed by:

DSS Peripheral Corp.

62 Commerce Drive

Farmingdale, NY 11735

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\$140

by James Barbarello

An EPROM programmer lets you store programs or other information in an erasable programmable read only memory (EPROM) integrated circuit. If you find you no longer need the information, and you have an ultraviolet EPROM eraser, you can erase the EPROM and then reprogram it with new information.

The Intronics EPROM Programmer can program most common EPROMs: 2508, 2578 (H or L), 2758 (H or L), 2516/2716, 2532, 2732, 2732A, 2564, 68764/68766, MK2764, 25128, and 27128. It also offers capabilities not found in other programmers.

Construction

The Programmer comes with a schematic diagram, eight pages of instructions, and a 90-day warranty. The unit is a double-sided, glass/epoxy printed circuit board with gold-plated edge connectors.

The PC board contains two 6821 PIAs, a 7407 TTL IC, a switching power supply, a 2716 EPROM (containing the operating software) and a 28-pin ZIF (zero insertion force) socket to accept the EPROMs you want to program. The PC board is well designed and constructed, and all ICs are socketed.

Documentation

The quality of the hardware is much

better than the documentation. You must read through the first three pages before you reach the startup procedure. The text also contains a number of typos, but none that should be a problem.

Those familiar with EPROMs and EPROM programmers will find the instructions adequate, but the first-time user might wish for more information. On the positive side, the text includes some theory on the power supply's operation, some troubleshooting tips, a list of parts, and some advanced software information.

The instructions become particularly confusing when they discuss using the programmer with a disk-based system. They say that you must use the Multi-Pak expansion unit if you have a CoCo 2. The text gave some modifications you must make to use the Programmer with the original CoCo, but I found the details unclear.

I also wondered if I must use a Y cable or the Multi-Pak interface to connect both the disk controller and the programmer to the single CoCo ROM port. A call to DSS Peripheral Corp. didn't provide the answer, and I couldn't reach George Indorf, the designer.

Setup

Setting up the unit is easy: Just plug it into the CoCo's cartridge port and then turn on your computer. Load your data into the buffer (a 2K-8K area in the CoCo's memory, starting at 2000 hex). You can get a list of devices that you can program and a menu of available functions to perform on the device you've selected.

Performance

The Programmer lets you verify that the EPROM is blank (note, though, that the Programmer will not erase EPROMs). You can, of course, transfer the buffer contents to the EPROM and thereby program it. You can compare the EPROM contents with the buffer. If the data does not agree, you can see the contents of both the EPROM and the buffer. You can also move the EPROM contents to the buffer.

With the Programmer, you can slide memory, fill the buffer with FFs, return to Basic, change the buffer address, and erase EEPROMs. Although you cannot erase EPROMs with the unit, you can erase EEPROMs

“When you're not programming EPROMs you can use the Programmer as a parallel-printer interface. The instructions show you how to construct a printer cable. . .”

(electrically erasable PROMs), like a 48016.

You can also transfer a Basic program to an EPROM and then to a ROM pack, should you decide to produce a product that way. Load your Basic program from tape and EXEC 50961 to condition the program to execute at C000 hex (the ROM port's location).

This also imparts an auto startup to the EPROM (you can eliminate the auto start if you want). A list-default option will cause the CoCo to reset if someone attempts to list the program in your EPROM.

After you've conditioned your program, the screen will tell you what size EPROM (2K, 4K, etc.) you'll need to hold your program. You then EXEC 49152, as with the normal start-up procedure, and program an EPROM that is as large or larger than the recommended size. You can then place the programmed EPROM in a standard ROM pack.

Printer Interface

When you're not programming EPROMs, you can use the Programmer as a parallel-printer interface. The instructions show you how to construct a printer cable, which connects your printer to the Programmer's ZIF socket.

When you're ready to print, the data is redirected through the Programmer to the printer. If you reset your machine at any time, you must EXEC 50886 before printing again.

The interface performed admirably, but, again, I found the documentation on it a little confusing. It would be helpful to have a picture of the cable

REVIEWS

construction along with the pin-connection list. Also, you must place a 24-pin header in the 28-pin ZIF socket. A simple statement explaining this apparent conflict to first-time users would eliminate some confusion.

If you have been printing at 600 baud, you'll be pleasantly surprised at the increased speed of this true parallel interface.

Summary

In spite of its documentation, the Intronics EPROM Programmer is a very capable device for those who want to store their software on a chip. The fact that the unit doubles as a parallel-printer interface certainly increases its value.

You'll probably also want an ultra-

violet EPROM eraser if you intend to reprogram the chips, and disk-based CoCo 2 owners must have the Multi-Pak interface. You don't need personality modules for different types of EPROMs, but of course you will need a supply of blank EPROMs, which aren't cheap. Don't plan on transferring all your programs to ROM pack unless you've just won the lottery. ■

	organization thoroughness	production readability	quality
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Books

Golden Flutes and Great Escapes

Delton T. Horn

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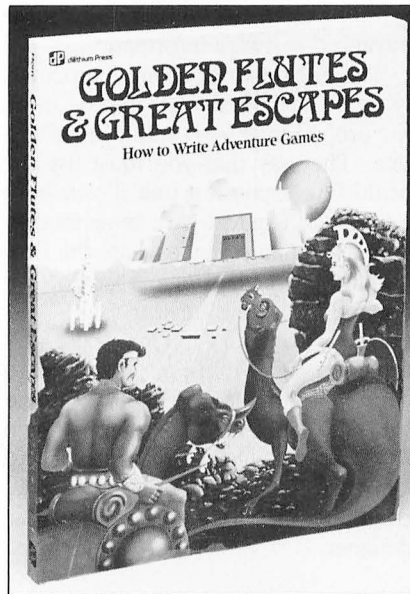
\$29.95 book plus disk

by Graham Heywood

Golden Flutes and Great Escapes is the rather prosaic title of Delton T. Horn's book that takes you from a first look at adventure gaming to writing and marketing your own material. It's a valuable source of information to all aspiring authors in this particular field.

Although this book aims at the TRS-80 Model III and 4 market, all its information is valid for Extended Color Basic CoCos, and you can use most of it on 16K machines. Among other things, the text contains program listings for four adventures, each written in Model III Basic, without the higher functions, so you can simply type them into your Color Computer.

For the CoCo owner, only the game, Mars, requires more than 32K in its given form. However, a little judicious trimming (e.g., cutting out the welcoming messages and a few of the more esoteric aspects of play) should keep a playable version within the 32K limits.



Golden Flutes & Great Escapes

Golden Flutes and Great Escapes gives a thorough treatment of all aspects of adventure writing. It includes chapters on creating a plot, beginning the program (including examples of flowcharting), complicating the game, writing instructions, and adding extras.

An entire chapter is dedicated to each of the four adventures. These include the program listings and discussions on various aspects of each game. The final chapter offers advice on marketing your software and gives a table of selected software publishers, although Adventure International will be the only one of particular relevance to Color Computer programmers.

The adventures include Treasure Hunt, a 16K game in which you are the captain of a six-man crew looking for a treasure that is randomly hidden on one of 10 islands near a coral reef. You can't leave your ship, but your crew members will do exactly what you tell them, as you send them out to search the islands.

The Golden Flute is a fantasy adventure in which you must guide your magic chariot through a land of elves, ogres, and gremlins to recover the Golden Flute and return to the Woodlands. This game also includes random elements that make the solution a little different each time you play.

In The Great Escape, you must find your way out of a 100-room building. The presence of villains of differing persuasions and the odd trap or two make your task more interesting. Once again, the escape route is different each game, and objects are placed randomly throughout the house, so you might find yourself in new situations each time you play.

Mars is the *piece de resistance*: a 48K, complex puzzle that works the many options it offers into a smooth, descriptive adventure. As you might suspect, you search for treasures, battle monsters, and solve the accompanying problems on the planet Mars. Standard adventure fare, you say? Well, so it is, but that's what this book is all about.

Golden Flutes and Great Escapes should be a great teaching aid to beginning and more experienced adventure programmers alike. It takes you step by step through the fundamental elements and finer points of enhancing your work to show you how to write sophisticated, playable games.

The chapter on adding extras even touches upon putting sound and graphics in your programs, although not in much detail. I especially liked the fact that Mr. Horn included a real-time input routine to give the realism of timing and quick thinking to your games.

Golden Flutes and Great Escapes takes an easy, informal approach to its subject. It's interesting and informative, and anyone who can type in a program listing should find it easy enough to understand. ■

REVIEWS

	ease of use	documentation	performance	error handling
10				
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Application Software

Assembler Math
Rainbow Connection Software
 3514 6th Place NW
 Rochester, MN 55901
 507-288-4424
32K, Extended Color Basic
\$24.95 cassette
\$27.95 disk

by **Scott L. Norman**

Bill Kuhl's Assembler Math claims to teach "... the fundamental concepts of binary and hexadecimal math so essential to Assembly-language programming on the CoCo." That may be overstating the case; this is essentially a drill-and-practice

program that provides a good workout in the conversion of quantities from one number system to another.

It can certainly help you gain some dexterity in base conversions, although I wonder whether a novice would actually feel he had learned the mathematical principles involved, as opposed to the manipulations. This is not a product that emphasizes the mathematical fundamentals.

There are five types of base-conversion exercises in the program: decimal to and from binary, decimal to and from hexadecimal, and binary to hexadecimal. (There is an error in the listing on the cover of the manual.) In addition, you can select problems in binary addition or subtraction. The video "worksheet" is actually a high-resolution graphics screen on which the characters are drawn.

In many cases, the program provides a visual prompt for the direction in which you are to enter information: from right to left or from

"... this is essentially a drill and practice program that provides a good workout..."

left to right. This changes with the particular procedure employed, of course. You can enter data without pressing the enter key, just as with a Basic INKEY\$ routine. This means that you don't have a chance to change your mind without getting a "Wrong!" from the computer first. Very humbling. There are also plenty of audio clues to tell you when you've gone off the track.

Each type of exercise receives a single page in the small Assembler Math manual. A single paragraph usually gives a general description of the procedure. Another paragraph or two describe what you will see on the screen when the computer starts generating problems. You also get more detailed instructions for working through the necessary steps.

Finally, there is a small printout



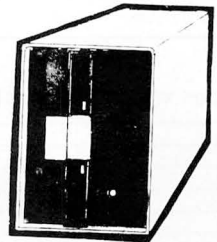
The **HJL Keyboard** is generally preferred by many touch typists in that it feels like many electric typewriter keyboards. It does require the cutting of one plastic post for installation but mounts in a nice recessed position. This is Jeff's favorite Keyboard. Please specify board revision on this model, or call us to help you determine it \$79.95



The **Macatron Premium Keyboard** is preferred by many programmers because it uses the Alps keys as used in the Model IV, as well as many other computers. This is Al's favorite keyboard because of that. This model requires no post cutting but the board revision should be known \$79.95



The **Key-tronic Keyboard** is the newest keyboard from a very old Company. This keyboard has no comparison and is by far the best. No cutting required, no need to know your revision board. It is higher priced, and worth the extra cash \$89.95

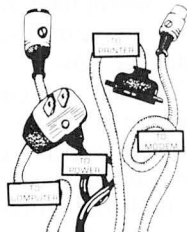


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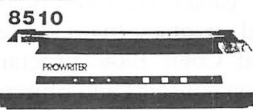
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showing the screen's appearance at the end of a successful trial. In many cases, all the intermediate steps will still be visible at the end.

This is sometimes very useful. Remember how tough it was to learn where everything went when you were studying long division? Or square roots? It can be very handy to have someone show you the mechanical aspects of working through an unfamiliar procedure.

A demonstration mode is also available: You can watch the computer do sample problems of various types, to get a feeling for how things go. It may be best for the beginner to have a crack at going through the exercises unaided before calling for the demonstration, however.

The screen action—the point at which numbers are being entered—moves around quite a bit, and I suspect the totally automated version might be confusing for the first-timer. Getting the speed right is an impossible task for the programmer, anyway.

After you have successfully solved a problem, you are given what the manual describes as the C.A.R. option: Continue with the next type

of exercise according to the order established on the menu, do the same example Again, or Return to the main menu to select another type of calculation altogether. You also need the main menu to select another problem of the type that you just finished.

Assembler Math can provide enough drill material to let the diligent user become quite adept at base-conversion calculations. However, I suspect that only a few of these topics are likely to come up very often in common Assembly-language programming. Decimal/hexadecimal conversions are terribly important, but I have my doubts about some of the others. It is ironic that a calculator is generally needed to carry out the important conversions anyway.

Consider the problem of converting, say, \$DEFF to decimal. You must multiply the decimal equivalent of each hex digit by the value of its position in the number (see "Colormania," *HOT CoCo*, January 1984, p. 100). That means that sooner or later you're going to have to multiply 4,096 by 13. That's not exactly easy mental arithmetic.

You can buy a pocket calculator capable of doing decimal/hex conversions for about the same price as Assembler Math itself. Not that I'm about to advocate turning everything over to the calculators; people who plan to do much in Assembly-language should develop a certain level of competence in these manipulations, just as it was probably good for you to have learned that long division in the first place.

I just think it's important to understand that Assembler Math can only help you develop one of the auxiliary skills that can come in handy if you plan to expand your skills in the direction of Assembly-language programming.

With that out of the way, I can report that the program works well. It is thoroughly error-trapped, and the manual and examples are probably enough to let the average user develop a reasonable level of skill.

The documentation doesn't assume too much background, either. It even includes a small glossary of obvious terms, and a decimal/binary/hex conversion table. The table extends from 0-71 (decimal), by the way. I have no idea why. ■

	ease of use	documentation
	performance	error handling
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Application Software

Peanut Butter Panic

Catalog no. 26-2523

Two joysticks, 16K, Extended Color Basic

\$19.95 cassette

Radio Shack

1400 One Tandy Center

Fort Worth, TX 76102

a branch of the group that brings you *Sesame Street*.

These games use some of the best animated graphics I've ever seen for Extended Color Basic programming. The lesson concepts and objectives are clearly defined, and the manuals are easy to understand.

Grover's Number Rover

This package consists of six games for ages three to six that the popular *Sesame Street* character, Grover, brings in his space ship, the Rover.

The first, Twiddle Windows, is a simple game for the youngest child. In it, one or several Twids appear below the Rover, and the child must use the up-arrow key to let the Twids into the ship, one at a time. If there are any

Twids left, Grover shakes his head, indicating there's been a mistake.

In Twiddle Numbers, the child must press the number key that corresponds to a number that appears on the Rover. A correct answer sends the number into the space ship.

In Twiddle Counting, a number of Twiddlebugs appear on the screen. The child must count them and press the appropriate number key. If he does so correctly, the Twiddlebugs enter the Rover.

Twiddle Adding is for the older children in the age group. An addition problem appears on the Rover, and the child must calculate the answer. If he finds the problem too difficult, he can press the right-arrow key to bring out a group of Twiddlebugs whose total is equal to the elusive answer. The child can then count the creatures to discover the solution.

Twiddle Away is similar to Twiddle Adding, except that here the child must solve a subtraction problem. This time, the down-arrow brings out the correct number of Twiddlebugs as an aid.

Grover's Number Rover

16K, Extended Color Basic

Catalog no. 26-2522

\$19.95 cassette

Taxi

Catalog no. 26-2509

Joysticks, 16K, Extended Color

Basic

\$19.95 cassette

by John Steiner

Grover's Number Rover, Taxi, and Peanut Butter Panic are part of a series of educational software from the Children's Computer Workshop,

REVIEWS

In the last game, Twiddle Play, the child can make up the rules. He can use the four arrow keys to move Twiddlebugs on and off the screen, and in and out of the Rover.

Grover's Number Rover is an excellent educational game for the preschooler, and the familiar Muppet, Grover, along with the fast action and bright colors, help capture the child's interest.

Taxi

Taxi is a strategy game for one or two players, ages seven and up. The object is to pick up a passenger and take him quickly over the most direct route to his destination. The program calculates the fare according to the distance traveled, and drivers get tips for taking the shortest routes. But you can also get fined for running red lights or breaking other traffic laws.

Drivers race against time to deliver as many passengers as possible, and players can choose to operate their taxi company in Dallas, New York, San Francisco, London, Paris, or Shanghai. You can change cities after each game.

In the two-player mode, children cooperate to earn money for the taxi company, instead of competing against each other.

Peanut Butter Panic

Peanut Butter Panic is an arcade-style, cooperative-effort game, again for ages seven and up. You must have two players for this one.

The object is to jump up and catch as many stars as possible. However, players cannot catch the highest stars without helping each other. One player must jump on a spring, which throws the other high into the air.

When players have jumped and caught too long without eating, they become thin and can't function well.

"These three games, generally speaking, are excellent. They offer great graphics, high interest, and sound educational principles."

But they earn peanut butter sandwiches when they catch stars, and they can eat these to renew their strength and weight. It's best if the player jumping on the springs eats enough to become fat, so he can send his partner up higher. Players can take turns being jumpers and catchers.

The challenge is increased by the fact that dreaded snarfs appear during the action to steal peanut butter sandwiches from your stack. You must be quick to catch these creatures before they get the sandwich. Your score depends upon the number of sandwiches

you've accumulated or eaten.

Although Peanut Butter Panic is an arcade-style game, it offers a valuable lesson in cooperation.

Summary

These three games, generally speaking, are excellent. They offer great graphics, high interest, and sound educational principles. However, the three copies I saw wouldn't run with a disk drive connected and, therefore, can't be transferred to disk without extensive modification.

That's not so bad in itself, but the tapes take several minutes to load because they access several files. Wisely, the author added poems and screen displays to provide some entertainment during the long load time, but still this puts a strain on the child's interest, even though the programs are so successful at being entertaining once they are loaded. A copy on a quicker-loading disk would be an improvement.

I appreciate the fact that the book that comes with each program directs children towards educational activities that don't require a computer. This indicated a conscientious approach to marketing a worthwhile product.

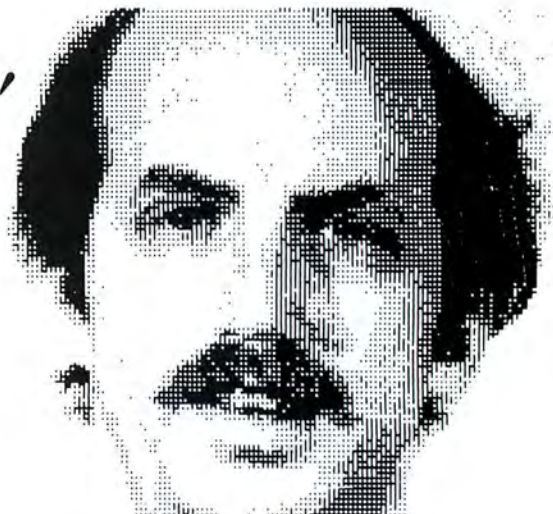
The Children's Computer Workshop series looks like software that can be an important aid in developing your children's thinking skills. The programs are well done, they teach some valuable concepts, and they are affordable. What more could you ask? ■

Photos. Educational Software from Children's Computer Workshop



TALKHEAD FOR THE 'REAL TALKER'

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Gameware



Stellar Lifeline

Here comes Thanksgiving vacation, and you've got nowhere to go, eh? Well, this month you can take one of two trips to the far reaches of the galaxy, become a bird watcher at the South Pole, or risk your life in a Canadian hockey rink.

Radio Shack

I suspect you Defender addicts will love **Stellar Lifeline** (Radio Shack, 1400 One Tandy Center, Fort Worth, TX 76102, cat. no. 26-3047, 16K, \$19.95 ROM pack); it's a great piece of arcade action, and I'm not even particularly fond of Defender.

But the idea is the same: You pilot a starfighter back and forth across the screen, warding off alien threats. Only this time you don't protect cities, but a fleet of six cargo ships.

A convenient radar screen at the bottom of the display shows your position, the location of the cargo fleet, and the presence of any alien elements.

You must escort your fleet from one side of a right-scrolling screen to the other. The cargo ships bob up and down a bit, but doggedly, albeit slowly, fly from left to right.

At the easier levels, asteroids float randomly about in the path, and at more difficult levels, magnetic mines and enemy saucers join the hazards. They might be in front of you, or they might be behind—only your radar knows for sure.

You lose your ship, or a cargo ship, if it hits one of the obstacles. The idea, then, is to destroy all alien objects before they touch your ships.

Stellar Lifeline has most every-



Star Trader

thing you could want in an arcade game: excellent graphics, challenging action, and precise control. I particularly like the fact that you can choose to use either the left or right joystick or the arrow keys. I found the arrow key control to be far more efficient.

The best strategy seems to be the one I'm incapable of: patience. Those pilots who stick close to their convoy so they can move quickly from front to rear and ward off enemy attacks, usually score the highest. Personally, though, I can't resist the fast-paced action of zooming along at top speed, firing and dodging quickly. But I lose a lot of ships that way.

Also, when you become accustomed to the game, start out on the hardest level. You'll rack up a lot more points.

Computerware

Those of you who took Han Solo as your favorite character in *Star Wars* will love **Star Trader** (Computerware, P.O. Box 668, Encinitas, CA 92024, 619-436-3512, joystick, Extended Color Basic, \$24.95 32K cassette, \$27.95 64K disk), a graphic adventure that puts you in command of an intergalactic cargo ship.

You begin in a port city on a planet somewhere in the known universe. You have 500 credits and your object is to double your purse by delivering cargo to distant ports.

During each phase of play—from acquiring cargo through transporting it and selling it—the top half of the screen displays the scene from your ship's viewscreen, while the bottom half presents the options that are available to you at that time. You make your selection via a joystick-controlled window.

The great thing about this game is the different strategies you can use



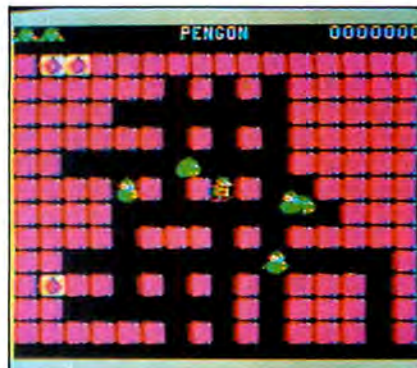
Ice Hockey

to reach your goal. You can be an unwaveringly legitimate trader, negotiating legally for cargo and doing your best to deliver it to the proper destination on time; you can be an unscrupulous blackguard who steals goods from other traders and sells them on the Black Market; or you can use your shrewdest combinations of above- and below-board dealings to amass your fortune.

You can turn a quick profit by the unscrupulous method, but there are heavy fines when you get caught. My attempts to play this way showed me once again the truth in the old adage, "Crime doesn't pay."

Other aspects of the game add to its interest. Managing your fuel supply will be a significant factor in your success or failure, especially if you run out of fuel somewhere in space.

A normal hyperspace jump conserves fuel and is less likely to mis-jump, but double speed can get your cargo there faster, and for more profit. Can you afford the risk? And keep an eye on those ships that sometimes appear on your view-screen—they might just be nasty pirates who attack without warning.



Pengon

Star Trader is lots of fun. It's a near-perfect blend of arcade action and interactive role playing. You get five skill levels from which to choose, and plenty of opportunities to test different tactics for creating wealth.

Computerware's **Ice Hockey** (32K, joysticks, \$24.95 cassette, \$27.95 disk) puts you in control of both members of a two-man hockey team, as you match your skills against the computer or a human opponent on one of eight levels of difficulty.

One of your players guards your net and that half of the court, while the other skates only in the opponent's half. No player can cross the center line. When the puck crosses from one half of the court to the other, the program automatically switches joystick control to your player on the appropriate side.

Ice Hockey provides some fast sports action, but the graphics are a little strange, as the players seem to flash rapidly on and off. Sometimes this makes it hard to tell just who has the puck, but then that adds to the fun.

Those of you who are a little short on patience and want to start playing a game as soon as you've loaded it might find this one somewhat trying. The program first asks you if you want to play in the U.S. or Canada. When you've made your selection, you'll hear that country's national anthem—all the way through, far as I can tell—and you're even asked to stand. The game is also in real-time, and halfway through you get to sit through halftime while a little man in his cart resurfaces the ice.

But if you have patience enough to sit through these touches of realism, you'll find Ice Hockey an entertaining test of your ability between the boards.

Spectral Associates

Pengon (Spectral Associates, 3418 South 90th St., Tacoma, WA 98409, 206-581-6938, 16K, one joystick, \$24.95 cassette, \$28.95 disk) sends you to the South Pole where you try to help Willie the Penguin defend himself against encroaching sea lions (at least that's what the documentation says they are—they look more like gum drops).

When the game begins, Willie ap-

pears in the center of a maze of ice blocks, with five sea lions closing in. Willie's only defense is to push blocks of ice onto his adversaries.

Three of the blocks are a different color, and if he can push those three together, he wins the round and gets a fat bonus.

Pengon is a challenging game, but I found the joystick control just a little too slow to respond. You've got to plan and move quickly to save

Willie, and to be trapped because of the inability to control your character is frustrating.

However, I enjoy the strategy involved in avoiding the sea lions long enough to push the three cubes together. Those particular blocks are usually located at different areas of the screen, and you've got to decide quickly how you can best get them together. It's a real challenge.—**M.E.R.** ■

Tips

Do you have a hot tip on a game, or need one? Share your discoveries and frustrations here.

More Madness

Eds. note—From the mail we've received, it looks like several people are having trouble with Radio Shack's Madness and the Minotaur. Last month, Ruth Chaffin sent in a list of spells for the game, and both she and Paul Riddle gave tips for getting out of the maze. But the questions keep coming.

I've found several treasures in Madness and the Minotaur, but I can't get any points for them. I also can't get the shield or do away with any of the monsters.

*Don Johnson
Cottage Grove, MN*

Lost in Egypt And Daggorath

I've found the Vulcan and Rime rings in Radio Shack's Dungeons of Daggorath. Can anyone tell me the incantations for them?

Also, how can I get from the pool to the treasure room in The Sands of Egypt? I suspect I have to drain the pool, but how?

*Randy Roth
Essexville, MI*

A good dictionary (I use Webster's New Collegiate) will give you helpful clues to the incantations and powers of the rings and flasks in Dungeons of Daggorath.—Ed.

Pyramid Tips

In the July 1984 *HOT CoCo* (Tips, p. 108), Kent Jackway asked how to get past the snake and through the maze in Radio Shack's Pyramid. To get past the snake, drop the scepter, get the statue case, and then get the bird statue. Throw the statue at the snake and see what happens. As for the way through the maze, I'm still working on it.

Now, can someone tell me how to get past the guard dog in Bedlam?

*John Maika
Valparaiso, IN*

In one place in Pyramid, there's a pit that's too wide to jump. Swing something special and a bridge will appear.

*A.D. Naron
New Caney, TX*

More Pyramid Puzzles

Where do you get the coins for the vending machine in the Pyramid maze?

*Brian Rogers and Jerry Hunter
Dudley, NC*

I've scored 120 points in Pyramid, and I always let the mummy have his treasures before I look for the treasure, but I can't find it. In the July 1984 *HOT CoCo* (p. 108), Kenneth Dey said that you're only eight turns from the chest when you enter the maze, but can anyone tell me those eight turns?

By the way, the tips you've published for Madness and the Minotaur have helped me very much. As for Paul Riddle's question, the packrat will bring you a treasure, although I don't know how to get him to do so. However, you'll see the message, "You can thank the packrat for his treasure."

*Richard Gain
Tyler, TX*

In Pyramid, what happens when you've got all the points? Typing PLUGH does nothing.

*Henk Fikke
Delfzyl, Holland*

The Rug in Raaka-Tu

How do you get across the oriental rug in Radio Shack's Raaka-Tu? I assume that's part of the solution.

*A.D. Naron
New Caney, TX*

A Blast In The Monster Maze

In Radio Shack's Monster Maze, touch your gun to the wall and fire. The bullets will pass through.

*David Schuff
Altamonte Springs, FL*

PRODUCT NEWS

edited by Celeste Wrenn

Information used in the Product News section is supplied through manufacturers' press releases. *HOT CoCo* has not tested or reviewed these products and cannot guarantee any manufacturer's claim.

More Sugar

Sugar Software has announced three new products for the Color Computer.

The Presidents of the United States is three programs in one designed for the whole family. It is a study guide to learn about the accomplishments of our presidents, a multiple-choice game for the younger learners, and a challenging identify-the-presidents game for high-school, college, and adult players. It's all machine language, menu oriented, and easy to use and modify. The 16K and 32K versions on the same tape cost \$24.95 and the 32K disk costs \$29.95.

Flying Tigers is an arcade-type game with action, color, sounds, and graphics. It has five skill levels and a pause button. The 16K tape costs \$24.95 and the 32K disk costs \$27.95.

The CoCo Calligrapher turns your Color Computer into a calligrapher's quill if you have a bit-mode printer. The type is 36 points high and variably spaced. There are currently three type styles available: Old English, Gay Nineties, and Cartoon. The 32K ECB tape costs \$24.95 and the 32K disk costs \$29.95.

For more information contact Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068. 614-861-0565.

Reader Service ✓556

Animation Fun

Triad Pictures Corporation has developed the Animator, a full-featured animation program, for the Color Computer.

The Animator features motion-picture animation techniques, 12 help screens, and an extensive manual. The average nonprogrammer can create sound effects and animated cartoons of up to a minute and a half with the illusion of motion.

The animator comes with a library of ready-to-use cels and back-

grounds, sample sequences, built-in sound effects library, and a course in the art of animation, as well as the "animation studio" itself. The three-cassette package requires 32K and Extended Basic. It lists for \$35. Contact Triad Pictures Corp., P.O. Box 1299, Sequim, WA 98382. 206-683-6459.

Reader Service ✓553

Dieting Success

Draco Software wants to help you make a success of your diet whether your goal is to lose or gain weight.

Their Calorie Counter Weight Analyzer program will determine your ideal bodyweight by using the input you provide about your lifestyle. It will determine the number of calories you need to maintain your present bodyweight. This is then contrasted with your day's intake from a selection of over 400 foods. The program costs \$29.95, requires 32K, and is available on cassette.

For more information contact Draco Software, 22 Lassell St., Portland, ME 04102. 207-772-8463.

Reader Service ✓555

Riteman Printers

Riteman has introduced four new printers. The **Riteman Plus** prints 120 characters per second with a line feed of 0.10 second. The DIP switches are accessible from the outside panel. It costs \$399.

The **Riteman Blue Plus** prints

140 characters per second with a line feed of 0.10 second. It has both full-height, block-graphics character sets. It costs \$499.

The **Riteman II** comes with 2K or with an optional 8K RAM buffer. It prints 160 characters per second and costs \$549, or \$599 with 8K.

Each printer comes with the following features: one-year warranty on parts and labor; friction or pin feed or an optional adjustable tractor feed; easily replaceable, fully-contained cartridge ribbon; a steel cable for print-head movement; and all fit in a standard 3-inch briefcase.

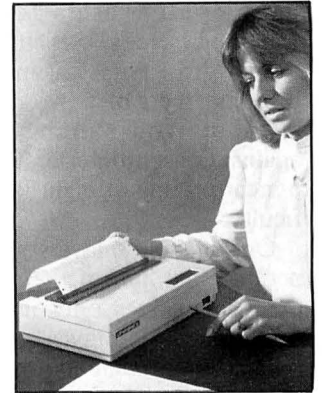
The **Riteman 15 Business Printer** comes with 2K or optional 8K RAM buffer. It prints 160 characters per second. The paper can be fed from the bottom as well as the rear. The roller bar can be moved with an external control lever without removing the cover. Controls on the front panel let you adjust the forms position without affecting printing modes. It comes with a one-year warranty, and fully self-contained ribbon cartridge. It costs \$799, or \$849 with 8K.

For further information contact Riteman, Airport Business Park, 431 North Oak St., Inglewood, CA 90302. 213-453-6688.

Reader Service ✓550

The Great Little Printer

Centronics Data Computer Corp. has announced a new series



The Great Little Printer from Centronics

of personal printers.

The portable GLP printer measures 13 inches wide, 7.5 inches deep, 2.8 inches high, and weighs 6.6 pounds. It has block graphics and near letter-quality printing. The standard features include enlarged, condensed, emphasized, and double-strike print modes. Superscript, subscript, and underline are also standard.

The GLP is available with a Centronics parallel interface or with both RS-232 and Centronics parallel interfaces in one unit. It offers a print speed of 50 characters per second for draft printing and 12 characters per second for near letter-quality printing. The GLP costs \$299. Contact Centronics Data Computer Corp., 1 Wall St., Hudson, NH 03051. 603-883-0111.

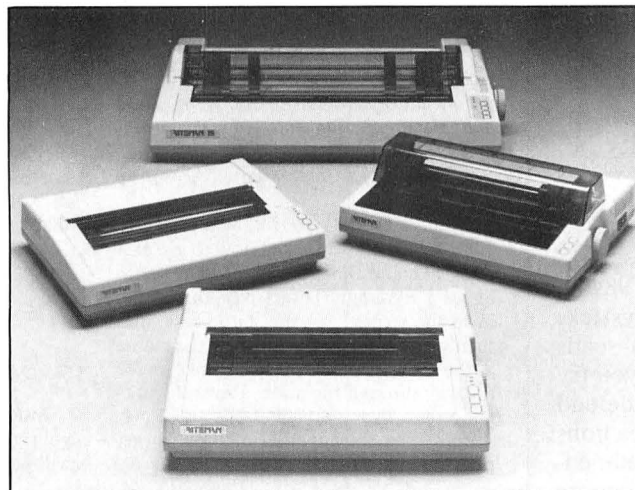
Reader Service ✓568

Video Programming Form

A new video programming form for 32-column users is now available from Gilengco.

The form acts as a listing form for the program statements and commands, and it almost automatically formats the video screen printout. Long texts can be right- and left-justified, words hyphenated, and the maximum string-length delineated.

As an introductory offer, six samples with the instructions for use are available for \$1, postpaid to zip-coded addresses. The forms are normally available in 50-sheet pads for \$6 postpaid to zip-coded addresses. Foreign orders must include



New Riteman Printers

PRODUCT NEWS

postage for 11 ounces. Contact Gilengco, 2801 Joplin St., Joplin, MO 64801.

Reader Service ✓569

Keep Track Of Your Calls

The BBS Log Book, from Atmospheres, helps you keep track of your phone calls and related information when accessing bulletin board systems. It includes a section to record long-distance calls and a personal directory for storing frequently called numbers.

The BBS Log Book will keep track of your password, time on, time off, access numbers, dates, and more. There's room for notes.

For more information contact Atmospheres, BBS Log Book, 1207 Eighth Ave., Brooklyn, NY 11215.

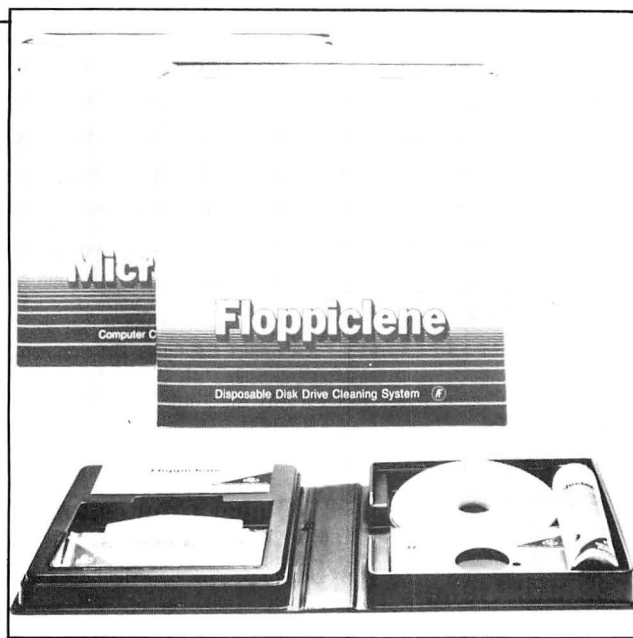
Reader Service ✓370

Comprehensive Educational Software

American Educational Computer has added two new product lines to its educational Software.

AEC Spelling is a new software series that teaches the spelling of over 4,000 words, with the ability to enter additional words. The program addresses the spelling needs of students in grades 2 through 8.

AEC Spelling uses a test/teach/test method. A pretest eliminates words that the student spells correctly. Words spelled incorrectly are automatically recorded on a study list. Words are presented in categories and in order of increasing difficulty. The AEC program



Cleaning Kits for Complete Computer Care

offers a variety of techniques for learning misspelled words. Among these are visualization exercises and alphabetizing study words. Each disk for one grade level costs \$39.95.

The Matchmaker series has expanded. The new titles are U.S. Government, World History, Biology, French, and Science I, II, and III. This series uses a diversity of standard quiz formats, such as multiple choice, matching, true/false, and completion questions. Although the majority of the question and answer choices are preprogrammed, some spare space is provided for additional material.

All the programs provide high-resolution graphics, full color, and animation. Visual rewards and game play are offered to the user after successful completion of a series of questions. Each grade level program disk costs \$39.95.

For further information contact American Educational Computer Inc., 2450 Embarcadero Way, Palo Alto, CA 94303. 415-494-2021.

Reader Service ✓566

New Books From Sybex

Sybex Computer Books has published two new books.

Understanding C, by Bruce H. Hunter, will help you take advantage of the new programming language C.

It explains the fundamentals of C, using an approach that starts your programming in the first chapter and gradually expands your knowledge of C features through a series of short example programs. The book gives you an overview of the entire C language.

The Best of CP/M Software, by John D. Halamka, evaluates thousands of commercially available application software packages and narrows the selection down to the best 45 packages.

For more information contact Sybex Publishing Co., 2344 Sixth St., Berkeley, CA 94710. 415-848-8233.

Reader Service ✓558

Spic and Span

Automation Facilities Corporation has announced two new lines of cleaning kits for the complete

care and maintenance of your computer.

The Floppiclene is a disposable wet/dry disk drive-head cleaning system. The kit includes 20 cleaning disks, Safeclene aerosol, screen wipes, and polishing cloths. It sells for \$34.95. Refill kits with 20 cleaning disks and Safeclene sell for \$14.95. A home kit with 10 cleaning disks sells for \$19.95.

The Microclene comes in two forms to cover all your computer hardware. The CRT/Workstation System contains four agents for cleaning monitor screens and computer surfaces. The Microclene kit for printers and keyboards contains everything necessary to maintain these components. Both kits cost \$24.95.

For more information contact Automation Facilities Corp., P.O. Box 06346, Columbus, OH 43206. 614-221-4201.

Reader Service ✓551

Can Your Computer Pay?

The Software Writer's Marketplace is a comprehensive guide that offers step-by-step instructions for creating saleable programs, documentation, negotiating contracts, and much more.

The book is available from Running Press Book Publishers, 125 South 22 St., Philadelphia, PA 19103, for \$9.95 plus 75¢ shipping. 215-567-5080.

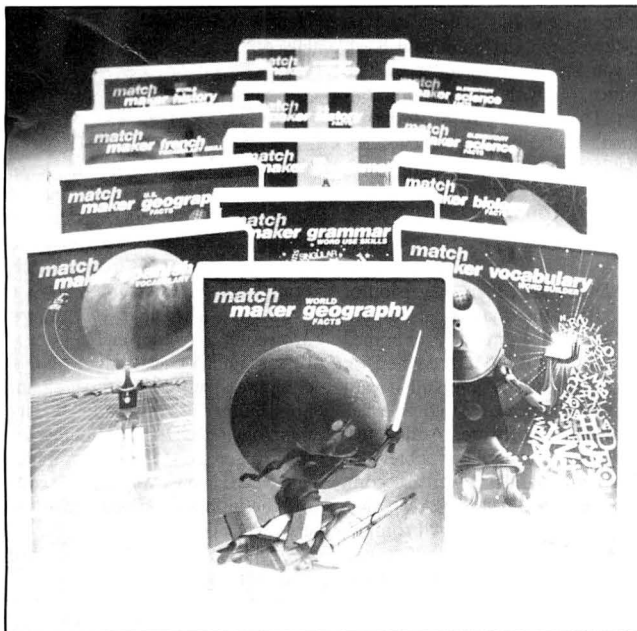
Reader Service ✓554

Computerized Greeting Cards

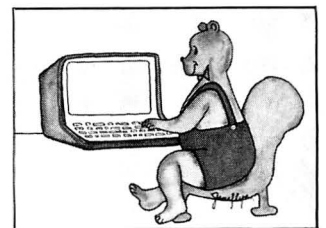
Compugreet has introduced an expanded line of greeting cards with continuous tab feed and clean-edge perforation. The cards are designed so you can print a personal message inside using your word processor. Envelopes are attached to fan-fold paper for continuous tractor-feed addressing.

There are eight all-occasion designs available. A package of 20 cards and envelopes is \$9.95, a box of 100 is \$45, and a box of 300 is \$130. Contact Compugreet, P.O. Box 3357, Reston, VA 22090.

Reader Service ✓557



The Matchmaker Series of Educational Software



Computer Greetings



Peripheral Corporation

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PRODUCT NEWS

Math Fun

Heroes and Trolls is an educational math-facts adventure game with high-resolution graphics and sound. The game may be played by either one or two players, each of whom select an arithmetic operation and one of three skill levels. The program is available on either disk or tape and requires 32K Extended Basic. The price is \$29.95.

Contact Cognitive Development Co., Suite 141, 12345 Lake City Way N.E., Seattle, WA 98125. 206-367-3470.

Reader Service ✓561

Sugar Connection

Sugar Software will now market Rainbow Screen Machine and Super Screen Machine for Rainbow Connection Software.

Rainbow Screen Machine and Super Screen Machine are popular graphics/text screen enhancers. They both require 16K Extended. Rainbow costs \$29.95 on tape and \$32.95 on disk. Super costs \$44.95 on tape and \$47.95 on disk.

For more information contact Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068. 614-861-0565.

Reader Service ✓562

Microsearch

Microsearch, created for members of The Source, is invaluable to anyone involved with computing. This comprehensive database has combined product literature, about 6,000 computer products, with product reviews and articles excerpted from nearly 150 computer publications.

To review this database, type "Microsearch" at command level. If you are not a member of The Source, but wish to be, call or contact The Source, 1616 Anderson Road, McLean, VA 22102. 703-734-7500.

Reader Service ✓563

ADOS

ADOS is an enhanced version of Disk Basic that may either be used in RAM in a 64K machine, or burned into an EPROM to replace the Disk Basic ROM. It is compatible with virtually 100 percent of commercially available software. Added features include control-key abbreviated Basic commands, lowercase command entry, ROM-to-RAM transfer, auto-line-number prompts, file copying, text file scan, a machine-language monitor, DOS command, one- or two-column directory, routing of text output to printer, and a movable memory window.

Customizing utilities are included to allow user-defined command abbreviations, baud rate, step rate, support of double-sided drives, etc. ADOS requires 64K RAM for use on disk and costs \$27.95 plus \$2 shipping.

Contact Spectrosystems, 11111 N. Kendall Drive, Suite A108, Miami, FL 33176. 305-274-3899.

Reader Service ✓564

Happy Birthday

In the program, Happy Birthday Mr. Gift, children unwrap presents and unlock words, discriminating between pairs of one-syllable words with different vowels. The program features graphics, spoken messages, timed levels, music, and a scoring machine. A complete manual also accompanies the program.

Contact Teksym Co., 14504 County Rd. 15, Minneapolis, MN 55441. 612-471-8320.

Reader Service ✓559

Indexed Reviews

Computer Software/Hardware Index is a monthly loose-leaf index to software reviews (by title, by computer, and by subject), hardware reviews, book reviews, and printed programs. It indexes the reviews and programs from approximately 35 (the number is still growing) computer publications.

CS/HI is published at \$60 a year, which includes a sturdy binder, 12 monthly issues, and an annual cumulation. CS/HI also features a document delivery service by which subscribers can obtain authorized copies of many reviews and programs at nominal cost.

Contact Computer Software/Hardware Index, P.O. Box 7991, Haledon, NJ 07538.

Reader Service ✓567

Captain Computer

Now your children can learn about computers by following the adventures of Captain Computer and his side-kick Micro Mouse, in an entertaining series of comic coloring books.

Captain Computer and Micro Mouse teach young children step-by-step approaches to the world of computers and computer program applications. Conversational terminology, and the continuing familiar figures of Captain Computer and Micro Mouse will take the edge off the intimidation and make the experience enjoyable.

Each book costs \$4.95. For more information contact Management Information Source Inc., 3543 N.E. Broadway, Portland, OR 97232. 503-287-1462.

Reader Service ✓560

This Publication is available in Microform.



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Computer Technology will Enhance your Chess Playing Skills

High technology comes to the aid of chess players! Chess-007 was designed to help you and not a computer! This unique program, developed for use on the Radio Shack TRS-80 color computer, allows you to record any game with multiple variations for rapid retrieval. Imagine reviewing your favorite openings or grandmaster games prior to competition!



Chess-007 Displayed on Radio Shack TRS-80 Color Computer

- Easy to operate, menu driven, user friendly program requires no programming skills.
- Tournament clock, skittles clock and accumulative blitz clock also incorporated for two player usage. (Incorporates two joysticks).
- Input moves by joystick manual controls.
- Records games and chess problems with multiple sideline variations.
- Build a low cost video library of your tournament games or your study games. Instructions provided to utilize blank computer cassette tapes for data storage.
- Record comments for play by play review.
- Variable speed replay for review.
- No need to set up two boards for analysis -you can return to any position during the recorded game!
- Error-free - our computer program checks for illegal or ambiguous moves before recording entry moves.
- Time saving - imagine reviewing your pre-recorded grandmaster games with extensive analysis in less than 4 minutes per game!
- Definitely not another "me-too" chess playing program. The highest levels of chess are played by people, not computers!
- Requires Radio Shack TRS-80 32k extended color computer (approx. cost \$399.00), two joysticks and cassette recorder. Uses any color or b/w TV for video playback.
- Reasonably priced program cassette is only \$59.95. Nothing on the market like it!

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ChessTech, Ltd.

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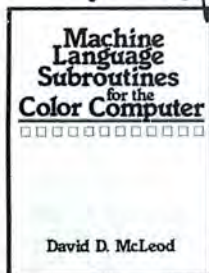
BOOKS



Nanos System Reference Cards

No more flipping through the Color Computer manuals to find information you need. Nanos System Reference cards are pocket-sized summaries for your quick, easy reference. Find such information as BASIC commands and instructions, ROM routines, reserved words, I/O instructions, hex conversions, screen line layout, and anything else you need to know to program your machine. TRS-80 Color BASIC and Extended FC1006 \$4.95

331



Machine-Language Subroutines for the Color Computer

A book of useful machine-language routines for use in your Color Computer programs. Both ROM and RAM subroutines are included, and all programs are on the cassette that comes with the book. The ROM subroutines come from the standard BASIC ROM and can be used with BASIC 1.0 or BASIC 1.1. The RAM subroutines are a collection of the author's routines. For each routine, you get entry requirements, exit conditions, error interpretation and program listings. Numeric conversions, data processing, keyboard input, text screen output, text output using high-resolution graphics, tape/disk I/O and multiple-precision routines are discussed at length.
\$29.95 CC7404 300 pp.

For credit card orders, call toll-free, 1-800-258-5473. Or send your order on a separate piece of paper to: Wayne Green Books, Retail Sales, Peterborough, NH 03458. Be sure to include the book title, order number, and price. Postage and handling is \$1.50 for the first book, \$1.00 for each additional book. Foreign air mail is \$10.00 per book. Check, money order, or complete credit card information must accompany your order. If you have questions about your order, write customer service at the above address. Orders payable in U.S. dollars only.

BOOKS



Rainbow Quest for the Color Computer

A computer fantasy for young Color Computer users. **Rainbow Quest** is an adventure that combines fiction and programs. Readers must cross the planet Rainbow and master a series of challenges to succeed on the Quest. Each challenge is a program on cassette. Included are arcade games, puzzles, and mazes. Book and cassette sold together. \$24.97 CC7391 128 pp.

Wayne Green Books

CP/M

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HOT CoCo

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ABC'S IN COLOR

In the ABC program, all 26 letters spring up in color to the familiar ABC tune. Then, colorful detailed pictures depicting each individual letter of the alphabet appear one by one. Your child's fascination will mount as he or she correctly presses the letter on the keyboard and is rewarded with a musical tune before the next detailed picture is drawn line by line onto the screen: AIRPLANE for A, BUS for B, CLOWN for C and so on to ZEBRA for Z. Truly a must program for the preschool to first grade age group!



CoCo 16K ECB Tape: \$19.95 Disk: \$25.95

CRISS—CROSS MATH

As the program begins, your child is presented with a nine square playing board. It is your choice as to which square you choose. After a choice is made, a MATH PROBLEM appears in the square. You score your first X by answering the problem correctly. If your answer is incorrect, the square clears and your opponent is allowed his choice of squares. The game is over when three squares vertically, horizontally, or diagonally are won by the same player. When playing against the computer, every answer you get wrong is won by the computer. Multi-level ADDITION AND SUBTRACTION program.

CoCo 16K Tape: \$12.95

FRACTIONS

SIDE ONE: Fraction Lessons, explains fractions with the aid of graphics. Child studies the different ways fractions can be represented. Lessons include:

- IMPROPER FRACTIONS
- MIXED FRACTIONS
- PROPER FRACTIONS

Many educators have praised the use of motion and color to display the fractional equivalents.

SIDE TWO: Fraction practice, offers a random computer generated quiz.

Atari 16k Tape: \$19.95
CoCo 16k Tape: \$19.95

JOYSTICK DRAW

Joystick Draw is the simple way to explore your artistic talents! Program operation is easy enough for a child to use, but effective enough that TCE uses it to design many sophisticated high-resolution graphic screens. Joystick Draw's design allows you or your child to save those masterpieces for future revisions or for use in other programs (instructions included). Your child will spend many hours enjoying this program and at the same time improving his or her eye hand coordination! You will find Joystick Draw to be an easy way to design those more sophisticated graphics for your own programs!

CoCo 16K ECB Tape: \$16.95

TM

SPELL BOMBER

As captain of your ship, you must destroy the enemy bomber by spelling the mystery word. In this exciting and educational game the bomber gets closer with each inaccurate letter. You have only EIGHT tries to guess the mystery word or your ship will be bombed! If you guess the word correctly, GENERAL QUARTERS will sound and your ship will fire a missile to destroy the bomber, Three levels are available: EASY, MEDIUM, and HARD. Challenging for all ages!

Atari 16K Tape: \$18.95
CoCo 16k ECB Tape: \$18.95 Disk: \$22.95
Vic 20 13k Tape: \$18.95

SPELLING BEE

The word is pronounced vocally and it is up to you to type in the correct spelling. If wrong, the computer will be your friend and flash the word on the screen for just an instant. OK! Try typing the word in again. STILL WRONG! The computer wants success and allows you to see the word again this time a little longer. If you just can't spell the word, the computer realizes you need to learn to spell the word and leaves the word on the screen for you to copy. Try your best and the computer has a surprise for your reward!

SPELLING BEE I . . . GRADE 1 & 2 SPELLING BEE III . . . GRADE 5 & 6
SPELLING BEE II . . . GRADE 3 & 4 SPELLING BEE IV . . . GRADE 7 & 8
CoCo 16k ECB TAPE: \$16.95 Each

TC—INVENTORY

Many insurance companies offer a discount for policy holders which have complete inventories on file. TC — Inventory is designed to help you organize, maintain, and compile the personal belongings of your home. Program is user friendly and menu driven. TC — Inventory allows input for location of item, price of item, serial number of item, date of purchase, and a text written description of the item. Don't put off recording your personal belongings until its too late. Requires printer for hard copy.

CoCo 32k ECB Tape: \$16.95

TEACHING CLOCK



Torn between teaching time on a digital or a conventional (face and hands) clock? Well, this program combines the two using high resolution graphics and prompts! Your child will learn to tell time with the aid of a specially designed CLOCK! Child enters the time, if wrong, the center of the clock displays a graphic aid. If the child is correct a musical reward is heard. Program offers three levels: hours, quarter hours, and five minute intervals.

Apple 48k Disk: \$19.95
Atari 32k Tape: \$16.95
CoCo 16k ECB Disk: \$19.95 Tape: \$16.95



**Additional Educational Software available
for Color Computer, TDP 100, Atari®,
Apple®, Commodore 64®, and VIC 20®.**



390

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The HJL-57 Keyboard

Now available for all models,
including CoCo 2.



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Only \$79.95, the HJL-57 is available for immediate shipment for either the original Color Computer (sold prior to October, 1982) or the F-version and TDP-100 (introduced in October, 1982), and the new 64K CoCo. **Now also available for CoCo 2.**

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